12.334/D

——— Search more deeply for the Cause;
And study Nature well, and Nature's Laws.—
Dryden

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A
SUPPLEMENT
TO THE
New and Univerſal
DICTIONARY
OF
ARTS AND SCIENCES.

Ja.s Baſire fecit.

LONDON:
Printed for the PROPRIETORS,
And Sold by JOHN HINTON, at the *King's-Arms* in *Newgate-Street*, *London.*
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1754

GEORGE R.

GEORGE the Second, by the Grace of God, King of *Great-Britain*, *France*, and *Ireland*, Defender of the Faith, *&c.* To all to whom theſe Preſents ſhall come, Greeting: Whereas our Truſty and Well-beloved *John Hinton*, of our City of *London*, Bookſeller, hath by his Petition humbly repreſented to Us, That he hath been at very great Labour and Expence in purchaſing Books, and employing Mr. *John Barrow* to compile and write a Work, entitled, *A New and Univerſal Dictionary of Arts and Sciences, containing, Not only an Explanation of the various Terms made Uſe of in the following Arts and Sciences, but alſo, whatever elſe is requiſite to render theſe Branches of Literature themſelves, Eaſy and Familiar to the meaneſt Capacities*, viz. Agriculture, Algebra, Anatomy, Architecture, Arithmetic, Aſtronomy, Botany, Catoptrics, Chemiſtry, Chronology, Commerce, Conics, Coſmography, Dialling, Dioptrics, Ethics, Fluxions, Fortification, Gardening, Gauging, Geography, Geometry, Grammar, Gunnery, Handicrafts, Heraldry, Horſemanſhip, Huſbandry, Hydraulics, Hydrography, Hydroſtatics, Law, Levelling, Logic, Maritime and Military Affairs, Mathematics, Mechanics, Merchandize, Metaphyſics, Meteorology, Muſic, Navigation, Optics, Painting, Perſpective, Pharmacy, Philoſophy, Phyſic, Pneumatics, Rhetoric, Sculpture, Series, Statics, Statuary, Surgery, Surveying, Trigonometry, *&c.* With an Introductory Preface, tracing the Progreſs of Literature from the earlieſt Ages, and enumerating the various Improvements made therein at different Periods of Time; the whole being a complete Body of Arts and Sciences, as they are at preſent cultivated; illuſtrated with a great Number of Copper-Plates: In Two Volumes, in Folio: One Volume of which is already Publiſhed, and the other now Printing from the Manuſcripts of the ſaid *John Barrow*. Which Work the Petitioner apprehends will be of the greateſt Uſe and Benefit, by facilitating the Study of the Arts and Sciences. And being deſirous of enjoying the Profit and Benefit that may ariſe from Printing and Vending the ſame, without any other Perſon interfering in his juſt Property: He has therefore moſt humbly prayed Us, to grant him Our Royal Licence and Protection, for the ſole Printing, Publiſhing, and Vending the ſaid Work, in the ſame Manner as has been done in Caſes of the like Nature: We being willing to give all due Encouragement to this Undertaking, are graciouſly pleaſed to condeſcend to his Requeſt; and We do by theſe Preſents, ſo far as may be agreeable with the Statute in that Behalf made and provided, grant unto him the ſaid *John Hinton*, his Executors, Adminiſtrators, and Aſſigns, Our Licence for the ſole Printing, Publiſhing, and Vending of the ſaid Work, for the Term of Fourteen Years, to be computed from the Date hereof; ſtrictly forbidding all our Subjects, within our Kingdoms, or Dominions, to reprint, or abridge the ſame, either in the like, or in any other Size or Manner whatſoever; or to import, buy, vend, utter, or diſtribute, any Copies thereof reprinted beyond the Seas, during the aforeſaid Term of Fourteen Years, without the Conſent or Approbation of the ſaid *John Hinton*, his Executors, Adminiſtrators, and Aſſigns, under his or their Hands and Seals, firſt had and obtained, as they will anſwer the contrary at their Peril: Whereof the Commiſſioners, and other Officers of our Cuſtoms, the Maſter, Wardens, and Company of Stationers are to take Notice, that due Obedience may be rendered to Our Pleaſure herein declared.

Given at our Court at St. James's, *the Third Day of* December, 1753, *in the Twenty-Seventh Year of Our Reign.*

By His Majeſty's Command,

HOLDERNESSE.

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PREFACE.

HAVING, in our preface to the Dictionary traced the progreſs of the Arts and Sciences from the earlieſt ages, we ſhall here endeavour to ſhew how theſe various branches of human knowledge form one regular ſyſtem; for it is obvious upon reflection, that they have a certain connection with, and mutually aſſiſt each other; and, conſequently, all form one general concatenation. But, if we find it no eaſy taſk to reduce any ſingle Art, or Science, to a few rules or general principles, we ſhall find it equally difficult, at leaſt, to reduce the various branches of human knowledge into a general ſyſtem. In order, however, to ſee how far this may be effected, we ſhall previouſly enquire into the origin, generation, or production of human knowledge; its cauſes, ſigns, and the formation of ideas.

Human knowledge, in general, may be divided into direct and reflex. The former is what we receive directly by the ſenſes without any exertion of the will; and flows to the mind ſpontaneouſly, and without obſtruction. The latter is an acquiſition of the mind attained by its operations upon the direct, in uniting, ſeparating, arranging, or combining.

As we are indebted to the ſenſes for all our direct knowledge, our ideas are all, conſequently, derived from our ſenſations. This was a principle with the earlieſt philoſophers; and, becauſe of its antiquity, long held as an axiom among the ancient ſchoolmen; who would indeed have as warmly defended ſubſtantial forms, and occult qualities. Upon the revival of philoſophy this truth, ſtanding among a number of abſurd opinions, was overlooked, and preſcribed indiſcriminately with them; nothing being more dangerous to truth, than its keeping company with error. The ſeducing doctrine of innate ideas, recommended the more ſtrongly perhaps by its novelty, was adopted, and long prevailed over this axiom of the ſchoolmen; nor is it yet deſtitute of defenders; ſo difficult is it for truth to regain her ſeat, when once dethroned by prejudice or ſophiſtry.

Nothing is more certain than the exiſtence of our ſenſations; and, to prove that they alone are the foundations of all our knowledge, it will be ſufficient for us to ſhew, that they poſſibly may be ſo: for, in ſound philoſophy, deductions, having facts and acknowledged truths for their baſes, are preferable to what reſts only on mere hypotheſes, however ingenious.

The firſt thing taught us by our ſenſations is our own exiſtence, which cannot be diſtinguiſhed from them; and, conſequently, our primary reflections revert back upon ourſelves, or that thinking principle that conſtitutes our nature, and differs in nothing from ourſelves.

The ſecond thing taught us by our ſenſations is the exiſtence of external objects, and among the reſt, that of our bodies, which are, in a certain ſenſe, external to us, even before we diſtinguiſh the ſeparate nature of the thinking principle within us.

Theſe innumerable external objects have upon us ſo ſtrong, conſtant, and attractive an effect, that our ideas of reflection have no ſooner called us into ourſelves, than thoſe of ſenſation, which entirely ſurround us, force us outwards; and detain us from that penſive ſolitude, in which we ſhould otherwiſe continue.

The multiplicity of theſe ſenſations, the concurring agreement of their evidence, the degrees we obſerve in them, the involuntary affections they excite in us, compared with the voluntary controul we have over our ideas of reflection, which operate only upon our ſenſations; all this, we find, produces in us an irreſiſtible impulſe to acknowledge the real exiſtence of external objects, and to regard them as the cauſe of our ſenſations. This impulſe has by many philoſophers been looked upon as the effect of the ſupreme Being, and the moſt convincing argument of an external world.

But, as we are ignorant of any relation between a ſingle ſenſation and the object thus ſuppoſed to occaſion it, we cannot reaſon from the one to the other: nor could any thing but a kind of inſtinct, more evident than reaſoning itſelf, oblige us to draw ſo remote a concluſion. But this inſtinct is ſo ſtrong, that, could it for a moment ſubſiſt, and all external objects be annihilated, their reproduction could add nothing to its ſtrength. We may therefore ſurely conclude, that our ſenſations actually have the external cauſe ſuppoſed; ſince even the effect of that very cauſe would be the ſame with that we really experience.

Our own bodies, belonging more immediately to us than any other external objects, affect us moſt. We are no ſooner ſenſible that our body exiſts, than we are convinced of the care requiſite to guard it from ſurrounding dangers. It is not only expoſed to a thouſand wants, but ſo extremely ſenſible of the action of other bodies, that it would ſoon be deſtroyed, did not we exert our utmoſt attention to preſerve it. All external bodies, indeed, do not produce diſagreeable ſenſations; the action of ſome is attended with pleaſure: but the condition of human nature is ſuch, that we have a quicker ſenſe of pain than of pleaſure; and, therefore, the latter ſeldom compenſates for the former.

Certain philoſophers, indeed, maintained, that pain was no evil, and ſuppreſſed their cries in the midſt of torments: others placed ſupreme happineſs in voluptuouſneſs, but avoided it for fear of its conſequences. All of them however would have ſhewn themſelves better acquainted with human nature, had they reſtrained the ſovereign happineſs of this life to exemption from pain; and allowed, that we can approach this happineſs, only in proportion to our care and circumſpection.

Reflections like theſe infallibly ariſe in the breaſt of every perſon, who has not imbibed the prejudices of wrong education or perverted ſtudy. They follow as conſequences of the firſt impreſſions we receive from objects, and may be placed among thoſe firſt emotions of the ſoul, which are ſo valuable to the truly wiſe, and ſo deſerving of obſervation; though neglected, or rejected, by vulgar philoſophers, whoſe principles they almoſt univerſally contradict.

As we are under a neceſſity of preſerving our bodies from pain and deſtruction, we muſt examine what external objects may prove uſeful or hurtful to us, in order to ſecure the one, and avoid the other: but we no ſooner begin to conſider theſe objects than we diſcover among them numerous beings like ourſelves, their form exactly reſembling ours; and, having, in all appearance, the ſame perceptions, we juſtly conclude they labour under the ſame wants, have the ſame appetites, and the ſame deſire of gratifying them; and, conſequently, that we might, by uniting ourſelves with others of our ſpecies, in diſcovering what things in nature to tend to our preſervation, or detriment, reap very great advantages. The communication of ideas is the principle and ſupport of this union, which neceſſarily requires the invention of ſigns: and upon this principle was ſociety formed, and language introduced.

And ſurely the pleaſure and advantage flowing from this communication, either by imparting our ideas to others, or by adding thoſe of others to our own, ſhould oblige us to an intimate union in ſociety, and induce us to exert all our powers to render it as mutually uſeful as poſſible.

But as each member of ſociety is chiefly ſollicitous to procure his own perſonal advantage, and as an equal deſire to do the ſame is implanted in others; all of us cannot poſſibly receive an equal ſhare, though we have all undoubtedly an equal right: and hence a right, ſo juſtly founded, is preſently invaded by that barbarous one of inequality, or the law of force; a law that reduces human nature almoſt to a level with the brutes, and is extremely difficult not to abuſe. The ſtrength nature has generouſly given to ſome, doubtleſs to be imployed for the ſupport and protection of the weaker of our ſpecies, becomes the means of oppreſſion: but the weak, in proportion to the violence of this oppreſſion, the leſs patiently endure it: being perſuaded that it is founded on no reaſonable motive. And from hence flow our ideas of injuſtice, and of moral good and evil; the principle of which philoſophers have ſo long endeavoured to diſcover; whereas it is truly the voice of nature, extending even to ſavages. This is the law of nature implanted in every human breaſt, and the true origin of the earlieſt laws formed by mankind. Nay, this ſole voice of nature, unaſſiſted by human laws, is often ſufficient either to prevent oppreſſion, or, at leaſt, to confine it within certain bounds. Thus the vices of our own ſpecies produce in us the reflex knowledge of our oppoſite virtues.

Having acquired the idea of juſt and unjuſt, and the conſequent moral nature of actions, we are led to examine, what that acting principle within us is, which wills and conceives. We eaſily diſcover, without a long reſearch into the nature of our own bodies, and the idea we have of them, that they are very different from this principle, becauſe the properties found in bodies are entirely different from the faculty of willing and thinking; conſequently, we are compoſed of two principles, different in their nature; but ſo united, that the motions of the one are connected with the affections of the other, which we are abſolutely unable either to ſuſpend or alter: and this connection renders them reciprocally ſubordinate to each other.

This ſubordination ſo independent of us, added to the reflections continually flowing from the nature of theſe two principles, and their imperfections, raiſes us to a contemplation of an omnipotent intelligent being, to whom we are indebted for our exiſtence and preſervation, and who, conſequently, demands our adoration: our internal ſentiments, therefore, are ſufficient to demonſtrate the exiſtence of an omnipotent Being; were we even deprived of the univerſal conſent of others, and of all mankind. And thus our pure intellectual notions of virtue and vice, the principle and neceſſity of laws, the ſpiritual nature of our ſouls, the exiſtence of God, and our duty towards him; in ſhort, all the truths we have an abſolute occaſion for, naturally flow from our firſt ideas of reflection upon thoſe of ſenſation.

But notwithſtanding theſe firſt truths are of the greateſt conſequence, with regard to the more noble part of us, our ſoul; the body, to which that part is united, ſoon diverts our attention from them, to provide for its numerous wants. Its preſervation obliges us either to prevent the dangers that threaten it, or to remove the evils it ſuffers. We have only two methods of performing this; the firſt is our own particular diſcoveries; and the ſecond, thoſe of others, which we acquire by intercourſe. And from hence agriculture, medicine, and all thoſe arts abſolutely neceſſary, or the primitive arts of man, together with all the reſt, though apparently very remote, derived their origin.

Men, in the earlieſt ages, either by mutually aſſiſting each other with information, or by joint endeavours, ſeem ſoon to have diſcovered ſome particulars to which they might apply themſelves. Eager in the purſuit of uſeful knowledge, they did not long amuſe themſelves with idle ſpeculations, but examined the different objects of nature, and, diſcovering their moſt obvious and ſtriking properties, applied them together.

This firſt application produced a more latent one, relating to man's neceſſities; conſiſting principally in examining more minutely ſome leſs ſingle properties, in the alteration and decompoſition of bodies, and the uſes naturally flowing from thence.

But in whatever method the firſt of our ſpecies, and their ſucceſſors, proceeded, inſtigated by an object ſo intereſting as their own preſervation; their experience and obſervation of this immenſe univerſe muſt have produced difficulties too great for their utmoſt efforts to ſurmount. But, having now accuſtomed their minds to meditation, and being deſirous of drawing advantage from it, their only reſource muſt be the diſcovery of ſome merely curious properties of bodies. And, indeed, were it poſſible for an immenſe number of agreeable facts to ſupply the place of a ſingle uſeful truth, the ſtudy of nature would be abundantly ſufficient; for, if it does not afford us neceſſaries, it at leaſt furniſhes us with a profuſion of pleaſures; and ſupplies, though very imperfectly, the place of what is truly eſſential, by a kind of barren ſuperfluity.

Pleaſure holds one of the firſt places in the order of our wants, and the objects of our paſſions; and curioſity is a want to the penſive mind, eſpecially when animated by the flattering hopes of acquiring entire ſatisfaction. Hence, we owe numerous diſcoveries, whoſe only merit conſiſts in pleaſing, to an unhappy impotence of acquiring ſuch as would be attended with real utility. But there is another motive to works of curioſity; we mean, a pretence of advantage. When we are convinced, that ſomething real and advantageous has reſulted from enquiries, where at firſt we had not the leaſt reaſon to ſuſpect it, it inſpires us with hope that all curious enquiries may, in the end, prove uſeful: and ſhews the origin, cauſe, and progreſs of that vaſt ſcience, called, in general, phyſics, or the ſtudy of nature, comprehending ſo many different parts; agriculture and medicine, which principally gave it birth, are now only branches of it; and, though the moſt ancient and moſt eſſential, have only been eſteemed, in proportion as they happened to be more or leſs obſcured by others.

In this ſtudy of nature, partly proſecuted from neceſſity, and partly for amuſement, we are ſufficiently convinced that bodies have numerous properties; but generally ſo united in the ſame ſubject, that, in order to ſtudy thoroughly each of them, we are obliged to conſider them ſeparately. And, by this operation of the mind, we ſoon diſcover properties apparently belonging to all bodies; as motion, reſt, and the communication of motion: ſources of the principal changes we obſerve in nature. Upon examining theſe properties by the ſenſes, eſpecially the laſt, we ſoon diſcover another property, whereon they depend, namely, impenetrability; or that kind of force, by which each body excludes all others from the ſpace it occupies.

Impenetrability is the principal property by which we diſtinguiſh bodies from the parts of indefinite ſpace, wherein we ſuppoſe them placed; at leaſt, we are obliged by our ſenſes to judge thus of them: and, if our ſenſes in this particular deceive us, it is ſo metaphyſical an error, that our exiſtence and preſervation have nothing thence to fear; our common manner of conceiving obliging us conſtantly, in ſpite of ourſelves, to return to this notion. We are induced by every object that ſurrounds us to look upon ſpace, as the real, or at leaſt the ſuppoſed place of bodies: and it is, actually, by the means of the parts of ſpace, conſidered as penetrable and immoveable, that we acquire the juſteſt idea of motion we can poſſibly obtain: and are conſequently obliged to diſtinguiſh, mentally at leaſt, two kinds of extenſion; the one impenetrable, and the other conſtituting the place of bodies. Thus, though we include impenetrability in the idea we form of the parts of matter, yet, being a relative property, the idea of which we only acquire by examining two bodies together, we ſoon accuſtom ourſelves to conſider it as diſtinguiſhed from extenſion; which we can mentally abſtract from body.

In this new conſideration we regard bodies only as figured and extended parts of ſpace: which is the moſt general and abſtract light they can be conſidered in: for extent, wherein we diſtinguiſh no figured parts, reſembles only an obſcure picture, whoſe ſeveral parts eſcape our notice; becauſe we can diſtinguiſh nothing. Colour and figure, properties conſtantly, though differently, reſiding in bodies, help us to diſtinguiſh body from ſpace. Indeed, one of theſe properties is ſufficient for the purpoſe; and, in that caſe, figure is generally preferred to colour.

Hence, we are enabled to fix the properties of ſimple figured extenſion, which conſtitutes the object of geometry, which, the more eaſily to attain its end, conſiders extenſion as firſt limited by one, then by two, and laſtly by three dimenſions. Theſe three dimenſions conſtitute the eſſence of all bodies in the univerſe. Alſo, by the ſucceſſive operations and abſtractions of mind, we diveſt matter of almoſt all its ſenſible properties, in order to examine only its idea. This enquiry cannot fail of leading to diſcoveries of the greateſt utility; eſpecially, as it is here unneceſſary to regard the impenetrability of bodies: for example, when we contemplate their motion, we need only conſider them as figured and moveable parts of ſpace, and diſtant from one another.

The examination of figured extenſion preſenting a great number of poſſible combinations, it is neceſſary to invent a method of rendering theſe combinations eaſy. And as they principally conſiſt in the calculation, and proportion, of the different parts which we imagine conſtitute geometrical figures; this enquiry leads us immediately to arithmetic, or the ſcience of numbers. This art conſiſts in finding a ſhort and facile method of expreſſing a ſingle relation, reſulting from the compariſon of ſeveral others. The different ways of comparing theſe relations give us the different rules of arithmetic.

By attentively conſidering theſe rules, we cannot help obſerving certain principles, or general properties, of relations; and, by expreſſing theſe relations in a general manner, we diſcover different poſſible combinations. The reſults of theſe combinations, being reduced to one general form, are in effect no more than arithmetical calculations indicated and expreſſed in the moſt conciſe manner, conſiſtent with their generality. The art or ſcience of repreſenting theſe relations is what we term algebra. And though, properly ſpeaking, it is impoſſible to perform any calculation, but by numbers; nor meaſure any magnitude but by extenſion (for without ſpace we could not exactly meaſure time) we arrive, by conſtantly generaliſing our ideas, at that principal branch of the mathematics, and all the natural ſciences, called the ſcience of magnitude in general; being the foundation of all the poſſible diſcoveries relating to quantity; that is, whatever is ſuſceptible of being increaſed or diminiſhed.

This ſcience is the ultimate end poſſible to be attained by the contemplation of the properties of matter; it being impoſſible to go farther, without entirely quitting the material univerſe. But ſuch is the progreſs of the mind in its enquiries, that after having generaliſed its perceptions, ſo as to be unable to analyſe them farther, it returns back by the ſame ſteps, recompoſes its perceptions anew, and gradually forms ideas of ſuch beings as are the immediate and direct objects of our ſenſations. Theſe being immediately relative to our wants, we are under an abſolute neceſſity of ſtudying them; mathematical abſtractions greatly facilitate this ſtudy, and by this application only prove uſeful in life.

Having now, as it were, exhauſted the properties of figured extenſion by our geometrical ſpeculations, we again reſtore to it impenetrability; which conſtitutes phyſical body, and is the laſt ſenſible property we diveſted it of by our abſtractions. This new conſideration is attended with another, the action of bodies upon each other; for bodies only act by means of impenetrability; whence we derive the laws of equilibrium and motion; the object of mechanics. And hence we extend our enquiries to the motion of bodies, propelled even by unknown powers, or moving cauſes; provided the law, regulating theſe cauſes, is either known or ſuppoſed.

Returning thus to the corporeal world, we immediately perceive the uſe of geometry and mechanics, in deriving, from the properties of bodies, the moſt ſublime and intereſting truths; and from whence, nearly, all thoſe ſciences, termed phyſico-mathematical, are derived. At the head of theſe ſciences we juſtly place aſtronomy; a ſtudy, next to that of ourſelves, the moſt worthy of cultivation, on account of the magnificent ſcene it preſents to our view. Joining obſervation with calculation, and illuſtrating the one by the other, aſtronomy determines, to a ſurpriſing degree of exactneſs, the diſtances and moſt complicated motions of the celeſtial bodies; and even aſſigns the forces themſelves, by which theſe motions are either produced or altered. So that this ſcience may be juſtly regarded as a ſublime and certain application of geometry and mechanics united; and its progreſs as an inconteſtable monument of the advantageous efforts of human ſagacity.

The uſe of mathematical knowledge is no leſs conſiderable in examining the terreſtrial bodies that ſurround us. All the properties obſervable in theſe bodies have certain relations to one another, more or leſs ſenſible to us: The knowledge, or diſcovery, of theſe relations is almoſt the only object we can arrive at; and, conſequently, the only one we ſhould propoſe to ourſelves. The knowledge of nature can never be obtained from vague and arbitrary hypotheſes: it muſt be acquired by conſidering phænomena, comparing them together, and reducing, as much as poſſible, many of them to one ſingle cauſe, which ſhould be regarded as a principle. In fact, the more we diminiſh the number of principles in a ſcience, the more we increaſe their extent; for, the object of a ſcience being neceſſarily determined, the principles applied to that object become ſo much the more pregnant, in proportion as they are rendered fewer, or more general. This reduction, which facilitates the diſcovery of principles, conſtitutes genuine theory; and ſhould not be miſtaken for the ſpirit of building ſyſtems; which is often a very different thing.

But this reduction becomes more or leſs difficult, in proportion as the object conſidered proves more or leſs abſtruſe, or extenſive; and, accordingly, we are more or leſs intitled to require it of thoſe who apply themſelves to the ſtudy of nature. The magnet, for example, is a ſubject that has been greatly laboured; and ſurpriſing diſcoveries are already made in it; as its properties of attracting iron, and communicating the ſame virtue thereto; its turning to the north, with a variation ſubject to rules, and affording as ſurpriſing a phænomenon, as a more exact direction; and, in fine, its dip to the horizon, in an angle greater or leſs, according to the part of the earth it is placed upon. Theſe are particular properties, probably depending upon ſome one general principle, or cauſe, hitherto unknown. And it is ſurely an enquiry worthy of philoſophers to reduce, if poſſible, all theſe properties to one, by ſhewing the principle that connects them. But this diſcovery, however ſerviceable it might be to natural philoſophy, is, we fear, not eaſy to make. We may ſay the ſame of many other phænomena, whoſe connection, perhaps, belongs to the general ſyſtem of the univerſe.

The only method to be followed in ſuch laborious, neceſſary, and uſeful reſearches, is, to collect as many facts as poſſible; diſpoſe them in a natural order; and reduce them under a certain number of principal facts, of which the leſſer ſhould appear as ſo many conſequences. If at any time we preſume to riſe higher, it ſhould be with a circumſpection becoming ſo feeble an underſtanding as ours.

Such is the plan to be followed in this vaſt part of phyſics, generally called experimental philoſophy. It differs from the phyſico-mathematical ſciences, in being, properly, no more than a rational collection of experiments and obſervations; whereas the phyſico-mathematical ſciences, by applying calculation to experience, ſometimes, even from a ſingle obſervation, draw numerous conſequences, approaching, with certainty, to geometrical truths. Thus from one experiment upon the reflection of light, the whole ſcience of catoptrics, or doctrine of mirrours, was produced; and, from another on the refraction of light, the theory of the rainbow, the doctrine of colours, and all dioptrics. From obſerving the preſſure of fluids, we derive the laws of their equipollency and motion. In fine, from the ſingle experiment of the acceleration of falling bodies, was derived their falling on inclined planes, and the whole doctrine of pendulums.

It muſt however be acknowledged, that ſome mathematicians have miſapplied algebra to phyſics. Inſtead of proper experiments to ground calculation upon, they ſometimes uſe hypotheſes, commodious for their purpoſe, though often different from what is actually found in nature. Algebraiſts have been fond of reducing all to calculation, not excepting the healing art itſelf. That complicated engine, the human body, has been treated by algebraical phyſicians, as a ſimple machine, eaſy to analyſe. For our own parts, either more cautious or more kind, we look upon the greateſt part of ſuch calculations, and vague ſuppoſitions, as the ſport of fancy, to which nature is not in the leaſt obliged to ſubmit; and conclude, that the only true method of philoſophiſing conſiſts either in the application of mathematical calculation to experiments; or in ſimple obſervation, conducted ed by proper methods, and ſometimes aſſiſted by conjectures for further enquiry; ſcrupulouſly avoiding all arbitrary hypotheſes.

From what has been ſaid, we may obſerve that there are two limits, within which all our certain knowledge of nature appears to be confined; the one is, what we at firſt laid down, the idea of ourſelves; which leads us to that of an almighty being, and our principal duties. The other is, that part of mathematics, which has for its object the general properties of body; we mean, extent and magnitude. Between theſe two limits, is an immenſe interval, wherein the ſupreme intelligence ſeems willing to exerciſe human curioſity, by the numerous clouds interſperſed, and certain tracts of light breaking out here and there, as if to allure us. The univerſe may be compared to books written with ſublime obſcurity; where the author, ſometimes levelling himſelf to the capacity of his readers, ſeems to perſuade them they nearly underſtand the whole. Happy for us, who enter this labyrinth, if we do not miſtake the path; for, if we ſhould, the light, deſigned to conduct, will miſlead us farther.

As the ſmall acquiſition of certain knowledge we can boaſt of, is incapable of conducting us beyond the two limits above-mentioned, it is far from being ſufficient to ſupply our numerous wants. The ſtudy of human nature, ſo neceſſary, and ſo much recommended by Socrates, is an impenetrable myſtery to man, who has only reaſon to direct him. The greateſt genius, reflecting upon this important ſubject, ſeldom riſes higher than to know leſs than the reſt of mankind. And the ſame may be ſaid of our preſent and future exiſtence; the eſſence of that being to whom we owe them both; and of the kind of worſhip he requires of us.

A revealed religion is therefore abſolutely neceſſary, to inſtruct us in eſſential points, and ſerve as a ſupplement to natural knowledge, by teaching us things otherwiſe impoſſible to be diſcovered. Revelation however has confined itſelf to what is abſolutely neceſſary for us to know; the reſt remains, and, perhaps, for ever will remain, concealed. A few truths to believe, a few precepts to practiſe, make the ſubſtance of revealed religion; but, by means of the light it has communicated to the world, we are more confirmed in many intereſting points, than any of the ſects of mere philoſophers.

With regard to the mathematical ſciences, which conſtitute the ſecond limit of our knowledge, their nature and number ſhould not deceive us. It is principally to the ſimplicity of their object, that they are indebted for their certainty. And, as the objects of the ſeveral branches of theſe ſciences are not equally ſimple, demonſtration, which is founded on ſelf-evident principles, does not equally belong to them all. Many of them are founded on principles merely phyſical; that is, on experiments, or ſimple hypotheſes; and, conſequently, have only experimental or hypothetical certainty. Properly ſpeaking, only thoſe branches which treat of magnitude, and the general properties of extenſion, as algebra, geometry, and mechanics, can be called demonſtrative. The light, acquired by the mind from theſe ſciences, has a certain kind of gradation; and their principles become clearer, in proportion as their object is conſidered in a more abſtract and general manner. Geometry is more ſimple and abſtract than mechanics; and algebra more ſimple and abſtract than either. This is no paradox to thoſe who have philoſophically ſtudied theſe ſciences; the abſtracteſt notions, which the generality look upon as moſt confuſed, commonly afford the cleareſt light: our ideas become obſcure, in proportion to the number of ſenſible properties we examine in an object. Impenetrability, joined to the idea of extenſion, ſeems like adding one myſtery to another; the nature of motion is an ænigma to philoſophers; the metaphyſical principle of the laws of percuſſion is as little known: in a word, the more we compare our idea of matter with its properties, the more that idea becomes obſcure, and ſeems to elude the utmoſt efforts of human perſpicacity.

From what has been ſaid it evidently follows, that all the mathematical ſciences are not equally capable of giving ſatisfaction to the mind: let us next examine without prejudice, how far theſe ſciences may be reduced. At firſt view, they appear extremely numerous, or almoſt inexhauſtible; but, when ranged in order, and brought into a philoſophical liſt, their number falls greatly ſhort of expectation. There are numerous mathematical truths, of which little uſe, or application, is made. This, indeed, is no argument againſt them, conſidered in themſelves; but even moſt of the axioms which geometry plumes itſelf with, what are they but expreſſions of the ſame ſimple idea, under two different ſigns, or words? Do we derive any more real knowledge from ſaying that two and two make four, than we ſhould from ſaying that two and two make two and two? The ideas of a whole and a part, greater and leſs, are they, properly ſpeaking, any more than the ſame individual ſimple idea; as we cannot have the one without the other's preſenting itſelf at the ſame time? Certain philoſophers obſerve, that many errors are owing to the abuſe of words; and perhaps axioms are alſo owing to this abuſe. We do not however abſolutely condemn their uſe, but only propoſe to obſerve its limitation; which conſiſts in rendering ſimple ideas more familiar by habit, and fitter for the different purpoſes to which they may be applied. The ſame, with proper reſtrictions, may be ſaid of mathematical theorems; for, when they are conſidered without prejudice, they may be reduced to a few primitive truths. If we examine a train of geometrical propoſitions, ſo deduced the one from the other, that every contiguous two are linked together; we ſhall find, that they are all no more than the firſt propoſition ſucceſſively diſguiſed, in paſſing from one conſequence to the next; the original propoſition not being in the leaſt multiplied by this concatenation, but only appearing under different forms: as if ſucceſſively expreſſed in a language, gradually changing by time, and employing a different phraſeology, according to the different ſtages it paſſes through; whilſt each ſtage remains diſcoverable by comparing it with that immediately preceding, but not ſo well by comparing it with one more remote one; though all the ſtages depend upon each other, and deſign to convey the ſame ideas. We may therefore conſider the concatenation of a ſeries of geometrical truths, as ſo many different tranſlations of the ſame propoſition, and often of the ſame hypotheſis. Such tranſlations, indeed, are often of the greateſt uſe, as they enable us to make different applications of the theorem they expreſs: and theſe applications are more or leſs valuable, in proportion to their importance and extent. But as the real merit of ſuch mathematical tranſlation originally reſides in the propoſition tranſlated, how greatly are we indebted to thoſe inventors, who, diſcovered any one of theſe fundamental truths, the ſource, or original from whence numerous others flow, as they have, by that means truly enriched, and greatly enlarged, the Science of Geometry. The ſame may be obſerved alſo of thoſe phyſical truths, and properties of bodies, which form a concatenation; for all theſe properties, well ranged together, afford us only one ſimple truth. If numerous others appear to us detached, or ſeparate, ſo as to form different truths, this melancholy advantage ariſes from the weakneſs of human underſtanding; our abundance here flowing only from our indigence. Electrical bodies, for example, wherein ſo many extraordinary, and apparently independent properties have been diſcovered, are perhaps, in one ſenſe, the bodies we leaſt underſtand; though we may think we know them the beſt. The virtue they acquire, by friction, of attracting lighter bodies, and of producing violent commotions in animals, appear at preſent two different things; but, could we diſcover their primary cauſe, we ſhould be convinced of their unity. The univerſe itſelf, were it poſſible for us to reduce it to a ſingle point of view, would be no more than a ſingle pregnant fact, or immenſe verity.

We have yet mentioned only thoſe Sciences which owe their origin to our wants; but theſe are not the only ſort we are obliged to cultivate: there are others relative to theſe, which men have therefore ſtudied at the ſame time with them. Both kinds might, indeed, have been deſcribed together; but we thought it more proper, and, at the ſame time, more ſuitable to the philoſophical method of this diſcourſe, firſt to conſider it without interruption, the general ſtudy men employ on bodies, and with which they originally commenced; though others were ſoon joined with it. Theſe ſtudies ſeem to have been purſued in the following order.

The advantages they found upon enlarging the ſphere of their ideas, whether by the efforts of their own genius, or the aſſiſtance of others, muſt have pointed out to them the great utility of reducing the means of acquiring and communicating knowledge to an Art, which, being invented, was termed logic. It teaches us to range our ideas in the moſt natural order; to form them into a cloſe concatenation; decompoſe ſuch as comprehend too many ſimple ones, examine them on all ſides, and, in fine, to communicate them to others in the moſt intelligible and perſpicuous manner. In this conſiſts the Science of reaſoning, which may be juſtly called the key of knowledge, though it did not come firſt in order of diſcovery. The Art of reaſoning is the free gift of nature to men of genius; and the books which treat of logic prove, in general, only of uſe to thoſe who might reaſon well without their aſſiſtance.

The valuable Art of forming our ideas into a concatenation, and conſequently of facilitating the tranſition from one to the other, furniſhes us with a method of reducing nearly to an equality the abilities of every individual. For in fact, all our knowledge reduces itſelf primitively to ſenſations, which in all men are nearly the ſame; and the Art of combining and connecting our direct ideas is no more than arranging the ſame ideas in a ſeries, more or leſs exact; whence they become more or leſs ſenſible to others. A man who readily combines his ideas, differs but little from another who combines them ſlowly; as he who judges of a picture at ſight, differs but little from him who requires to be made ſucceſſively ſenſible of all its parts: both, at the firſt glance, have the ſame ſenſations; but, as they do not ſink ſo deep in the ſecond, there is a neceſſity for him to dwell longer upon each, to render them ſtrong and diſtinct. By this means, the reflex ideas of the former become as eaſy to the latter as the direct ones. And, perhaps, it would be difficult to find an Art or Science, that, by means of a well-adapted logic, may not be taught to perſons of ſlow underſtanding; becauſe there are few Arts, or Sciences, whoſe precepts, or rules, may not be reduced to ſimple notions, and diſpoſed in ſo connected an order, that the chain need never be broken. But, in proportion as the mind is more or leſs ſlow in its operations, this connected order will become more or leſs neceſſary; and the advantage of a great genius is that of having leſs occaſion for it, or rather of being able to form it in a rapid and almoſt imperceptible manner.

The Science of communicating our ideas is not confined to the method of arranging them in a proper order; it alſo teaches how to expreſs each idea in the moſt exact and perſpicuous manner, and conſequently to perfect and aſcertain the ſigns deſtined to convey them: this alſo the human ſpecies have, by degrees, endeavoured to perform. Thoſe languages which had their origin at the ſame time with ſociety, were, doubtleſs, at firſt only a confuſed collection of ſigns; and, conſequently, natural bodies, as being objects of our ſenſes, were firſt repreſented by names. And, as languages, at their firſt origin, were adapted only to the moſt preſſing occaſions, they were certainly very imperfect, confined, and ſubject to very few certain principles: and, therefore, the Arts and Sciences, of abſolute neceſſity, might have made a great progreſs, before men attempted to form any rules for ſtyle or diction. The difficulty and imperfection attending the communication of ideas, during this want of rules, and ſcarcity of words, muſt have obliged every man to improve his knowledge, by his own reſolute labour, without greatly depending on others for aſſiſtance. Too facile a communication of knowledge may doubtleſs ſometimes benumb the faculties of the mind, or prevent the exertion of its force.

But, as a facile method of exchanging ideas by mutual commerce was attended by inconteſtable advantages, it is no wonder men ſhould endeavour to render this exchange ſtill more eaſy. In order to this, they began to reduce ſigns to words, which are marks or ſymbols, always ready at hand. The order of the generation of words, therefore, followed the order of the operations of the mind: after individuals, ſenſible qualities came next to be named, which, without having any exiſtence of their own, except in individuals, belong in common to a great number; and hence, by degrees, men came to uſe certain abſtract terms; ſome ſerving to connect ideas together, others to denote the general properties of bodies, and others to expreſs mere mental notions. All theſe abſtract terms, which children are ſo long in learning, doubtleſs required much time to diſcover. But, at length, the uſe of words being reduced to rule, grammar was formed; which we may conſider as a branch of logic. Grammar, aſſiſted by a ſubtle and refined metaphyſics, determines the ſhades or degrees of our ideas; teaches us to diſtinguiſh theſe ſhades by different marks; affords rules for the more commodious uſe of ſuch marks; and, by means of philoſophical ſagacity, in tracing the origin of things, often diſcovers the reaſons of that apparently odd choice, which prefers one ſign to another, and leaves as little as poſſible to that national caprice, called cuſtom.

Men, at the ſame time that they communicate their ideas, endeavour alſo to communicate their paſſions. This is performed by means of eloquence. This ſpeaks to the ſentiments of the heart, as logic and grammar ſpeak to the underſtanding, and can ſilence reaſon itſelf; and, perhaps, the great effects, which a ſingle orator ſometimes produces upon a whole people, are the moſt glaring inſtance of the ſuperiority of one man over another. And here it is very ſurpriſing, that men ſhould ever have thought of ſupplying the want of this prodigious talent by rules; can genius be reduced to precept? He who firſt pretended that orators were owing to Art, was either no orator himſelf, or very ungrateful to nature, which alone has the power of making an orator. There are but two books to be ſtudied by orators; men are the firſt, and the greateſt maſters of the Art the ſecond.

We are not contented to live with our cotemporaries alone. The mind of man, drawn by curioſity and ſelf-love, eagerly endeavours to embrace, at once, the paſt, the preſent, and the future times. We deſire to live both with our ſucceſſors and predeceſſors. Hence the origin and intention of hiſtory, which unites us with paſt ages, by repreſenting their vices, virtues, knowledge, and errors; and tranſmitting our own to poſterity. It is by hiſtory we learn to eſteem men only for their good actions, and not for the ſeducing pomp that ſurrounds them. Sovereigns, who are often unhappily excluded from truth on all ſides, may here previouſly paſs ſentence upon themſelves: for hiſtory is a tremendous, uncorrupt tribunal, which judges their reſembling predeceſſors juſt as it will do them.

Chronology and geography are two appendages, or ſupporters of hiſtory: the one fixing the inhabitants of the earth, in point of time; and the other aſſigning their place upon our globe: they both derive great advantages from the hiſtory of the earth and the heavens; that is, from hiſtorical facts and celeſtial obſervations; and may therefore, in the language of the poets, be ſtiled, the daughters of aſtronomy and hiſtory.

One principal advantage reſulting from the ſtudy of empires, and their revolutions, is to examine how mankind, ſeparated, as it were, into numerous large families, formed different ſocieties; how theſe ſocieties gave birth to different kinds of government; and how each people endeavoured to diſtinguiſh themſelves from the reſt, both by laws, and particular ſigns, as the means of more eaſily communicating their thoughts: whence aroſe that great diverſity of languages and laws, which, to our misfortune, is become a principal object of ſtudy. Hence, alſo, we ſee the origin of civil policy, as a particular and ſuperior kind of morality; it being often difficult, without ſtraining, to accommodate the principles of common moral duty to civil policy, which, entering into the principal motives of government, aims at diſcovering what may tend to preſerve, weaken, or deſtroy a ſtate. This ſtudy is perhaps the moſt difficult of any; for it requires not only a deep knowledge of mankind, in general, and of the people to be governed, in particular; but alſo a great compaſs, and variety of abilities: eſpecially if the politician would remember that the law of nature, being prior to all particular conventions, is the firſt law of the people; and that his being a ſtateſman does not exclude his being a man.

Theſe are the principal branches of that portion of human knowledge, which conſiſts either in the ideas we receive directly by the ſenſes, or in the combination or compariſon thereof: which combination is, in general, called philoſophy. Theſe branches ſubdivide themſelves into ſuch a prodigious number of others, that the enumeration of them rather belongs to the work itſelf than the preface.

We began with conſidering the firſt operation of reflection, which conſiſts in collecting and uniting our direct notions, and have mentioned the different Sciences reſulting from thence. The notions, formed by the combination of our primitive ideas, are not however the only ſort of which the mind is capable. There is another kind of reflex knowledge, which we ſhall now conſider. It conſiſts in the ideas we form to ourſelves, by imagining and comparing things, as they reſemble the objects of our direct ideas. This is what we term the imitation of nature, ſo well known, and ſo much recommended, by the ancients. As the direct ideas which ſtrike us with the moſt vigour are thoſe we remember beſt; ſo we the more earneſtly endeavour to reproduce them in ourſelves, by an imitation of their objects. Agreeable objects indeed ſtrike us ſtronger when real, than when barely repreſented; but this defect is, in ſome manner, ſupplied by the pleaſure we receive from their imitation. On the other hand, thoſe real objects which excite melancholy or diſtreſsful ſentiments, their imitation becomes more agreeable than the objects themſelves, by placing us at ſuch a juſt diſtance, that we receive the pleaſure of the emotion, without the diſorder. And in this imitation of all kinds of objects, capable of raiſing lively or agreeable ſentiments in us, conſiſts, in general, the imitation of beautiful nature; upon which ſo many authors have wrote, without being preciſe: perhaps becauſe it requires exquiſite ſentiments to determine what beautiful nature is; or becauſe the limits that diſtinguiſh what is arbitrary from what is juſt, are not hitherto properly aſcertained; and therefore leave ſome liberty to opinion.

At the head of the Arts of imitation painting and ſculpture are placed, as being thoſe wherein imitation comes neareſt to the objects they repreſent, and ſpeaking the moſt directly to the ſenſes. To theſe we may add that Art, which owes its origin to neceſſity, and its perfection to luxury; we mean architecture, as having riſen by degrees from cottages to palaces; and being, to a philoſophical eye, no more than an embelliſhed diſguiſe of one of our greateſt wants. The imitation of beautiful nature is here leſs ſtriking, and more confined, than in painting or ſculpture; which indifferently and with reſtriction expreſs all the parts of beautiful nature, by repreſenting her as ſhe is, either uniform, or with variety: whereas architecture is conſtrained, in diſpoſing and uniting the different materials it employs, to imitate that ſymmetry, which nature obſerving, more or leſs viſibly, in the ſtructure of each individual, produces ſo fine a contraſt with the beautiful variety of the whole.

Poetry, which occupies the next place to painting and ſculpture, employs, in its imitations, words ſo diſpoſed as to make agreeable harmony to the ear; but ſpeaks rather to the imagination than to the ſenſes; and thus preſents, after a ſtrong and lively manner, all the objects in the univerſe; and appears rather to create than paint, by the glow, motion, and life it gives to each.

The laſt among the Arts of imitation is muſic, which at once ſpeaks both to the imagination and the ſenſes. It is not becauſe its reſemblance is leſs perfect than theirs, with regard to the objects it would repreſent, that it is the laſt in the ſeries, but becauſe it has been confined to fewer images. Nor ſhould this perhaps be attributed ſo much to its nature, as to the want of invention and contrivance in moſt of its profeſſors.

And here we conclude our enumeration of the principal branches of human knowledge. If we conſider them all together, and ſearch for the general views that ſerve to diſtinguiſh them, we ſhall find, that ſome of theſe branches are entirely practical, and have the execution of ſome deſign for their end: that others are merely ſpeculative, or confine themſelves to the examination of their object, or the bare contemplation of its properties; and that a third ſort, from the ſpeculation of its ſubject, derives a practical uſe in theory and practice that principally diſtinguiſh Sciences from Arts; and accordingly one or other of theſe terms is applied to moſt branches of knowledge; but it muſt be confeſſed, that our ideas are, in this caſe, not hitherto ſufficiently preciſe. We are often at a loſs in naming ſuch branches of knowledge where ſpeculation is joined with practice; and it is frequently diſputed in the ſchools, whether logic be an Art or a Science: the queſtion might eaſily be ſolved, by ſaying it is both the one and the other. If words could be brought to a clear and preciſe ſignification, much time would be ſaved, and many diſputes avoided.

The term Art may, in general, be given to any branch of knowledge, capable of being reduced to determinate invariable rules, independent of caprice or opinion; and, in this ſenſe, ſeveral Sciences, conſidered in their practical uſe, may be termed Arts. There are rules for the operations of the mind, and others for thoſe of the body, the operations whereof, being confined to external ſubjects, require no more than the aſſiſtance of the hand to perform them. Hence proceeds the diſtinction between the liberal and mechanic Arts, and the preference given to the former, though very unjuſtly, in many reſpects. The mechanic Arts, depending upon manual operation, and confined to a certain beaten track, are aſſigned over to thoſe perſons whom prejudice has placed in an inferior claſs. Indigence, rather than taſte and genius, compelling them to this occupation, became, in time, a cauſe of contempt: ſo detrimental is it to thoſe it attends: whilſt the free operations of the mind were left to others, who thought themſelves greater favourites of nature. But the advantage of the liberal over the mechanic Arts, from employing the operations of the mind, and from the difficulty of excelling therein, is ſufficiently compenſated by the greater utility generally reſulting from the latter. This very utility reduces them to mere mechanical operations, in order to facilitate their practice among a greater number of men. Thus ſociety may have a juſt regard for its enlightening geniuſes, without debaſing the hands that ſerve it. The diſcovery of the mariner's compaſs is not leſs ſerviceable to mankind, than an explanation of the properties of the needle would be to philoſophy. In fine, if we divide the ſeveral branches of knowledge according to the grounds of diſtinction above-mentioned, how many of thoſe, termed Sciences, will be reduced to mechanic Arts? And what is the difference between a head furniſhed with a chaos of uſeleſs unconnected facts, and the inſtinct of an artiſan, diſplayed in mechanical execution?

The contempt thrown upon mechanic Arts has alſo, in ſome degree, been extended to their inventors. The names of theſe benefactors to mankind are rarely heard of; whilſt the great deſtroyers of our ſpecies, called conquerors, are univerſally known. Yet we find, among artiſans, many extraordinary proofs of ſagacity, genius, aſſiduity, and invention. Moſt Arts, indeed, are diſcovered by degrees; and ages have been employed in bringing ſome of them to perfection. And may not the ſame be ſaid of the Sciences? How many diſcoveries, which have immortaliſed their authors, were begun and continued by the labour of preceding ages, and ſome of them brought ſo near perfection, that little more than a ſingle addition was requiſite? Should not the inventors of the ſpring, the chain, and repeating parts of a watch, be equally eſteemed with thoſe who have ſucceſſively ſtudied to perfect algebra? But, though the gradual improvement of Arts ſhould be granted as a ſufficient reaſon for not ranking theſe artiſts in the claſs of inventors, yet there are certain machines ſo complicated, and all their parts ſo much depending upon one another, that it is difficult to conceive they ſhould have been invented by different perſons; and ſhould not ſuch extraordinary inventors, inſtead of having their names buried in oblivion, obtain a place among the few diſcoverers who ſtrike out new paths of Science?

Among the liberal Arts reduced to principles, thoſe that make the imitation of nature their end, are called fine Arts, or Arts of elegance, and have principally agreeableneſs for their object. But this is not the only particular that diſtinguiſhes them from the more neceſſary, or more uſeful liberal Arts, as grammar, logic, and morality. The latter have their fixed and determinate rules, capable of being tranſmitted from one man to another: whereas the practice of the Arts of elegance principally conſiſts in invention, and derives its laws from genius. The rules laid down, with reſpect to theſe Arts, properly regard their mechanical part; and therefore, like teleſcopes, aſſiſt only thoſe who have eyes.

From what has been ſaid it follows, that the different ways, in which our mind operates upon objects, and the different uſes it derives from thence, are the firſt means of diſtinguiſhing, in general, our different kinds of knowledge from each other; and that the whole of it relates to our wants, either of neceſſity, convenience, amuſement, real uſe, or caprice. The more remote our wants are, or the more difficult to ſupply; the more ſlow is the progreſs of our knowledge. What improvement would the Art of phyſic have made, to the diſcredit of the ſpeculative Sciences, were it founded on as certain principles as thoſe of geometry? There are alſo other characters or differences, beſides thoſe we have enumerated, taken from the manner wherein our knowledge affects us, or the different judgments we form of our ideas. Theſe judgments are denoted by the words evidence, demonſtration, probability, ſentiment, and taſte.

Evidence belongs properly to thoſe ideas, between which the mind immediately perceives a connection; and demonſtration to thoſe where the connection does not appear, without the aſſiſtance of intermediate ideas; or when the propoſitions are not found to have an identical agreement with the ſame ſelf-evident principle, but by means of a chain of reaſoning; and hence a propoſition may appear different to different perſons, according to the nature of their minds; for it may be ſelf-evident to the one, and only demonſtrative to the other. But, taking the term in a different ſenſe, we might ſay that the former is the reſult of the mere operations of the mind, employed in metaphyſical and mathematical ſpeculations; and that the latter regards phyſical objects, our knowledge whereof flows from the conſtant and invariable relation of our ſenſes. Probability principally relates to hiſtorical facts, and, in general, to all events, whether paſt, preſent, or future, which we uſually aſcribe to accident, for want of knowing the cauſes from whence they flow. But, though the hiſtory of preſent and paſt tranſactions reſts ſolely upon teſtimony, yet it often produces as ſtrong a perſuaſion in us as axioms. Sentiment is of two kinds; the one relates to moral truths, and is called conſcience; which is a conſequence of the law of nature, and of the ideas we have of good and evil; whence it might be called the evidence of the heart: for, though it differs greatly from the evidence of the underſtanding, which regards ſpeculative truths, yet it equally affects us. The other kind of ſentiment is reſtrained to the imitation of beautiful nature, and what is called the beauties of expreſſion. This catches, with tranſport, all ſublime and ſtriking beauties; diſcovers, with elegance, ſuch as lie concealed; and rejects all falſe appearances and pretenſions. It often condemns at once, without aſſigning the motives; which, to render intelligible to others, would require much time to explain. To this kind of ſentiment we owe what is called taſte and genius; which only differ, as genius is creative, and taſte judicial ſentiment.

After this enumeration of the different parts of our knowledge, and the characters by which they are diſtinguiſhed, it remains that we form them into a kind of genealogical tree, or ſyſtematical table of human knowledge, which may repreſent them all at one view, ſo as to ſhew their origin, relation, and mutual connection. The uſe of ſuch a contrivance is evident; but the execution is attended with difficulties. The philoſophical hiſtory of the origin of our ideas, given above, will, indeed, help us herein; though it would be abſurd and impracticable ſeverely to follow the ſeries of that hiſtory, in forming our plan. A general ſyſtem of Arts and Sciences is a kind of labyrinth, which the mind enters, without well knowing which path to take. Preſſed by its own wants, and thoſe of the body, to which it is united, it fixes on the firſt objects that preſent themſelves; proceeds as far as it can in underſtanding them; but ſoon meets with difficulties to ſtop its progreſs; and, either in hope or deſpair of conquering them, ſtrikes into a new track; returns afterwards by the way it went; but no ſooner ſurmounts the firſt difficulties, than it is oppoſed by others; and, paſſing rapidly from one object to another, makes upon each a ſeries of different attempts, which the very generation of its ideas neceſſarily interrupts. This diſorder, however philoſophical in the mind, is ſufficient to diſfigure, or even annihilate entirely any ſyſtematical plan of the Arts and Sciences.

Beſides, we have already ſhewn, in that part of the preceding diſcourſe relating to logic, the greateſt part of thoſe Sciences which include the principles of others, and therefore ought to have the firſt place in the philoſophical order, muſt not have the ſame in the genealogical order of our ideas, becauſe they were not firſt invented. The truth is, the primitive ſtudy of the human ſpecies muſt have been that of individuals; the particular obvious properties of theſe were firſt examined, and then, by the abſtraction of the mind, their general properties; which formed metaphyſics and geometry. Primitive ſigns were long in uſe, before mankind ſo far improved the method of uſing them, as to form it into a Science. A long ſeries of operations on the objects of their ideas was neceſſary, before men could form, by reflection, rules for ſuch operations.

In fine, the ſyſtem of human knowledge is compoſed of different branches, many of which unite in one point. And as it is impoſſible, by beginning from the ſame point, to trace all the different branches; the choice of every man muſt be determined by the natural turn of his own mind: and, conſequently, very few can purſue numerous branches to any advantage. Many, at firſt, applied themſelves, in concert, to the ſtudy of nature, in order to ſupply their moſt preſſing wants; but thoſe parts of knowledge, not abſolutely neceſſary, were divided, and each individual purſuing that which beſt ſuited his own genius, a number of them were almoſt equally improved at once. But, though ſeveral of the ſciences were thus cultivated at the ſame time together, yet, in giving the hiſtorical order of the progreſs of the mind, they muſt neceſſarily be conſidered as ſucceſſive.

It is not the ſame, with regard to the ſyſtematical order of our knowledge. This conſiſts in contracting the whole of it into the ſmalleſt ſpace poſſible, and placing the reader on an eminence above this vaſt labyrinth, ſo that he may at once take a view of all the principal arts and ſciences; diſcover, by a ſingle glance, the objects of each, and the operations to be performed upon theſe objects; diſtinguiſh the general branches of human knowledge, the points which ſeparate or unite them, and, at the ſame time, perceive the ſecret paths that join them. Such a ſyſtem would reſemble a map of the world, on which the principal countries, their ſituation, and mutual relation, together with the direct roads that lead from one to the other, are delineated: though theſe roads are frequently interrupted, and ſo obſtructed, that none but the reſpective inhabitants, or experienced travellers, can know them: nor is it poſſible for them to be delineated, except on the particular maps of each country. The different articles of our Dictionary and Supplement make ſuch particular maps; and the philoſophical tree, or ſyſtematical view annexed to this diſcourſe, forms the general map of the world.

But as, in general maps of the globe, objects are placed nearer or more remote, and appear differently, according to the point wherein the eye is ſuppoſed to be placed; ſo the form of our philoſophical tree will vary, according to the point from which we view the univerſe of literature. We may therefore conſider the different ſyſtems of human knowledge, as general maps of different projections: and each ſyſtem may have ſome advantage peculiar to itſelf over the reſt. It is natural to think that every man would willingly place in the center of the whole his own favourite ſcience; as the firſt men, being perſuaded that the univerſe was made for them, placed this earthly globe in the center of it. And many of theſe pretenſions, impartially conſidered in a philoſophical light, might be juſtified by ſolid reaſons.

Among all the various kinds of ſyſtematical plans of knowledge, that ſhould doubtleſs be preferred, which takes in the moſt connections and relations between the ſciences. But who can flatter themſelves with having been fortunate enough to find it? Nature, as we have already obſerved, and which we cannot repeat too often, is wholly compoſed of individuals; which are the primitive objects of our ſenſations, and direct perceptions. We truly remark, in theſe individuals, certain common properties, by means whereof we compare them; and certain diſſimilar properties, by which we diſtinguiſh them; and, by aſſigning abſtract names to theſe properties, we are enabled to diſtribute objects under different claſſes. But as an object, which, on account of ſome properties, ſhould be ranged in one claſs, has others which equally intitle it to another; it follows that all general diviſions muſt needs be arbitrary. The moſt natural arrangement would be to make things ſucceed each other in gradual ſhades, or ſcarce diſcernible tranſitions; which at once might ſerve to ſeparate and unite them: but the ſcanty number of the things we know, will not permit us to diſcern theſe ſhades. The univerſe reſembles an immenſe ocean, where we ſee iſlands of different ſizes above the ſurface, but cannot diſcern their connection with the continent.

A ſyſtematical plan of human ſcience might be formed, by dividing it either into natural and revealed, or into uſeful and agreeable, or into ſpeculative and practical, or into evident, certain, probable, and ſenſible; or into the knowledge of things, and the knowledge of ſigns; and ſo in infinitum: but we have choſen ſuch a diviſion as appeared, at the ſame time, moſt ſuitable both to the ſyſtematical and genealogical order of human knowledge. We principally owe this diviſion to the immortal Sir Francis Bacon. But we are too ſenſible how arbitrary all diviſions of the arts and ſciences muſt ever be, to imagine ours the beſt or only ſyſtem.

The objects which employ our minds, are either ſpiritual or material; and we are employed about them, either by direct or reflex ideas. Our ſtock of direct knowledge conſiſts of a merely paſſive or mechanical collection of things treaſured up in the memory. We have already obſerved that reflection is of two kinds, and either reaſons upon the objects of our direct ideas or imitates them. Hence, there are three different methods, whereby the mind operates on the ſubject of its thoughts; which are memory, reaſon, properly ſo called, and imagination. We do not mean by imagination the mere faculty of recollecting ſenſible objects; this is no more than memory, which, were it not for the uſe of ſigns, muſt be in continual exerciſe; but we uſe the word in a higher and more explicit ſenſe, to ſignify that faculty of the human mind which creates objects by imitation.

Theſe three faculties form the three general diviſions of our ſyſtem, and the three general objects of human knowledge, viz. hiſtory, which relates to memory; philoſophy, which is the product of reaſon; and the polite arts, which owe their origin to imagination. We place reaſon before imagination, becauſe that order is more conformable to the natural progreſs of the operations of the mind; imitation is a creative faculty, but the mind, before it attempts creating, reaſons upon what it ſees and knows. Another motive for placing reaſon before imagination is, that reaſon and memory unite, to a certain degree, in forming the imagination. The mind creates, or imagines objects, only reſembling thoſe it already knows by direct ideas and ſenſations: The more it departs from theſe objects, the more ſtrange and diſagreeable objects it forms. Hence, in the imitation of nature, even invention is ſubject to certain laws; and theſe laws chiefly conſtitute the philoſophical part of the polite arts; though, at preſent, it is but little known, as being only the work of genius, which rather delights in creating than diſcerning.

In ſhort, if we examine the progreſs of our rational faculty, in its ſucceſſive operations, we ſhall find it plainly precedes imagination; becauſe the ultimate operations which reaſoning performs upon objects, lead, in ſome ſort, to imagination. For theſe ultimate operations conſiſt in the formation of general notions, which, ſeparated from their ſubject by abſtraction, are no longer the immediate objects of our ſenſes. And hence metaphyſics and geometry, of all the ſciences that derive their origin from reaſon, are thoſe where imagination has the greateſt ſhare. The imagination of a geometrician who diſcovers, is as active as that of a poet who invents; though they operate differently on their reſpective objects. The former ſimplifies and analyſes, whilſt, the latter compoſes and adorns. Theſe different operations alſo belong to different kinds of geniuſes; whence, poſſibly, the talents of a great geometrician, and of a great poet, are impoſſible to be united. But, whether the one excludes the other, or not, they have doubtleſs no right to deſpiſe each other, as is too often the conſequence. And, perhaps, among all the great geniuſes of antiquity, Archimedes beſt deſerves to be ranked with Homer.

The general diſtribution of ſubjects, into ſpiritual and material, forms the ſubdiviſion of the three general branches of our knowledge. Hiſtory and philoſophy equally regard both, whilſt imagination wholly operates upon the plan of material objects: whence we have another reaſon for placing it laſt in the order of our faculties. At the head of ſpiritual beings is God; who holds the firſt place by his nature, and the neceſſity we have of knowing him. Next to this ſupreme being, come created ſpirits; the knowledge of whoſe exiſtence we derive from revelation. In the next place comes man, compoſed of two principles, a ſoul, which is ſpiritual, and a body, which is material; and, laſtly, comes this immenſe univerſe, which we call the corporeal world or nature.

Hiſtory, as it relates to the ſupreme being, includes revelation and tradition; and is therefore divided into two parts, ſacred and eccleſiaſtical. The hiſtory of man hath human actions and human knowledge for its object; and therefore is either civil or literary; treating of powerful nations and great geniuſes; potentates and men of letters; conquerors and philoſophers. Laſtly, the hiſtory of nature is the hiſtory of the numerous productions we behold; and forms almoſt as many branches as there are different productions in nature: but among the reſt is juſtly placed, with diſtinction, a hiſtory of arts; which is no other than a detail of the different purpoſes to which men have applied the productions of nature, either to ſatisfy their wants, or their curioſity.

Having conſidered the principal object of memory, we ſhall next proceed to that faculty of man which reflects and reaſons.

Both ſpiritual and material beings, which are the objects of this faculty, having certain general properties, ſuch as exiſtence, poſſibility, and duration; the examination of theſe properties immediately forms that branch of philoſophy, from which all the reſt borrow ſome part of their principles; and is called ontology, the ſcience of being, or general metaphyſics. From ontology, in general, we deſcend to all the different particular beings; and the diviſions, afforded by this ſcience, of particular beings, form themſelves on the ſame plan with the diviſions of hiſtory.

Our knowledge of God, known by the name of theology, divides itſelf into two branches, natural and revealed. Natural theology, or the knowledge we have of God, by reaſon alone, is very confined; but revealed theology derives a more perfect knowledge of him from ſcripture. Man alſo owes his knowledge of created ſpirits to revelation.

The firſt part of the ſcience of man, is that of the ſoul; conſiſting in the ſpeculative knowledge of the ſoul itſelf, and of its operations. The ſpeculative knowledge of the ſoul participates both of natural and revealed theology; and is a branch of metaphyſics, called pneumatology. The ſpeculative knowledge of the ſoul's operations is ſubdivided into two branches, as its object is either the diſcovery of truth, or the practice of virtue. The diſcovery of truth, which is the end of logic, conſtitutes the art of conveying truth to others: and hence the uſe we make of logic is partly for our own ſakes, and partly for the ſake of others. The rules of morality do not chiefly regard man in a ſolitary ſtate, but ſuppoſe him neceſſarily linked with others in ſociety.

The ſcience of nature is the knowledge of bodies, and their general properties; ſuch as impenetrability, mobility, and extenſion, which are the firſt to be ſtudied in natural philoſophy. Theſe general properties, being conſidered abſtractedly, open an immenſe field for ſpeculation; and, when conſidered materially, they become the objects of menſuration. Pure ſpeculation belongs to general phyſics, or the metaphyſics of body; and menſuration is the object of mathematics, the diviſions and applications of which are almoſt infinite.

Theſe two Sciences lead to particular phyſics, or natural philoſophy, which conſiders bodies as they are in themſelves, and has individuals for its object. Among theſe the human body is that whoſe properties we are principally concerned to know; and next after this come ſuch as are neceſſary to our preſervation: whence proceed anatomy, agriculture, medicine, and their different branches. In ſhort, all the natural bodies, ſubject to our examination, furniſh the other numerous branches of natural philoſophy.

Painting, ſculpture, architecture, poetry, and muſic, with their ſeveral branches, form the third general diviſion, which refers to the imagination, and are all comprehended under the title of polite Arts. They might alſo be included under the general name of painting; becauſe all the polite Arts are reducible to painting, and differ only in regard to the means they employ. Or, indeed, they might all be referred to poetry, taken, in its natural ſignification, for invention or creation.

In order farther to elucidate this ſyſtematrical plan of the Arts and Sciences, we have added the following general view of the ſeveral branches of human knowledge.

A SYSTEMATICAL VIEW *of* HUMAN KNOWLEDGE.

KNOWLEDGE.

- MEMORY.
  - Hiſtory.
    - Sacred. [Hiſtory of Prophecies.
    - Eccleſiaſtical.
    - Civil, Antient and Modern.
      - Civil Hiſtory, proper.
        - Memoirs.
        - Antiquities.
        - Complete Hiſtory.
      - Literary Hiſtory.
    - Natural.
      - Uniformity of Nature.
        - Hiſtory of the Heavens.
        - Hiſtory
          - of Meteors.
          - of the Earth and Sea.
          - of Minerals.
          - of Vegetables.
          - of Animals.
          - of the Elements.
      - Aberration of Nature.
        - Celeſtial Prodigies.
        - Strange Meteors.
        - Prodigies on the Earth and Sea.
        - Monſtrous Minerals.
        - Monſtrous Vegetables.
        - Monſtrous Animals.
        - Prodigies in the Elements.
      - Application of Nature, in Arts, Trades, and Manufactures.
        - Working and Application of Gold and Silver.
          - Aſſayers.
          - Coiners.
          - Gold-beaters.
          - Gold Wire-drawers.
          - Goldſmiths.
          - Refiners, &c.
        - Of precious Stones.
          - Lapidaries.
          - Diamond-cutters.
          - Jewellers, &c.
        - Of Iron.
          - Forging.
          - Foundery.
          - Anchor-ſmithery.
          - Armory, &c.
        - Of Glaſs.
          - Glaſs-blowers.
          - Looking-glaſs-makers.
          - Spectacle-makers.
        - Of Skins.
          - Tanners.
          - Curriers.
          - Shamoiſers.
          - Glovers, &c.
        - Of Stone, Plaiſter, &c.
          - Architecture.
          - Sculpture,
          - Maſonry, &c.
        - Silk.
          - Spinning.
          - Throwing.
          - Weaving, as of Velvet, &c.
        - Wool.
          - Woollen Manufactory.
          - Hoſiery, &c.
- REASON.
  - Philoſophy.
    - General Metaphyſics, or Ontology.
    - Science of God.
      - Natural Theology.
      - Revealed Theology.
        - Religion.
      - Science of Spirits.
    - Science of Man.
      - Pneumatology, or the Science of the Soul.
      - Logic.
        - Art of Thinking.
          - Apprehenſion. [Science of Ideas.
          - Judgment. [Science of Propoſitions.
          - Reaſoning [Induction.
          - and Method.
            - Demonſtration.
              - Analyſis.
              - Syntheſis.
        - Art of Retention.
          - Memory.
            - Natural.
            - Artificial.
          - Helps to Memory.
            - Writing.
            - Printing.
              - Alphabet.
              - Cypher.
                - Writing.
                - Printing.
                - Reading.
                - Decyphering.
                  - Orthography.
        - Art of Communication.
          - Science of Inſtruments in Diſcourſe.
            - Grammar.
              - Signs. — Geſture. Character.
              - Proſody.
              - Conſtruction.
              - Syntax.
              - Philology.
              - Criticiſm.
          - Science of Qualities in Diſcourſe.
            - Rhetoric.
            - Verſification.
      - Morality.
        - General. [Science of Good and Evil, in general.
        - Particular.
          - Science of Laws, or Juriſprudence.
            - Natural.
            - Oeconomical.
            - Political. [Commerce in general.
    - Science of Nature.
      - Metaphyſics of Bodies. Impenetrability, Extenſion, Motion, Vacuum, &c.
      - Mathematics.
        - Pure.
          - Arithmetic.
            - Numerical.
            - Algebraical.
              - Elementary.
              - Infiniteſimal. [Fluxionary.
          - Geometry.
            - Elementary. —
              - Fortification.
              - Tactics.
              - Navigation.
            - Tranſcendental. [Doctrine of Curves.
        - Mixed.
          - Mechanics.
            - Statics.
            - Hydroſtatics.
            - Hydraulics.
          - Geometrical Aſtronomy.
            - Coſmography.
              - Uranography.
              - Geography.
              - Hydrography.
            - Chronology.
            - Gnomonics.
          - Optics. —
            - Optics, proper.
            - Dioptrics. [Perſpective.
            - Catoptrics.
          - Acouſtics.
          - Pneumatics.
          - Art of Conjecture. [Doctrine of Chances.
        - Phyſico-Mathematics.
      - Particular Phyſics.
        - Zoology.
          - Anatomy.
            - Simple.
            - Comparative.
          - Phyſiology.
          - Medicine.
            - Hygieine.
            - Pathology.
            - Semeiotice.
            - Therapeutica.
              - Diet.
              - Surgery.
              - Pharmacy.
          - Farriery.
          - Horſemanſhip.
          - Hunting.
          - Fiſhing.
          - Fowling.
        - Phyſical Aſtronomy. [Aſtrology.
        - Meteorology.
        - Coſmology.
          - Uranology.
          - Aerology.
          - Geology.
          - Hydrology.
        - Botany. —
          - Agriculture.
          - Gardening.
        - Minerology.
        - Chemiſtry.
          - Chemiſtry, proper. [Pyrotechny, Dying, &c.
          - Metallurgy.
          - Alchemy.
- IMAGINATION.
  - Poetry.
    - Prophane.
    - Sacred.
      - Narrative.
        - Epic Poem.
        - Madrigal.
        - Epigram
        - Romance, &c.
      - Dramatic.
        - Tragedy.
        - Comedy.
        - Opera.
        - Paſtoral, &c.
      - Parabolic.
        - Allegories.
  - Muſic.
    - Theoretical.
    - Practical.
    - Vocal.
    - Inſtrumental.
  - Painting.
  - Sculpture.
  - Civil Architecture.
  - Engraving.

Explanation of the preceding Syſtematical View of Human Knowledge.

Phyſical objects act upon the ſenſes; and their impreſſions excite perceptions in the mind. O theſe perceptions the mind employs itſelf three different ways, according to its three principal faculties, memory, reaſon, and imagination. The mind either takes a pure and ſimple review of its perceptions by memory; or it examines, compares, and digeſts them by reaſon; or elſe attempts to imitate or counterfeit them by imagination. And hence ariſes a proper general diſtribution of human knowledge into *Hiſtory*, which relates to memory; *Philoſophy*, which is produced from reaſon; and *Poetry*, which flows from the imagination.

MEMORY, whence proceeds HISTORY.

HISTORY relates facts; and theſe facts either regard God, man, or nature. The facts regarding God belong to ſacred Hiſtory: the facts regarding man belong to civil Hiſtory; and the facts regarding nature belong to natural Hiſtory.

HISTORY. I. SACRED. II. CIVIL. III. NATURAL.

I. SACRED HISTORY is divided into religious, or eccleſiaſtical, and the Hiſtory of prophecies, where the recital precedes the event.

II. CIVIL HISTORY is a branch of univerſal Hiſtory, to whoſe truſt are committed the examples of antiquity, the revolutions of things, the foundations of civil prudence, and the names and reputations of men. This is divided, according to its objects, into what is properly called *Civil Hiſtory*, and *Literary Hiſtory*.

As the ſciences are the produce of reflection, and the natural light of the human ſpecies, the great Chancellor Bacon had reaſon to ſay, in his admirable work *de Dignitate & Augmentis Scientiarum*, That the hiſtory of the world, without the hiſtory of learning, is like the ſtatue of Polypheme, without its eye.

Civil Hiſtory, proper, may be ſubdivided into *Memoirs*, *Antiquities*, and *Complete Hiſtory*. *Civil Hiſtory*, is a deliniation of paſt times, of which antiquities are damaged ſketches; and *Complete Hiſtory* a copy drawn from *Memoirs*.

III. NATURAL HISTORY is divided according to the different facts of nature, proceeding from her different ſtates. For nature is either uniform, and purſues a regular courſe, as may, in general, be obſerved, with regard to the heavenly bodies, animals, vegetables, &c. or appears to be oppoſed, or driven from her ordinary courſe, as in the production of monſters; or elſe conſtrained, and bent to various uſes, as in ſeveral Arts. Whence, nature performs the whole, either in her ordinary and regular courſe, or in her aberrations or wanderings, or in the manner ſhe is employed. Uniformity of nature, therefore, conſtitutes the firſt part of Natural Hiſtory; her wanderings or aberrations the ſecond; and the uſes to which ſhe is applied, the third.

The advantages flowing from the hiſtory of uniform nature are ſufficiently evident; and, from the hiſtory of her aberrations, we learn the tranſition from monſtrous productions to the wonders of Art; or how ſhe may be diverted from her courſe, or brought back again to it; and teaches us particularly to correct the depravity of too general axioms.

The hiſtory of the application of nature to various uſes may be conſidered as a branch of Civil Hiſtory; for Art, in general, is no more than the induſtry of man applied to the productions of nature, either to ſatisfy his wants, or luxury. And this application can only conſiſt in bringing natural bodies together, or taking them aſunder.

The hiſtory of uniform nature is divided, according to its principal objects, into five parts. Firſt, celeſtial hiſtory, or that of the heavenly bodies, their motions, ſenſible appearances, &c. conſidered only as phænomena, without attempting to explain the cauſes by ſyſtems, hypotheſes, &c. Secondly, the hiſtory of meteors; as winds, rains, ſtorms, thunders, auroræ boreales, &c. Thirdly, the hiſtory of the earth and ſea; as mountains, rivers, currents, flux and reflux, ſands, foreſts, lands, iſlands, continents, &c. Fourthly, the hiſtory of minerals. Fifthly, the hiſtory of vegetables. Sixthly, the hiſtory of animals. Whence reſults, ſeventhly, the hiſtory of the elements, or the apparent nature, ſenſible effects, &c. of fire, air, earth, and water.

The hiſtory of monſtrous productions is divided in the ſame manner. Nature may produce prodigies in the heavens, in the air, on or below the ſurface of the earth, at the bottom of the ſea, &c. either wholly, or in part.

The hiſtory of the application of nature is as extenſive as the various uſes to which mankind apply all her productions in arts, trades, and manufactures. Every effect of human induſtry may be referred to ſome production of nature. Thus, to gold and ſilver belong the arts of aſſaying, refining, coining, gold-beating, gilding, wire-drawing, &c. To precious ſtones belong the arts of the lapidary, diamond-cutter, jeweller, &c. To iron belong foundery, forging, anchor-ſmithery, armory, cutlery, &c. To glaſs belong the Art, of glaſs, plate-glaſs, looking-glaſs, poliſhing-glaſs, &c. To ſkins belong the arts of the tanner, currier, ſhamoiſer, &c. To wool and ſilk belong the Arts of ſpinning, milling, throwing, fulling, weaving, buttons, velvet, ſattin, tapiſtry, &c. To earth belong pottery, glazing, porcelain, &c. To ſtones belong the mechanic part of architecture, ſculpture, ſtucco, &c. And the ſame of all other materials, and the reſt of the Arts.

Such is the hiſtorical part of human knowledge, with regard to the memory; and ought to be the firſt matter of philoſophers.

REASON, whence PHILOSOPHY.

Philoſophy, or that part of human knowledge which relates to reaſon, is very extenſive. There is ſcarce an object perceived by the ſenſes, but is, by reflection, made a Science. In the multiplicity of theſe objects, there are ſome, which, by their importance, require particular attention, in order to prevent an endleſs ſearch, and to which may be referred all the Sciences. The principal of theſe objects is GOD, to the knowledge of whom man raiſes himſelf by reflecting on natural and ſacred hiſtory. The ſecond is MAN, who is convinced of his own exiſtence by his conſcience, or internal perception. And the third is Nature, the hiſtory whereof we are taught by our external ſenſes. God, Man, and Nature, will therefore furniſh us with a general diſtribution of *Philoſophy*, or *Science* (which are ſynonymous terms) into *the Science of God*, *the Science of Man*, and *the Science of Nature.*

PHILOSOPHY, or SCIENCE. } I. Science of God. II. Science of Man. III. Science of Nature.

I. The natural progreſs of the mind is to riſe from individuals to ſpecies, from ſpecies to genera, from lower genera to higher, and at every ſtep to form a Science; or, at leaſt, to add a new branch to a Science already formed. Thus, our idea of an infinite, uncreated intelligence, recounted in nature, and revealed in ſacred hiſtory; and that of a created, finite intelligence, as we find in man, lead us to the idea of a finite, created intelligence without body, whence we derive our general notion of ſpirit. And as the general properties of both ſpiritual and corporeal things are exiſtence, poſſibility, duration, ſubſtance, attribute, &c. the examination of theſe properties produces ontology, or the Science of beings in general. And, by inverting the order, we have firſt the Science of ontology, and next the Science of ſpirit, or pneumatology, commonly called particular metaphyſics; which Science is divided into the Science of God, or natural theology, which he has been pleaſed to rectify and ſanctify by revelation; whence proceeds religion, or theology proper. Hence flows the doctrine of good and evil ſpirits, or angels and dæmons; whence divination, and that chimerical Art, called necromancy. Hence alſo proceeds the Science of the ſoul; which is divided into the Science of the rational ſoul, which thinks; and the Science of the ſenſitive ſoul, which is confined to ſenſations.

II. *The* Science *of Man.* The diſtribution of the Science of man is derived from his faculties, which are the underſtanding and the will; the former ſhould be directed to truth, and the latter to virtue. The one is the end of logic, and the other that of morality.

Logic may be divided into the Art of thinking, the Art of retention, and the Art of communication.

The Art of thinking has as many parts as the mind has principal operations. We diſtinguiſh four principal operations in the mind, viz. apprehenſion, judgment, reaſoning, and method. To apprehenſion belongs the doctrine of ideas, or perceptions: to judgment, the doctrine of propoſitions: to reaſoning and method, the doctrine of induction and demonſtration. But demonſtration either aſcends from the propoſition to firſt principles; or deſcends from firſt principles to the propoſition in proof; whence ariſe analyſis and ſyntheſis.

The Art of retention has two branches; the Science of the memory itſelf, and the Science of the helps to memory. The memory, before conſidered as a faculty purely paſſive, is now conſidered as an active power, improved by reaſon; and is either natural or artificial. Natural memory depends upon the organs. Artificial memory conſiſts in prænotion and emblem. Without prænotion no particular object can be preſent to the mind; and emblem employs the imagination to aſſiſt the memory.

Artificial repreſentations, as writing, &c. are helps to memory. In writing we uſe either common, or particular characters: of the firſt ſort are the letters of the alphabet, and of the ſecond are cyphers; whence proceed the Arts of reading, writing, decyphering, and the Science of orthography.

The Art of communication is divided into the Science of the inſtrument, and the Science of the qualities of diſcourſe. The Science of the inſtrument of diſcourſe is called grammar; the Science of the qualities of diſcourſe is rhetoric.

Grammar is divided into the Science of ſigns, pronunciation, ſyntax, and conſtruction. Theſe ſigns are articulate ſounds; pronunciation, or proſody, is the Art of articulating them: ſyntax is the Art of applying them, according to the different deſigns of the mind; and conſtruction is the knowledge of the order they ſhould have in diſcourſe, founded upon cuſtom and reflection. But there are other ſigns of our thoughts beſides articulate ſounds, viz. characters and geſtures. Characters are either ideal, hieroglypic, or heraldic. Ideal characters are like thoſe of the Indians, each of which denotes a particular idea; and muſt conſequently be as numerous as the real beings they denote. Hieroglyphics were the writing of the world in its infancy: and heraldic characters from the Science of blazoning.

To this Art of communication belong criticiſm, pædagogy, and philology. Criticiſm reſtores corrupt readings, publiſhes authors, &c. Pædagogy treats of the choice of ſtudies and the manner of teaching. Philology regards the knowledge of univerſal literature.

To the Art of embelliſhing diſcourſe belongs verſification, or the mechanical part of poetry. We omit the diviſion of rhetoric, becauſe no Art or Science is derived from it, except perhaps the pantomimic Art, from geſture, and declamation from the voice and geſture together.

Morality, which makes the ſecond part of the Science of man, is either general or particular. Particular morality is divided into the law of nature, œconomics, and politics.

The law of nature is the Science of the duties of man, out of ſociety. Œconomics is the Science of man's duties in a family. Politics is the Science of man's duties in ſociety. But morality would be incomplete, unleſs preceded by the doctrine of the reality of moral good and evil; the neceſſity of diſcharging the duties of a good, juſt, and virtuous man, &c. which is the object of morality, in general.

As ſocieties are under the ſame obligation of being virtuous, as particular perſons; this leads to the duties of ſocieties, or the natural law of ſociety; the œconomies of ſocieties; foreign and domeſtic commerce, by ſea and land; and the doctrine of civil policy relative to each ſociety.

The Science of nature is divided into natural philoſophy and mathematics. This diviſion naturally ariſes from reflection, and man's diſpoſition to form general ideas. From our ſenſes we receive the knowledge of real individuals, the ſun, the moon, Sirius, &c.— Air, fire, earth, water, &c.—Rain, ſnow, hail, thunder, &c. and ſo of all natural hiſtory. At the ſame time we acquire the knowledge of abſtract ideas; as colour, ſound, taſte, odour, denſity, rarity, heat, cold, ſoft, hard, fluidity, ſolidity, rigidity, elaſticity, gravity, levity, &c. figure, diſtance, motion, reſt, duration, extenſion, quantity, impenetrability.

We find by reflection, that ſome of theſe abſtract ideas, as extenſion, motion, impenetrability, &c. correſpond to all corporeal individuals, which are the object of general phyſics, or the metaphyſics of bodies; and the ſame properties conſidered in any particular individual, together with the varieties that diſtinguiſh one individual from another, ſuch as firmneſs, elaſticity, fluidity, &c. are the object of particular phyſics. Another more general property of body, which ſuppoſes all the reſt, viz. quantity, conſtitutes the object of mathematics. By quantity, or magnitude, we mean every thing capable of augmentation or diminution. Quantity, as the object of mathematics, may be conſidered, 1ſt, either alone, and independent both of the real and abſtract individuals we know; or, 2dly, as exiſting in real and abſtract individuals; or, 3dly, in effects ſought for from real or ſuppoſed cauſes: and, in this view, reflection divides mathematics into pure, mixed, and phyſical.

Abſtract quantity, the object of pure mathematics, is meaſured by number, or extenſion. Abſtract quantity, meaſured by number, is the object of arithmetic; and abſtract quantity, as extended, is the object of geometry. Arithmetic is divided into numeral, performed by figures; and algebra, or univerſal arithmetic, performed by letters; which is only the calculation of magnitudes, in general; its operations being no more than arithmetical operations, performed in a conciſe manner: for, properly ſpeaking, there is no calculation but in numbers.

Algebra is either elementary or infiniteſimal, according to the nature of the quantities to which it is applied. Infiniteſimal or fluxionary algebra is either direct or inverſe: direct when we deſcend from the expreſſion of a finite quantity, or of a quantity conſidered as finite, to its inſtantaneous increment or decrement; and inverſe when we aſcend from this expreſſion to that of the finite quantity.

Geometry has, for its primitive object, either the properties of right-lines, and the circle; or comprehends all the ſpecies of curves: and therefore is divided into elementary and tranſcendental.

Mixed mathematics has as many diviſions and ſubdiviſions as there are real beings, wherein quantity may be conſidered. Quantity, conſidered in bodies as moveable, or tending to motion, is the object of mechanics.

Mechanics has two branches, ſtatics and projectiles. The object of ſtatics is quantity conſidered in bodies that are in æquilibrio, and have only a tendency to motion; and the object of projectiles is quantity conſidered in bodies actually moving. Statics and projectiles are each divided into two parts. The former into ſtatics proper and hydroſtatics: ſtatics has for its object ſolid bodies in æquilibrio, barely tending to motion: the object of hydroſtatics is quantity conſidered in equipollent fluids tending to motion. The latter is divided into projectiles proper, which has for its object quantity conſidered in ſolid bodies, actually in motion; and hydraulics, whoſe object is quantity conſidered in fluids actually in motion. When quantity is conſidered in water actually in motion, hydraulics is ſometimes called hydrodynamics. Navigation might be referred to hydraulics; and gunnery or the throwing of bombs to mechanics.

Quantity, conſidered in the motion of the heavenly bodies produces geometrical aſtronomy; whence ariſes coſmography or the deſcription of the univerſe; which is divided into uranography, or the deſcription of the heavens; hydrography, or the deſcription of waters; and geography, or the deſcription of the earth: from whence alſo proceed chronology and gnomonics, or the Art of dialling.

Quantity, conſidered in light, produces optics; and conſidered in the motion of light it produces the different branches of optics. Light, moving in ſtraight lines, gives optics, proper; light, reflected in one and the ſame medium, gives catoptrics; and, as refracted in paſſing from one medium into another, it affords dioptrics. Perſpective is a branch of optics.

Quantity, conſidered in the air, as to its gravity, motion, condenſation, rarefaction, &c. produces pneumatics.

Quantity, conſidered in the poſſibility of events, gives the Art of conjecturing; whence the analyſis of the games of chance.

The object of the mathematical Sciences being purely intellectual, we need not be ſurpriſed at the exactneſs of their diviſions.

Particular phyſics ſhould have the ſame diſtribution as natural hiſtory. From hiſtories acquired by the ſenſes, of the ſtars, their motion, ſenſible appearances, &c. reflection proceeds to enquire into their origin, the cauſes of their phænomena, &c. and thus produces the Science of phyſical aſtronomy; under which we alſo rank the Science of their influences, called aſtrology. From hiſtories, given by the ſenſes, of winds, rain, hail, thunder, &c. reflection proceeds to enquire into their origin, cauſes, effects, &c. and produces the Science called meteorology.

From natural hiſtories of the earth, the ſea, mountains, rivers, flux, reflux, &c. reflection enquires into their origins, cauſes, &c. and produces coſmology, or the Science of the univerſe; which is divided into uranology, or the Science of the heavens; aerology, or the Science of the air; geology, or the Science of continents; and hydrology, or the Science of waters.

From the natural hiſtory of mines, reaſon enquires into their formation, the ways of working them, &c. and thus proceeds minerology.

From the natural hiſtory of plants, reaſon enquires into their ſtructure, propagation, culture, vegetation, &c. and thus produces botany, of which agriculture and gardening are two branches.

From the natural hiſtory of animals, reaſon enquires into the means of their preſervation and propagation, their organiſation, uſe, &c. and thus produces zoology: whence are derived phyſic, farriery, the manage, hunting, fiſhing, falconry, ſimple and comparative anatomy. Phyſic, according to the diviſion of Boerhaave, is either employed upon the œconomy of the human body, and reaſoning upon the anatomy thereof; whence proceeds phyſiology; or upon the means of preventing diſeaſes; whence hygieine; or upon morbid bodies, and treats of the cauſes, differences, and ſymptoms of diſeaſes, their nature and effects, under the name of ſemeiotics; or upon the Art of curing diſeaſes, ſubdivided into diet, pharmacy, and chirurgery; which are the three branches of therapeutics.

Hygieine may be conſidered as relative to the health, beauty, and ſtrength of the body; and accordingly is ſubdivided into hygieine proper, coſmetics, and athletics. Coſmetics produces orthopœia, or the Art of procuring a juſt conformation of the limbs; and athletics produces gymnaſtics, or the Arts of exerciſe.

From an experimental hiſtory of the external, ſenſible, and apparent qualities, &c. of natural bodies, reflection riſes to an artificial examination of their internal and occult properties, by means of chemiſtry; which is an Art that imitates and rivals nature: its object being nearly as extenſive as nature itſelf. This Art either analyſes bodies, recompounds them, or transforms them. Chemiſtry gives riſe to alchemy, and natural magic. Metallurgy, or the Art of working metals for human uſes, is an important branch of chemiſtry. Whence alſo proceeds the Art of dying.

Nature has her errors, and reaſon its abuſes. We conſider monſters as errors or wanderings of nature; and the abuſe of reaſon produces thoſe Arts and Sciences, which only manifeſt avidity, malice, or ſuperſtition; and tend only to diſgrace the human ſpecies.

And this is the whole of philoſophy, or the grand branch of human knowledge belonging to reaſon.

IMAGINATION; *whence proceeds* POETRY.

Hiſtory has for its object ſuch individuals as actually exiſt, or have exiſted; and poetry only imaginary individuals, which the mind creates in imitation of the hiſtorical. No wonder therefore if poetry falls under one of the diviſions of hiſtory. But the different kinds of poetry, and the difference of its ſubjects, preſent us two very natural diſtributions. The ſubject of a poem is either ſacred or prophane. The poet therefore relates things paſt, or makes them appear as preſent, by repreſenting them in action; or elſe gives bodies to mere abſtract intellectual beings. The firſt kind is narrative, the ſecond dramatic, and the third parabolic poetry. Epic madrigal, epigram, &c. are generally of the narrative; tragedy, comedy, opera, eclogue, &c. of the dramatic; and allegory, &c. of the parabolic kind.

POETRY. I. NARRATIVE. II. DRAMATIC. III. PARABOLIC.

We here underſtand, by poetry, fiction only. As there may be verſification without poetry, and poetry without verſification; we conſider verſification as a quality of ſtyle, and refer it to rhetoric. On the other hand, under poetry we rank architecture, muſic, painting, ſculpture, engraving, &c. for a painter may as juſtly be called a poet, as a poet be called a painter. A ſculptor, or engraver, is a painter in relievo or in creux; as a muſician is a painter in ſounds. The poet, the painter, the ſculptor, the muſician, &c. imitate or counterfeit nature; but the poet employs diſcourſe, the painter colours, the ſculptor, marble, braſs, &c. and the muſician his inſtrument, or his voice. Muſic is either theoretical, practical, inſtrumental, or vocal. Architecture imitates nature but imperfectly in the ſymmetry of its productions, as we have already obſerved.

Poetry has, as well as nature, its monſtrous productions, flowing from a diſordered imagination; and, in all the ſpecies of poetry, ſuch productions may happen.

This is the whole poetical branch of human knowledge, flowing from the imagination; and finiſhes our ſyſtematical view, or genealogical table of the Arts and Sciences.

Thus have we endeavoured to ſhew how the various branches of human knowledge form one regular ſyſtem; nothing therefore remains but to ſay ſomething of the enſuing work, that the reader may form an idea of its utility; and the manner we have purſued in its execution.

We have, in the firſt place, carefully connected the Supplement with the Dictionary, in order to render them both as one work; and thoſe articles which have the ſyllable *Dict.* annexed to it are additions to thoſe under the ſame word in the Dictionary; ſo that what is ſaid on that head in the Dictionary ought firſt to be conſulted.

As it has been our principal view to render this work uſeful to the reader, thoſe branches of learning, which are of more immediate uſe in life, are more largely treated of than thoſe of mere curioſity. Particularly agriculture, gardening, chemiſtry, dying, and the reſt of the mechanic Arts are fully conſidered.

And, as little help in the mechanic Arts could be acquired from books, we were obliged to have recourſe to workmen themſelves, obſerve them at their work, learn their various terms, and clear up and methodiſe what they delivered; and as many of them were unable to explain, in an intelligent manner, the machines they employed in their various Arts, we were obliged alſo to take their machines to pieces, in order to explain their conſtruction, and ſhew the uſes they are applied to.

Every perſon muſt be ſenſible that an attempt of this kind could not be executed without the aſſiſtance of copper-plates; and accordingly the reader will find in the Dictionary and Supplement *One Hundred* and *Seven* folio plates, engraved by the beſt hands. And ſeveral of thoſe relating to mechanic Arts are actually perſpective views of places where their reſpective works were carried on, and the men are repreſented in their proper attitudes, as they perform the various operations. By this method a mechanic Art, which it would be almoſt impoſſible to convey an adequate idea of by words, is eaſily apprehended.

But as there are objects ſo familiar that it would be ridiculous to give drawings of them; and, on the other hand, ſome of the mechanic Arts have machines ſo complicated, that no figures could uſefully repreſent them; we have therefore, in the firſt caſe, truſted to the reader's underſtanding and experience, and in the laſt referred to the objects themſelves. In ſhort, we have endeavoured to obſerve a proper medium, and repreſent that only which was neceſſary, and, at the ſame time, could be uſefully conveyed by figures. To treat any one Art at full length, and give it all the poſſible plates, would alone require numerous volumes. It would, for inſtance, be unneceſſary to repreſent in plates the ſeveral ſtages a piece of iron paſſes through before it is formed into an anchor. The whole proceſs indeed muſt be deſcribed; but we have repreſented in our figures only the moſt momentous actions, or addreſs of the artiſts, which are eaſy to draw, but very difficult to explain by words. We have, in ſhort, chiefly confined our plates to eſſential circumſtances; which, when once well repreſented, neceſſarily ſhew the reſt.

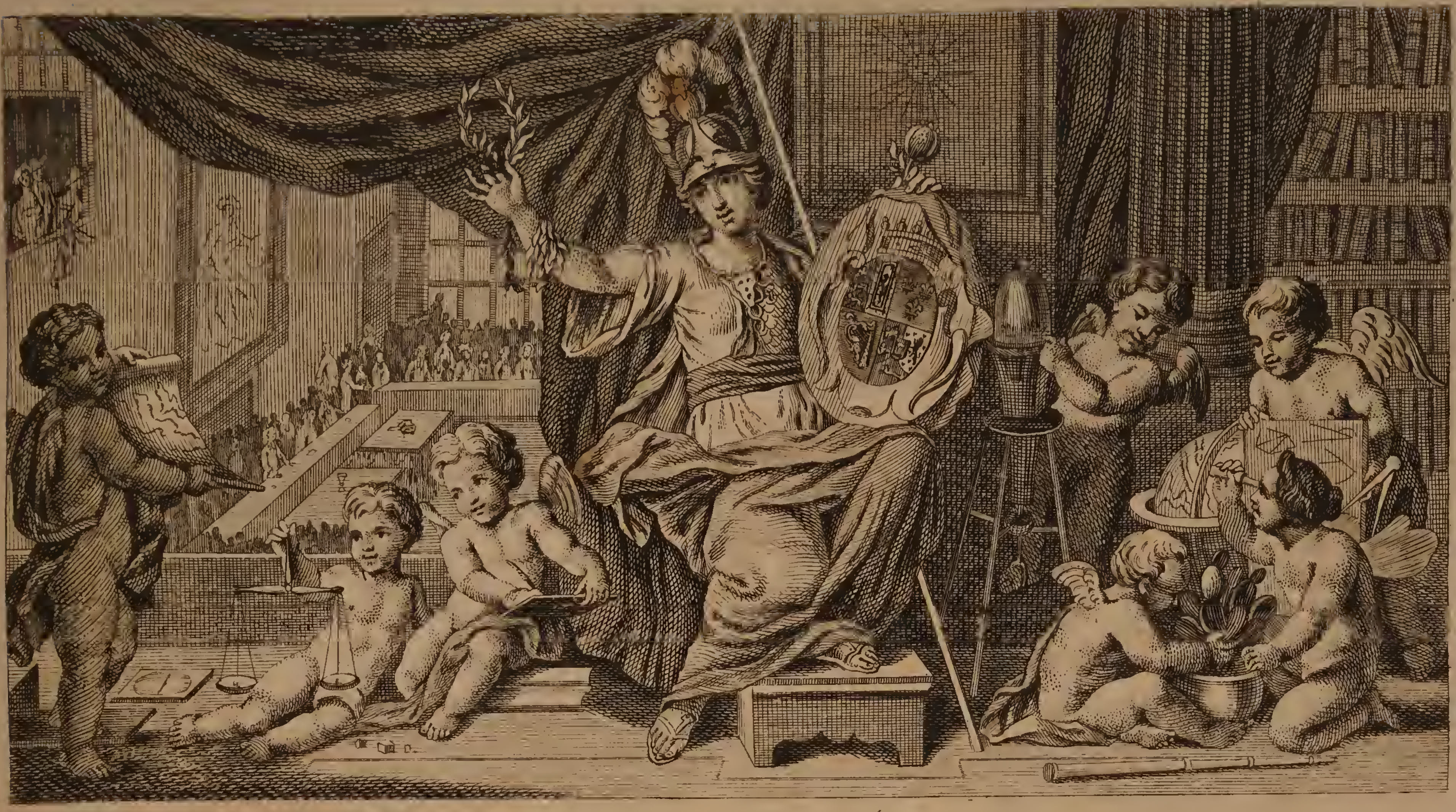
The various branches of natural hiſtory are carefully attended to, and thoſe of the greateſt uſe largely treated of; and, in order to convey an idea of the moſt curious and uſeful plants, animals, &c. we have repreſented them in their proper colours on eleven copper-plates; a circumſtance not to be found in any other Dictionary of this kind.

With regard to the Sciences and liberal Arts, the method we have purſued in their execution has been mentioned in our Preface to the Dictionary, and therefore need not be repeated here; all that ſeems neceſſary to be added is, that thoſe articles which were either omitted or defective are here ſupplied or completed, and all the diſcoveries ſince made in theſe various branches of literature inſerted.

To conclude, neither care, nor expence, has been wanting in our attempts to render this work a complete body of Arts and Sciences; and we ſhall always enjoy the internal ſatisfaction of having ſpared no pains to ſucceed. But, in ſurveying ſo extenſive and intricate a labyrinth, who can flatter themſelves with having accurately deſcribed and delineated the whole? The beſt performances, even on a ſingle Science, have their errors and defects. The great number of both which we have corrected and ſupplied in our extracts, has ſufficiently convinced us of this; and doubtleſs ſeveral have eſcaped our circumſpection. Nor can we flatter ourſelves that thoſe articles, additions, and obſervations of our own, interſperſed through the whole work, are entirely free from errors; but we dare ſay there are no fundamental ones; and, with regard to others, we hope for the candour and indulgence of the reader.

A Liſt of the Cuts in the Supplement, with Directions to the Binder, for placing them in the Book.

Plate		
I.	——	facing Air.
II.	—	facing Anchor.
III.	—	facing Anvil.
IV.	——	facing Apparent.
V.	—	facing Athanor.
VI.	——	facing Back.
VII.	——	facing Brewhouſe.
VIII.	——	facing Bridge.
IX.	Coloured.	facing Buckthorn.
X.	——	facing Building.
XI.	— —	facing Calendar.
XII.	——	facing Calico-printing.
XIII.	Coloured.	facing Caryophyllus.
XIV.	—	facing Catapulta.
XV.	———	facing Corn-mill.
XVI.	Coloured.	facing Crane.
XVII.	— —	facing Crucible.
XVIII.	Coloured.	facing Cydonia.
XIX.	——	facing Dye-houſe.
XX.	———	facing Forge.
XXI.	—	facing Furnace.
XXII.	Coloured.	facing Geranium.
XXIII.	———	facing Gerves's Engine.
XXIV.	— —	facing Green-Houſe.
XXV.	Coloured.	facing Greenland Buck.
XXVI.	———	facing Harbour.
XXVII.	— —	facing Hat.
XXVIII.	Coloured.	facing Humming Bird.
XXIX.	———	facing Malt Diſtillery.
XXX.	—	facing Marble.
XXXI.	——	facing Meridian Teleſcope.
XXXII.	Coloured.	facing Monodelphia.
XXXIII.	——	facing Mural Arch.
XXXIV.	—	facing Pile.
XXXV.	— —	facing Plough.
XXXVI.	Coloured.	facing Pomgranate.
XXXVII.	——	facing Portable Laboratory.
XXXVIII.	— —	facing Powder Mill.
XXXIX.	———	facing Rope-making.
XL.	Coloured.	facing Semifloſculous.
XLI.	— —	facing Ship-building.
XLII.	——	facing Shipwrights Sector.
XLIII.	Coloured.	facing Tobacco.
XLIV.	— —	facing Turning.



SUPPLEMENT

TO THE

New and Universal Dictionary

OF

ARTS and SCIENCES.

A ſymbolic letter, was uſed as an hieroglyphic by the ancient Egyptians, who, for their firſt characters, made uſe either of the figures of animals, or ſigns that denoted ſome of their properties: The Ibis is ſuppoſed to have been repreſented by an A, on account of the analogy between its triangular ſhape and the gait of that bird. Alſo, when the Phœnician characters, attributed to Cadmus, were adopted in Egypt, the letter A was a character of the ſymbolic writing conſecrated to religion, at the ſame time that it was uſed in the common writing for tranſacting the buſineſs of life.

A, among modern writers, is commonly uſed for anno, as A. D. anno Domini, in the year of our Lord; in England, A. M. ſtands for artium magiſter, maſter of arts.

A, in the Julian calendar, is alſo the firſt of the ſeven dominical letters.

The Romans made uſe of it long before the time of our Saviour, as the firſt of the eight nundinales literæ, in imitation whereof it was that the firſt dominical letters were introduced.

A B, the eleventh month of the civil year of the Hebrews, and the fifth of their eccleſiaſtical year, which began in the month Niſan. The month Ab anſwers to the moon in July and the beginning of Auguſt, and conſiſts of thirty days. The Jews obſerve the firſt day of this month as a faſt, on account of Aaron's death, as they likewiſe do the ninth, for ſeveral reaſons; firſt, becauſe both the temple of Solomon, and the ſecond temple built after the captivity, were burnt on that day, the firſt by the Chaldeans, and the ſecond by the Romans; ſecondly, from a belief that the ſpies which were ſent into the land of Canaan, after their return, engaged the people in rebellion on this day; and thirdly, in commemoration of the Emperor Adrian's edict, whereby they were prohibited from ſtaying any longer in Judea; wherefore, they on this day always turn their faces towards Jeruſalem, and bemoan its fate.

A'BACUS, in accounts and calculations, among the ancients, was a long ſquare, divided by ſeveral parallel braſs ſtrings, on each of which was ſtrung an equal quantity of ſmall, moveable, wooden or ivory balls, like a pair of beads, by the diſpoſition whereof, and according to the relation which the lower had to the upper ones, they divided the numbers into ſeveral claſſes, and thereby performed all ſorts of calculations. This arithmetical table, which was uſed by the Greeks, was not unknown to the Romans: We find it deſcribed by Fulvius Urſinus and Ciaconius, from ſome antique monuments; but, as ſome difficulty attended the uſe of it, they preferred the method of reckoning by counters. In China, and ſome parts of Aſia, the merchants ſtill compute by the help of a ſet of balls, made either of ebony or ivory, threaded upon braſs wire, which they tie to their girdle, and carry about with them.

Abacus *Logiſticus*, a name given by ſome mathematicians to a rectangled triangle, whoſe ſides, forming the right-angle, contain the numbers from one to ſixty; and its area, the product of each two of the numbers perpendicularly oppoſite. It is alſo known by the name of a canon of ſexageſſimals.

A'BAS, a weight uſed in Perſia for weighing pearls. It is an eighth part lighter than the European carat.

A'BASSI, a ſilver coin in Perſia, in figure and ſize very much like the antient pieces of fifteen ſols in France. The Abaſſi takes its name from Shah-Abas the Second, king of Perſia, who ordered the coinage of it. It has on one ſide, for legend, the profeſſion of the Mahometan faith, There is no God but God, and Mahomet is his prophet; and on the other the king's name, and that of the city where it was coined.

This coin, which has a great currency in Perſia, is worth two mammoudis or four chayes; the chaye being eſtimated at the rate of nine ſols ſix deniers of French money, makes the Abaſſi worth thirty-eight ſols, or ſeventeen ſols of Holland.

ABE'LLIO, or ABELLION, the name of a heathen deity, ſuppoſed to be the God of the air; two altars have been diſcovered, one in Italy, and the other near Nantz in France, inſcribed to this God; he was particularly worſhipped by the ancient Gauls and Britons, the latter of whom called him diw. Awelion. G. Voſſius is miſtaken, in ſuppoſing him to have been the ſame with Belinus, or the Apollo of the ancient Gauls, as is Bouchier in aſſerting, that he had his name from that of the place in which he firſt was worſhipped.

ABE'LMOCH. See MUSK-SEED.

A'BIB, a name given by the Hebrews to their firſt month of the holy year; it was afterwards called Niſan, and anſwered to our March. Abib, in the Hebrew, ſignifies green ears of corn, or freſh fruits, according to St. Jerom's tranſlation, menſe novarum frugum. Exod xiii. 4.

ABLACTA'TION (*Dict.*) — As nature has taken care to provide an aliment ſuitable to the tender ſtomachs of new-born infants, ſo has it given us plain directions when to change it for a diet that is more ſolid and difficult of digeſtion.

It is well known to obſervers of nature, that exerciſe and motion are the grand promoters of digeſtion, inſomuch that a labourer of a moderate ſtrength and conſtitution ſhall digeſt aliment of any kind without difficulty; whereas ſedentary people, though much more robuſt originally, ſhall in time ſcarcely be able to ſuſtain a diet of the moſt innocent food without the ſymptoms of indigeſtion. Digeſtion then ſeems to be, cæteris paribus, in proportion to motion.

Whilſt, therefore, a child is incapable of ſufficient exerciſe and motion to digeſt ſolid food, a thin fluid is provided for his ſuſtenance, which is almoſt converted into nouriſhment, before it is taken into the ſtomach of the infant. And, for fear the mother ſhould be ſo imprudent as to offer it improper aliment, providence ſeems to have ſecured the tender ſtomach, in ſome degree, from the miſchiefs of indigeſtion, by a ſingular artifice, that is, by denying the child the uſe of teeth for the firſt months.

From theſe obſervations it will appear, that a child ought not to be weaned, till nature points out the proper time, by giving it teeth, and making it capable of motion ſufficient to comminute, and afterwards to digeſt an aliment more ſolid, and more difficult to diſſolve, than the milk of its mother.

But, becauſe an infant is furniſhed by degrees with the inſtruments of maſtication, and the power of uſing exerciſe, the tranſition from milk to ſolid food ſhould not be ſudden.

Agreeable to this are the directions given by authors for the nouriſhment of young children. They tell us the milk of the parent ſhould be the only food of children, for the firſt two or three months, provided a ſufficient quantity can be ſupplied without inconvenience; that afterwards pap, panada, and bread boiled with milk, muſt prudently and gradually be introduced into their diet, till their abilities for maſtication and motion render them capable of digeſting more ſolid aliment, and at laſt fleſh.

Hence, it appears, how little thoſe mothers conſult the health of their children, who wantonly, and without any neceſſity, take them from the breaſt ſoon after they are born, and ſubſtitute a diet not to be digeſted in their tender ſtomachs, in the room of that which nature has provided for them, and accommodated to their conſtitutions.

A very few obſervations on the uſual food of infants will ſet this in a clearer light.

The milk of a healthy woman, in the flower of her age, is the moſt eaſily digeſtable of any aliment whatever, provided ſhe uſes moderate exerciſe, and a proper diet; and, for that reaſon, is the greateſt reſtorative in nature. Many inſtances occur in authors, of grown people, reduced by diſtempers to the utmoſt degree of weakneſs, who have been reſtored by ſucking the milk of women provided for that purpoſe.

The ſalutary effects of milk are very eaſy to be accounted for, if we conſider the ſtomach as the laboratory of health, and milk as a fluid, either ſecreted from the maſs of blood in the glands of the breaſt, or elſe communicated immediately to the breaſt from the receptacle of the chyle, by ſome ducts not yet diſcovered. When this is taken warm as it comes from the breaſt, it gives the ſtomach very little trouble to digeſt it, having lately paſſed the digeſtive organs of the woman. It is therefore eaſily convertible again into chyle, from which it differs but very little.

But I muſt not omit obſerving, that milk, like all animal fluids, loſes moſt of its virtues when it has been ſuffered to grow cold; and this irretrievably; for warming it again will not reſtore them. But, if milk is boiled, the qualities that rendered it an eligible food, are utterly deſtroyed, and from that moment it becomes an improper aliment for weak and tender ſtomachs.

Bread boiled in water is a food for children frequently ſubſtituted for milk, but is not by far ſo proper; for bread, thus boiled, will grow glutinous and viſcid, if not well fermented, but, if well fermented, it ſoon turns ſour. In both theſe caſes a conſiderable action of the ſtomach is required to convert it into chyle; for, otherwiſe, violent gripings, difficulty of breathing, inflammations of the belly, convulſions, and death, muſt be the conſequence.

It is not poſſible to lay down rules for the weaning children, adapted to every caſe that may occur. Regard is to be had to the ſtrength and health of the mother, as well as of the child. Upon the whole we are to purſue the method which nature ſeems to point out, unleſs ſome circumſtances interfere, which make it impracticable. Rules may be drawn from what has been repreſented above, which may, with a little variation, be accommodated to particular caſes. *James.*

ABLE'GMINA, in antiquity, were firſt-fruits, or the choiceſt and principal parts of victims offered to the Gods; they were firſt ſprinkled with wheat and flour, and then put in little baſkets by the perſons offering ſacrifice, after which, being placed on the altar, and wine poured on them, they were burnt. They were likewiſe called proſecta, proſiciæ, and magmenta.

ABORI'GINES, (*Dict.*) —The term Aborigines is famous in antiquity. Though at preſent taken as an appellative, it was originally a proper name of a certain people of Italy, the etymology whereof is greatly diſputed among the learned. Aborigines then denoted a nation in Italy, which inhabited the ancient Latium, or country now called Romania or Campagna di Roma. In which ſenſe the Aborigines are diſtinguiſhed from the Janigenæ, who, according to the falſe Beroſus, were ſettled in the country before them; from the Siculi, whom they expelled; from the Grecians, whom they deſcended from; from the Latins, whoſe name they aſſumed after their union with Æneas and the Trojans; and laſtly from the Auſonii, Volſci, Oenotrii, &c. neighbouring nations in other parts of the country. Whence this people came by the appellation, whether, firſt, as belonging to any of the ſpecies of Aborigines above recited; or, ſecondly, from their having been Aborigines, i. e. wanderers; or, thirdly, from their inhabiting the mountains, or on what other account, is much diſputed.

St. Jerom ſays, they were ſo called as being abſque origine, the primitive inhabitants of the country after the flood. Dion. Halicarnaſſeus ſays, that the name ſignifies the founders and firſt fathers of the inhabitants of that country; others think them ſo called, as being originally Arcadians, who claimed to be earth-born, and not deſcended from any people.

Aurelius Victor, and after him Feſtus, derive Aborigines by corruption from Aberrigines, wanderers, or vagabonds, and pretend that the Pelaſgians, another name ſometimes given them, is of the ſame import, and denotes vagabonds. Pauſanias rather thinks they were thus called, ἀπὸ ὀρήσι, from the mountains which they inhabited; which opinion ſeems confirmed by Virgil, who, ſpeaking of Saturn, the legiſlator of his people, ſays,

> *Is genus indocile, ac diſperſum montibus altis*
> *Compoſuit, legeſque dedit.*

The Aborigines were either the original inhabitants of the country, ſettled there by Janus, as ſome imagine, or by Saturn or Cham, as others, not long after the diſperſion, or even, as ſome think, before it; or they were a colony ſent from ſome other nation, who, expelling the ancient inhabitants the Siculi, ſettled in their place. About this mother nation there is great diſpute: Some maintain it to be the Arcadians, parties of whom were brought into Italy at different times; the firſt under the conduct of Oenotrius, ſon of Lycaon, four hundred and fifty-five years before the Trojan war; and others under the conduct of Hercules: Some derive this colony from the Lacedæmonians, who fled from the ſevere diſcipline of Lycurgus. All theſe, uniting, are ſaid to have formed the kingdom or nation of the Aborigines. Others will have them of Barbarian, rather than Grecian origin, and to have come from Scythia, others from Gaul, and laſtly, others will have them to be Canaanites, who were expelled out of their country by Joſhua.

ABO'RTION, (*Dict.*) — Aſtringent medicines and applications, and an aſtringent regimen, as they prevent hæmorrhages in general from the uterus, are particularly recommended for that reaſon, as preſervatives againſt Abortion.

For this reaſon, all thoſe medicines that are found effectual in moderating a profuſe flux of the menſes, are alſo ſerviceable in this caſe.

For this purpoſe tincture of roſes is frequently preſcribed, and Sydenham directs the following electuary:

Take conſerve of dried roſes two ounces. Troches of Lem-nian earth, a drachm and half. Pomegranate peel and red coral, of each two ſcruples. Blood-ſtone, dragon's blood, and Armenian bole, each a ſcruple. Syrup of coral, a ſufficient quantity to make an electuary.

Let the patient take the quantity of a large nutmeg in the morning, and at five in the afternoon, drinking after it ſix ſpoonfuls of the following julap. Take of the ſimple water of oak-buds and plantain, each three ounces. Of barley, cinnamon-water, and ſyrup of red roſes, each an ounce. Spirit of vitriol enough to make it agreeably acid.

Reſtringent plaiſters are ordered to be applied to the region of the loins by Sydenham, made of equal parts of diapalma and the rupture-plaiſter. Others direct the ſame, with an addition of the red-lead plaiſter, or plaiſters of other reſtringent ingredients, as dragon's blood, Armenian bole, maſtic, galls, biſtort-root, and red coral, made up, with Cyprus turpentine, into the conſiſtence of plaiſter.

It would be endleſs to give forms of medicines, frequently prejudicial, becauſe they are capable of being miſapplied, unleſs particular regard is had to the cauſes of the diſorder they are intended to remove, to which they muſt be adapted, as circumſtances ſhall direct. The reader will be more inſtructed by the following cautions.

1. Let nothing reſtringent be either given internally, or applied, when an approaching miſcarriage is ſo far advanced as to make the preventing it improbable, or impoſſible; for whatever then retards it is pernicious. Reſtringents then are particularly prejudicial, as they oppoſe the relaxation of the internal office of the uterus, at this time ſo neceſſary to the expulſion of the fœtus and ſecundines.

2. When there is reaſon to believe the fœtus is dead, let no aſtringents of any kind be made uſe of, becauſe whatever then prevents a miſcarriage does harm.

3. When a tenſion and ſtricture of the uterus make it incapable of a ſufficient dilatation, and thereby endanger a miſcarriage, aſtringents are improper, as they increaſe the tenſion, and conſequently the danger. I am ſenſible ſome authors are of opinion, that aſtringents are ſometimes neceſſary, even in the caſes laſt mentioned, to moderate a violent flux of blood. But they cannot anſwer the end propoſed, ſo long as the fœtus, placenta, or any part of it, or the clotted blood, keep the uterus diſtended, and the blood-veſſels thereof open; and, when theſe are brought away, they are generally ſuperfluous, becauſe the hæmorrhage uſually ceaſes without any further aſſiſtance, unleſs a laceration of the uterus, or ſome extraordinary accident, render both a prudent regimen and medicines neceſſary.

The precautions that are taken againſt a miſcarriage, during the time of pregnancy, are ſeldom ſo effectual as thoſe which are taken in the interval betwixt a miſcarriage and the next impregnation. Theſe conſiſt in reſtoring to the woman a perfect ſtate of health in general, particular regard being had to the diſorders of the uterus.

If, from the ſymptoms of great pain, tenſion, and hardneſs about the region of the uterus it is too tenſe to admit of ſufficient dilatation, the general habit of body muſt be relaxed, or the fibres of the uterus may be ſoftened by emollient fomentations, cataplaſms, injections, or peſſaries. *James's Dict.*

ABRA'SA, in ſurgery, ulcers attended with abraſion of part of the ſubſtance; or ulcers where the ſkin is ſo tender and lax as to be ſubject to abraſion.

ABRI'DGEMENT, epitome, ſummary, ſubſtance, &c. An Abridgement is a diſcourſe, in which we reduce to fewer words the ſubſtance of what is elſewhere treated of more at large, and more circumſtantially.

ABRIDGEMENT, in the common law, ſignifies, particularly, the making a declaration or account ſhorter, by ſevering ſome of the ſubſtance from it. A man is ſaid to abridge his plaint in aſſize, and a woman her demand in an action of dower, where any land is put into the plaint or demand, which is not in the tenure of the defendant: For, if the defendant pleads non-tenure, joint tenancy, &c. in abatement of the writ, the plaintiff may leave out thoſe lands, and pray that the tenant may anſwer to the reſt. The reaſon of this Abridgement of the plaint is, becauſe the certainty is not ſet down in ſuch writs, but the run in general; and, though the demandant hath abridged his plaint in part, yet the writ will be good for the remainder.

ABRI'DGING, in algebra, implies a method of reducing a compound equation to a more ſimple expreſſion. When there are ſeveral known quantities in the ſame term, mathematicians generally expreſs them by a ſingle letter. Thus in the equation $x^3 - axx + abx - abc = 0$; by putting $n = a$, $p = ab$, and $q = abc$, we ſhall have $x^3 - nxx - px - q = 0$, inſtead of the propoſed equation. This abridged equation is called a formula.

ABROTONI'TES, a wine mentioned by Dioſcorides impregnated with abrotanum or ſouthernwood, in this manner: Take of ſouthernwood bruiſed and ſifted a hundred ounces, (an ounce is eighteen penny-weights five grains $\frac{1}{7}$ troy) incloſe it in a linnen bag, and put it into a veſſel containing about ſeven gallons of muſt. It is good in diſorders of the ſtomach, loſs of appetite, and in a jaundice, for it is diuretic. Dioſcorides. l. 5. c. 62.

ABROTA'NUM. — There are two very different plants deſcribed by botanical writers under the ſame general name of Abrotanum, and diſtinguiſhed by the addition of mas and fœmina. The male Abrotanum is the plant we call ſouthernwood, and the female is what we call lavender cotton.

Southernwood, or *male Abrotanum*, is one of the *ſyngeneſia polygamia ſuperflua* of Linnæus, and one of the *herbæ corymbiferæ floribus non radiatis* of Ray. It is deſcribed by all the botanical writers under the name of Abrotanum vulgare, Abrotanum mas, and Abrotanum anguſtifolium majus. It grows to four or five feet high, and is a ſhrubby and ſtrong plant. Its ſtalks are hard and woody, but not tough; they are of a reddiſh colour, and lightly ſtriated on the ſurface, and have a hollow filled with a whitiſh medullary ſubſtance within. The leaves are very numerous; they are of a whitiſh green colour, very finely divided into ſegments, and of a ſtrong, and to ſome people very diſagreeable ſmell; though there are others who are fond of it.

Their taſte is acrid and bitter; the flowers ſtand thick together, about the tops of the branches, and are of a yellowiſh colour, and much like thoſe of the common wormwood, but ſmaller; they are compoſed of a number of ſmall and hollow floſcules, which are divided into five ſegments at the end. Theſe are all contained in one common cup, and each of them ſtands on an embryo ſeed, which afterwards ripens and is oblong, and like the ſeed of wormwood, but ſmaller, and has no downy matter annexed to it. In the whole it greatly approaches to the nature of the wormwood kind, in all things but its external appearance. It grows in great abundance on the Pyrenean mountains, and on moſt of the mountains of France and Italy. With us it is not found wild, but is cultivated in the gardens about London for its ſmell, and to ſupply the ſhops.

A pound of freſh tops of ſouthernwood, diſtilled by the retort, yields firſt about two ounces and a half of a limpid phlegm, of the ſmell and taſte of the plant; after this about ten ounces of a ſtronger-ſcented liquor, of an acid, and with it of ſomewhat of the volatile alkaline taſte; after this, about half an ounce of a browniſh liquor, of an empyreumatic ſmell, and of a ſtrongly volatile alkaline taſte, but with ſomewhat alſo of the acid yet in it; after this comes over about half an ounce of an oil partly fluid, and partly thick as butter. The remainder in the retort, calcined in an open fire and lixiviated, yields two drachms of a fixed alkaline ſalt.

The ſtrong ſmell and taſte of ſouthernwood, as well as the active principles it is reſolved into by analyſis, plainly ſhew that it is a powerful medicine; and it has been very juſtly lamented by Etmuller, that it is not brought more into uſe. It is evidently of the tribe of attenuants, and would be ſerviceable in all obſtructions of the viſcera. It deſtroys worms by its bitter eſſential oil, and at the ſame time acting as an attenuant on the foul vicious matter in the bowels, without which worms cannot live or breed there, it prevents a return of the complaint.

It is recommended by ſome in ſuppreſſions of urine, a drachm of it in powder for a doſe. But S. Pauli, who recommends it moſt ſtrenuouſly on this occaſion, orders ſome nitre to be added to it, and perhaps the effects that he found from that compound powder, were as much owing to the nitre, as to the plant. A decoction of it is in repute with ſome as a lotion for the recovering hair upon the head when fallen off; and others recommend its juice as a great cleanſer and healer of old ulcers. We ſometimes meet with a diſtilled water of it in the ſhops; but few make it, and fewer uſe it when made. It poſſeſſes but a ſmall ſhare of the virtues of the plant; an infuſion in water, or a conſerve made of the young tops in ſpring, ſeems much better calculated to anſwer the purpoſes intended by it.

Lavender cotton, or the *female Abrotanum*, is a plant of the ſame claſs with the former, but is extreamly different from it in its manner of growth and general external figure. It is deſcribed by the botanical writers under the name of *ſantolina*, *chamæcypariſſus*, and *Abrotanum fœmina*. Tournefort calls it *ſantolina foliis teretibus*, and C. Bauhine, *Abrotanum fœmina foliis teretibus*.

It grows in form of a thick and low buſh; its main ſtalks are woody and hard; they grow to two or three feet high, and are divided into a number of ſlender branches which are whitiſh or hoary. The leaves are about an inch long, very thick and narrow; they are minutely ſerrated round the edges, or, more properly ſpeaking, they are beſet in all parts with rows of little tubercles, four in a ſeries. They are more white and hoary than the ſtalks, and have a very ſtrong and fragrant ſmell, and are of an acrid and bitter taſte. At the extremity of every branch there ſtands a ſingle flower, moderately large and of the floſculous kind, or compoſed of a number of little tubular floſcules, cut into five ſegments at the edges, and ſeparated by ſeveral imbricated leaves. They are of a bright yellow colour, and when in their perfection, and a great number open upon the plant at once, they make a very beautiful appearance. The whole cluſter of floſcules that compoſe one flower, are contained in one common cup of the ſquammous kind, and each of them is ſucceeded by a ſmall oblong and ſtriated ſeed of a brown colour. Its root is hard, woody, and is often divided into a great number of branches. It is common in many parts of Italy, and in France wild by the road ſides, in mountainous places; with us it is cultivated in gardens for its beauty more than for its medicinal uſe, though it is rather of the number of thoſe plants which eſcape our notice, than of thoſe that do not merit it.

A pound of the freſh tops of lavender cotton, diſtilled in a retort, yield firſt about two ounces or a little more of a limpid and colourleſs phlegm, ſmelling and taſting of the plant, but, in taſte, ſomewhat obſcurely acid. This is in quantity about ſeven, or between ſeven and eight ounces; after this come over about two ounces of a reddiſh liquor, partly acid and partly alkaline, and, after this, about eight grains of a volatile alkaline ſalt, in a ſolid form; and finally near an ounce of a thick oil like butter. The remainder in the retort, calcined in an open fire and lixiviated, yields about a drachm and half of a fixed alkaline ſalt.

The virtues, aſcribed to the ſantolina or female Abrotanum, are in general the ſame with thoſe of the male; it is, however, particularly recommended in uterine complaints. The ſeed of this plant is accounted little inferior to the ſemen ſantonicum for deſtroying worms, and is not unfrequently ſold by the druggiſts as a ſuccedaneum for it.

Matthiolus recommends the powder of the dried leaves, half a drachm for a doſe, and to be continued a conſiderable time, as a remedy for the fluor albus. And Garidelli tells us of the ſame doſe having been given with great ſucceſs in pleuriſies and peripneumonies.

A'BSCESS, (*Dict.*)—Mr. Petit has preſented to the royal academy of ſurgery a very important paper on tumors of the gall-bladder, which have often been miſtaken for Abſceſſes in the liver, and, by the many curious remarks wherewith that memoir is replete, has enriched pathology with an accurate account of a new ſpecies of diſeaſe. He gives us the diagnoſtic ſigns which diſtinguiſhes the tumors of the gall-bladder, when diſtended by the bile retained in it, from Abſceſſes of the liver; compares that retention of the bile, and the biliary ſtone, with the retention of urine, and the ſtone in the bladder; and propoſes the performing operations on the gall-bladder ſimilar to thoſe made in the veſica. See Mem. de l'Acad. de Chirurgic, tom. 1. Very conſiderable Abſceſſes often happen in the fundament, and occaſion fiſtula's. See the article FISTULA *in ano*.

Mr. Littre obſerves, Hiſt. de l'Academie, an. 1701, p. 29, on occaſion of an inflammation of the parieties of the left ventricle of the heart, that the ventricles of the heart muſt be leſs ſubject to Abſceſſes than inflammations; becauſe an Abſceſs conſiſts in an extravaſated fluid, which coagulates, corrupts, and turns into pus; and an inflammation in a ſwelling of the veſſels, cauſed by too great a quantity of fluid. If then we ſuppoſe, that from the coronary arteries, which nouriſh the ſubſtance of the heart, it extravaſates, and diffuſes the blood that does not at firſt enter the coronary veins deſtined to receive it, it will be difficult that the continual motion of the contraction, and dilatation of the heart, does not force it to re-enter therein, or at leaſt break and attenuate in ſuch manner, as to eſcape into the ventricles acroſs the parietes. With regard to an inflammation, the heart has no other remedy than what it receives from ſome other part of the body, either to prevent it, or deliver itſelf from it.

We have, in the hiſtory of the royal academy of ſciences for the year 1730, p. 40, the hiſtory of a cure of an Abſceſs in the liver, which ought to be publickly known. Mr. Soulier, ſurgeon at Montpellier, was called to a youth of about thirteen or fourteen years of age, who, after having been violently heated, had put his feet into cold water, and thereby contracted a fever, which was attended with no leſs dreadful a conſequence than that of a very large tumor in the liver, which Mr. Soulier opened; he found the liver conſiderably impoſthumated on the outſide, and convex, and in it a hole capable of receiving half of an hen's egg; at each dreſſing there was diſcharged a bloody, thick, yellow, bitter, and inflamed matter, which he ſoon diſcovered to be the gall, accompanied with flakes of the ſubſtance of the liver.

In order to diſcharge the matter from this Abſceſs, Mr. Soulier contrived a ſilver canula, blunted at the end, ſo that it might be introduced into the liver without injuring it, and pierced with ſeveral lateral apertures to receive the peccant humour, and bring it off externally, where it fell upon a plate of lead, which he had applied to the wound, ſo that the matter could not excoriate the ſkin: This expedient had the wiſhed-for ſucceſs; the fever leſſened, a good habit of body came on, the wound cicatriſed, and the patient was cured.

ABSCI'SSA, (*Dict.*)—In the parabola, the Abſciſſa is a third proportional to the parameter and ſemiordinate; and the parameter a third proportional to the Abſciſſa and ſemiordinate.

In the ellipſis, the ſquare of the ſubordinate is equal to the rectangle of the parameter into the Abſciſſa, ſubtracting another rectangle of the ſame Abſciſſa into a fourth proportional to the axis, parameter, and Abſciſſa.

In the hyperbola, the ſquares of the ſemiordinates are to each other, as the rectangles of the Abſciſſa into another line compoſed of Abſciſſa and the tranſverſe axis.

ABSINTHI'TES *Vinum*. Dioſcorides deſcribes ſeveral ways of making the vinum Abſinthites. The beſt way, in the opinion of Fuchius, is to bruiſe an ounce of the beſt wormwood, and, tying it up in a thin linnen rag, infuſe the ſame in nine gallons of wine. Then put muſt (wine never fermented) to it and let it work, leaving a hole open, that it may not burſt the veſſel.

The vinum Abſinthites is good for the ſtomach, excites urine, accelerates concoction, relieves ſuch as labour under diſtempers of the liver, the ſtone, or yellow jaundice, removes a nauſea, and helps infirmities of the ſtomach. It is effectual alſo for an inveterate diſtenſion of the hypochondria, and all inflammations; kills round worms, reſtores the ſuppreſſed menſes, and is an antidote againſt the poiſon of the white chamæleon, provided it be drank in a large quantity, and returned by vomit.

ABSO'RBENT *Veſſels*, in anatomy, thoſe minute veſſels which imbibe the nutritious and other juices of the human body.

The learned Dr. Mead, in his Monita & Præcepta, has given us the following remarkable caſe of the veſſels abſorbing the water in a dropſical perſon.

I attended a certain merchant for an aſcitical dropſy, with another phyſician of great experience: And, after trying the uſual remedies to no purpoſe, we reſolved upon the paracenteſis, as the ultimate reſource. Accordingly the operation was performed, and about twenty pints of clear water were drawn off. In a few weeks his belly filled again. Whereupon we agreed to meet the ſurgeon next morning, in order to draw off the water by a ſecond tapping. As we came to the patient, he looked at us, and ſmiled; ſaying that he had no occaſion for any ſort of aſſiſtance; and, ſtripping off the cloaths, he ſhewed his abdomen, which was ſoft and relaxed. At this we were vaſtly ſurprized, and, having aſked him if he had any kind of evacuation in the night, he aſſured us that he had had none, either by ſtool, or urine, or ſweat, more than uſual. Wherefore all the water muſt have been abſorbed by the glands and capillaries of the peritonæum and adjacent membranes. But afterwards this patient very imprudently committed himſelf to the care of a certain quack, who, to prevent a return of the diſeaſe, gave him very ſtrong cathartics, which ſo exhauſted him that he ſoon died conſumptive. Yet upon diſſection there was little or no water found in the Abdomen.

Anatomiſts have long ſince diſcovered, that water is abſorbed from the belly into the circumjacent parts: for, if a pint of warm water be injected, through a ſmall wound, into the abdomen of a live dog, and his abdomen be laid open a few hours afterwards, not a ſingle drop of the water will be found therein. Thus, as Hippocrates has juſtly obſerved, every part of the body, both outward and inward, are perſpirable. But I refer the reader to the peruſal of what the learned Dr. Abraham Kaav has publiſhed on this ſubject; who demonſtrates that the humours are admitted into, and tranſude through, all the membranes of the body, both in health and ſickneſs.

ABSTRACTI'TIUS, *Abſtractitious*, a name given to the native ſpirits of aromatic vegetables, to diſtinguiſh them from ſpirits produced by fermentation. *Caſtellus*, from *Libavius*.

ACA'CIA, in botany, the name of a genus of trees, of which M. Tournefort has enumerated twelve, and Mr. Miller twenty-four ſpecies.

The characters of the tree are theſe:—It hath a tubuloſe flower conſiſting of one leaf, with many ſtamina, or threads, which are many of them collected into a kind of ſphere or globe: the pointal of the flower afterwards becomes a pod, in which are included ſeveral ſeeds, each of which is ſeparated by tranſverſe diaphragms, and are generally ſurrounded by a whitiſh pulp. *Miller's Dict.*

ACA'DEMY (*Dict.*) *Royal* ACADEMY *of Sciences and Belles Lettres of Pruſſia.* Frederic the Firſt, king of Pruſſia, founded it in the year 1700, and appointed M. Leibnitz to be the firſt preſident thereof: the liſt of the members of this Academy was, at its firſt eſtabliſhment, adorned with ſome of the greateſt names in the republic of letters. This Academy, in the year 1710, publiſhed the firſt volume of its tranſactions under the title of Miſcellanea Berolinenſia; and, though Frederic's ſucceſſor gave but little encouragement to letters, the Academy continued to publiſh new volumes in the years 1723, 1727, 1734, 1737, and 1740. At length, Frederic the Second, the preſent king of Pruſſia, thought proper to give new vigour to the Academy; for which purpoſe he invited to Berlin ſuch ſtrangers as were of the moſt diſtinguiſhed merit in literature, and encouraged the beſt of his ſubjects to proſecute the ſtudy and cultivation of it, by giving them ample rewards; ſo that, in the year 1743, there appeared a new volume of the Miſcellanea Berolinenſia, in which the new force that the Academy had acquired plainly appeared. However, that prince did not think fit to confine himſelf there: he thought that the Royal Academy of Sciences of Pruſſia, in which, till that time, ſome miniſter, or great nobleman, had preſided, would find an advantage from having a man of letters at its head, and accordingly he made choice of M. Maupertius, a gentleman well known all over Europe, and engaged him to ſettle at Berlin; he himſelf, at the ſame time, giving a new regulation to the Academy, and taking upon him the title of its protector. This Academy has, ſince the year 1743, publiſhed three volumes of memoirs, wrote in French, and nearly upon the ſame plan as the hiſtory of the Royal Academy of Sciences at Paris, but with this difference, that, in the ſecond of theſe volumes, the extracts of the memoirs are ſuppreſſed, as they are intended to be in the future volumes, one of which is to be publiſhed every year. The academiſts hold two public aſſemblies in the year; one in January, on the preſent king's birth-day, and the other in May, on the day of his acceſſion to the throne. At the latter of theſe aſſemblies is given a prize, conſiſting of a gold medal of the value of fifty ducats: the ſubject for this prize is ſucceſſively natural philoſophy, mathematics, metaphyſics, and erudition. This Academy has this in particular, that it includes metaphyſics, logic, and morality, which are not the objects of any other Academy: there is a particular claſs which is engaged in theſe matters, and is called the claſs of ſpeculative philoſophy.

The Imperial ACADEMY *of Peterſburg.* — Czar Peter the Firſt, ſirnamed the Great, by whoſe means Ruſſia ſhook off the yoke of barbariſm, which had reigned for ſo many ages in that kingdom, coming into England and France, in the year 1717, and obſerving the great utility of literary ſocieties and Academies, reſolved to eſtabliſh one in his capital; and had actually taken the neceſſary meaſures for that purpoſe, when he was taken off by death in the year 1725. His ſucceſſor, the czarina Catharine, being fully informed of his intentions, laboured upon the ſame plan, and, in a ſhort time, formed one of the moſt celebrated Academies in Europe, compoſed of the moſt conſiderable foreigners, ſome of whom came and ſettled at Peterſburg. This Academy, which is employed in cultivating the ſciences and polite literature, hath, ſince the year 1726, publiſhed ten volumes of memoirs, which are all wrote in Latin, and are highly valuable, particularly for the mathematical part, which contains a great number of excellent pieces. Moſt part of the foreigners who compoſed that Academy being either dead, or retired out of the kingdom, it was in a very deſponding and languiſhing condition upon the czarina Eliſabeth's acceſſion to the throne; but that princeſs, happily for herſelf, named count Raſomouſki to be preſident; gave the Academy a new body of ſtatutes; and left nothing neglected which could re-eſtabliſh its ancient ſplendor. This Academy has this modeſt motto, *Paulatim.*

ACÆ'NA, ἄκαινα, in antiquity, a ten-feet rod, uſed by the Greeks in meaſuring their land.

ACAJOU', the name of the tree which produceth the caſhew-nut, or anacardium. See ANACARDIUM in the dictionary.

ACANTHOPTERY'GII *, in natural hiſtory, a term uſed to expreſs one of the general claſſes of fiſhes, the rays of whoſe fins are bony, and ſome of them ſharp or pointed.

* The word is Greek, ἀκανθοπτερύγιοι, and formed from ἄκανθα, a thorn, and πτερύγιον, a fin.

ACATALE'PSIA *(Dict.)* — The Pyrrhoniſts, or Sceptics, aſſerted an abſolute Acatalepſia: all human ſcience and knowledge, according to them, went no farther than to appearances and veriſimilitude: they declaimed much againſt the ſenſes, and charged them with a principal ſhare in ſeducing and leading us to error.

Arceſilas was the firſt aſſertor of the Acatalepſia, and reaſoned as follows: We can know nothing, ſaid he, not even ſo much as what Socrates advanced, that we are ignorant of our knowing nothing. This impoſſibility proceeds both from the nature of things, and of our faculties, and even more from the nature of our faculties, than from that of things.

We muſt then either deny or aſſert any thing whatſoever; for it is unworthy of a philoſopher both to approve of any thing that is falſe, or uncertain, and to paſs his judgment without being inſtructed. But every thing having almoſt the ſame degrees of probability, pro and con, a philoſopher may then declare himſelf againſt that which he either denies or affirms, whatever it be; being ſure at length either of finding the truth of what he ſeeks for, or freſh reaſons to believe that it is not made for us. In this manner Arceſilas ſearched after it, during his whole life, perpetually quarrelling with the philoſophers of his own time: but, ſays he, if neither ſenſe nor reaſon are ſufficient to be attended to in the ſchools of philoſophy, they are at leaſt ſo in the conduct of life, when there is no danger of following probabilities; ſince we live among ſuch people as have not themſelves any better means to determine them.

ACATA'STATOS, a phyſical term, ſignifying inconſtant, and is applied to irregular fevers, where the periods of exacerbation are uncertain, and the appearances in the urine perpetually changing. It is applied alſo to ſhivering fits in fevers, which return at irregular periods, ſometimes every day, ſometimes every other day, or every third day; or it is applied to urines which are turbid, but do not depoſit any regular ſediment.

A'CCENT *(Dict.)* — It is a queſtion whether theſe Accents and aſpirates are now to be marked upon Greek words. F. Sanadon, in his preface to Horace, tells us, that he writes the Greek without Accents. This is certain, that we pronounce the words of the dead only according to the inflections of living languages: we do not touch the quantity of the Greek and Latin, except upon the penultima, though the word conſiſts of more than two ſyllables; but, with regard to the tone, or accent, we have loſt the ancient pronunciation: yet, not to loſe the whole, and, as it often happens that two words have no other difference between them than in the Accent, we think, with the author of the Greek method of P. R. that we ought to preſerve the Accents in writing the Greek; but muſt add, that we are to look upon them as ſigns of a pronunciation which is now diſuſed; and I am perſuaded, that the learned, who would, at preſent, regulate their pronunciation by theſe Accents, would be hiſſed at by the Greeks themſelves, were it poſſible that they ſhould hear them.

As for the Latins, it is commonly thought that the Accents were only made uſe of in writing, to fix the pronunciation, and make it eaſy to ſtrangers. At preſent, in the Latin grammar, they give the name of Accent only to the three ſigns (ſee CHARACTER in the dictionary) the grave, the acute, and, circumflex, and this laſt is never marked but thus [^], and not as in the Greek.

The ancient Latin grammarians had not reſtrained the name of Accent to theſe three ſigns. Priſcian, who lived in the ſixth century, and Iſidore, who flouriſhed a little time after him, both ſay that the Latins have ten Accents: theſe ten Accents, according to thoſe authors, are,

1. The acute.
2. The grave.
3. The circumflex.
4. The long line, uſed to mark a long vowel — longa linea, ſays Priſcian; longa virgula, ſays Iſidore.
5. The mark of the ſhortneſs of a ſyllable, brevis virgula [◡].
6. The hyphen, which ſerved to join two words, as antetulit; they marked it, according to Priſcian, thus [◡], and, according to Iſidore, thus [Ω]. The French uſe the tiret, diviſion, or ſtroke of union, for that purpoſe; porte-manteau, arc-en-ciel.
7. The diaſtole, on the contrary, was a mark of ſeparation; they marked it thus [ɔ], under the word ſuppoſita verſui. Iſid. de fig. accentuum.
8. The apoſtrophe, which we ſtill make uſe of: the ancients placed it alſo at the top of the word, to ſhew the ſuppreſſion of a letter; as tho' for though.
9. The δάσεῖα. This was the ſign of the aſpiration of a vowel, RAC. δασὺς, hirſutus, hairy, rough: they marked it over the letter thus [c]; it is the rough aſpirate of the Greeks, which the copyiſts have turned into an h, in order to a facility of writing quick, without the trouble of raiſing the pen to mark the aſpirate upon the aſpirated letter.
10. Laſtly, the ψιλὴ, which ſhewed that the vowel was not to be aſpirated: it is the ſoft aſpirate of the Greeks, which was wrote in contradiſtinction to the rough aſpirate.

They likewiſe had, as well as we, the aſteriſk, and ſeveral other notes, which Iſidore mentions, Orig. l. 1. and ſays that they were very ancient.

As to the Hebrews, towards the fifth century, the doctors of the famous ſchool of Tiberias laboured upon the criticiſms of the books of the holy ſcriptures, that is to ſay, to diſtinguiſh the apocryphal books from thoſe which were canonical; afterwards they divided them by ſections and verſes, and fixed their reading and pronunciation by points, and other marks, which the Hebreans call Accents; ſo that they give this name not only to ſigns which mark the elevation and depreſſion of the voice, but alſo to the ſigns of punctuation.

Theſe doctors were called maſſorets, from the word maſſore, which ſignifies tradition; becauſe thoſe doctors ſtuck cloſe in their operations to preſerve, as much as was in their power, the traditions of their fathers, in the manner of reading and pronouncing.

As for our part, we give the name of Accent primarily to the inflection of the voice, and to the manner of pronunciation of particular countries. Thus we ſay of the French Accent, &c. that man has a foreign Accent, i. e. that he has ſome inflection of voice, and a manner of ſpeaking, which is diſſimilar to that of perſons born in the capital; in this ſenſe Accent comprehends the elevation of the voice, and the quantity, and particular pronunciation, of each word, and of each ſyllable.

In the ſecond place, we have kept the name of Accent to each of the three ſigns of tone, which is either acute, grave, or circumflex: but theſe three marks have loſt, among us, their ancient deſtination; they are no more, on that account, than printed Accents: this is the uſe we make of them in Greek, Latin, and French.

As to the Greek, we pronounce it our own way, and place Accents according to the rules that grammarians give us, without uſing thoſe Accents as guides for raiſing or lowering the tone. As for the Latin, we at preſent diſtinguiſh the quantity of words only in reſpect to the penultima, though the word conſiſts of more than two ſyllables; for the words which have but two ſyllables are pronounced equally, whether the firſt be long or ſhort: for example, in verſe, the a is ſhort in pater, and long in mater; yet we pronounce both as if they were of the ſame quantity.

In books deſigned for public reading, the acute Accent is made uſe of, and placed differently, according as the penultima is either ſhort or long; for inſtance, in matutinus we perceive the quantity only on the penultima ti, and, becauſe this penultima is long, we place an acute Accent thereon, matutínus.

On the contrary, this penultima ti is ſhort in ſerótinus, in which caſe we put the acute Accent on the antepenultima ró, whether that penultima be ſhort or long. In verſe, this acute Accent then ſerves to ſhew us, that we muſt reſt upon that accented antepenultima, in order to paſs more eaſily on the penultima, and to pronounce it ſhort.

As the method of accenting, though uſed but by few authors, is of great uſe, it were to be wiſhed that this practice equally prevailed as to claſſical books, thereby to accuſtom young people to pronounce the Latin regularly.

ACCE′PTOR, in commerce, the perſon who accepts a bill of exchange.

The Acceptor, who is generally the perſon on whom the bill is drawn, becomes perſonal debtor by the acceptance, and is obliged to pay, even though the drawer happens to fail before the bill becomes due.

A′CCIDENT, in logic, is when we join a confuſed and indetermined idea of ſubſtance with a diſtinct idea of ſome mode: that idea is capable of repreſenting all things, wherein that mode will be, as the idea of prudent, prudent men, and the idea of round, all round bodies. That idea, expreſſed by an adjective term, prudent, round, gives the fifth univerſal, which is called Accident, becauſe it is not eſſential to the thing to which we attribute it; for, if it was, it would be difference, or proper. But here it is to be obſerved, that, when we conſider two ſubſtances together, we may conſider one of them as the mode of the other; thus, a dreſſed man may be conſidered as a whole, compoſed of that man and of his clothes; but, to be dreſſed in reſpect to that man, is only a mode, or faſhion of being, under which we conſider him, though his habits may be ſubſtances.

ACCIPE′NSER, a name given, by Linnæus, to a genus of fiſhes, whoſe characters are, that the mouth is tubulated, and without teeth, and the gills have only one hole, or aperture, on each ſide.—The ſturgeon, among others, belongs to this genus.

ACCI′PITER, in zoology, the hawk. Linnæus has given this name to an order of birds, the diſtinguiſhing character of which is, their having a crooked beak. There are three genera belonging to this order, the owl, the hawk, and the falcon.

ACCLAMA′TION, a token of joy, or applauſe, whereby the public teſtifies its eſteem, or approbation. Antiquity has tranſmitted to us ſeveral ſorts of Acclamations. The Hebrews were accuſtomed to cry hoſanna; and the Greeks ἀγαθὴ τύχη, good fortune, good luck. The hiſtorians ſpeak of ſome magiſtrates of Athens who were elected by Acclamation, which was not manifeſted by calling out, but by holding up the hands. The Barbarians teſtified their approbation by a confuſed noiſe, or claſhing of their arms. We have a more circumſtantial knowledge of the cuſtoms of the Romans on this head, which may be reduced to three different kinds of Acclamations, thoſe of the people, thoſe of the ſenate, and thoſe of the aſſemblies of the learned.

The Acclamation of the people took place upon the public entries of emperors and generals, at the ſhews given by the princes, or magiſtrates, and of triumphs of conquerors; this was originally no more than a confuſed outcry of a multitude tranſported with joy, and a ſimple undiſguiſed expreſſion of public approbation; plauſus tunc arte carebat, ſays Ovid. But, under the emperors, and even under Auguſtus, this impetuous motion, to which the people abandoned themſelves, as it were by enthuſiaſm, became an art, and a ſtudied harmony; a muſician ſet the tune, and the people, giving two chears, alternatively repeated the form of Acclamation. On the falſe report of Germanicus's recovery being ſpread over Rome, the people flocked to the capitol, with torches and victims, ſinging, Salva Roma, ſalva patria, ſalvus eſt Germanicus. Seneca and Burrhus were the firſt in their Acclamations to Nero (who was paſſionately fond of muſic) when he played upon the harp in the theatre, and theſe were followed by five thouſand ſoldiers, called auguſtales, who roared out his praiſes, which the reſt of the ſpectators were obliged to repeat. Theſe muſical Acclamations were continued to the reign of Theodoric. Applauſes in cadence were alſo ſometimes joined with theſe Acclamations; the moſt common formula's were, feliciter, longiorem vitam, annos felices; thoſe of triumph, were verſes in praiſe of the general, and the ſoldiers and people cried out, at certain intervals, ïo triumphe; though the ſoldiers ſometimes mingled with theſe praiſes very ſharp and ſatyrical railleries upon the conqueror.

The Acclamations of the ſenate, though they were more ſerious, yet had the ſame end, that of honouring the prince, and often of flattering him. The ſenators teſtified their conſent to his propoſitions by theſe formula's, omnes, omnes, æquum eſt, juſtum eſt. We have had inſtances of the elections of emperors made by Acclamation, without any preceding deliberation. Men of learning either recited their compoſitions, or declaimed in the capitol, or in the temples, and in the preſence of a numerous aſſembly; and Acclamations were then given nearly in the ſame manner as at the public ſhews, as well in reſpect of the muſic, as of the accompaniments. As thoſe Acclamations ought to be ſuitable to the ſubject, as well as to the perſons to whom they were given, they had ſeveral of them, ſome adapted to the philoſophers, others to the orators, others to the hiſtorians, and others again proper for the poets. One of the moſt common of theſe formula's was the ſaphos, which they repeated three times; neither were compariſons or hyperboles ſpared in the leaſt, eſpecially by thoſe admirers who were hired to applaud; for there were people of this ſort, as we learn from Philoſtratus.

ACCO′MPAGNAGE, a term uſed in ſilk manufactories, and ſignifies a fine woof of the ſame colour with the gilding, whereof the ſtuff is wrought, helping to enrich the ground under which it paſſes, and to hinder it from ſtriking croſs the gilding itſelf, which would diminiſh its gloſs and luſtre. All rich ſtuffs, the warps whereof are of a different colour from the gilding, ought to be accompanied.

ACCO′MPANIMENT, in muſic, is the execution of a complete and regular harmony upon any inſtrument, as the organ, harpſichord, theorbo, guitar, &c. we ſhall, in this place, conſider it in reſpect to the harpſichord.

Here we have one of the parts of muſic, which is commonly the baſs, for our guide. The baſs is touched on the left hand; and on the right the harmony is pointed out, either by the movement of the baſs, the tone of the other parts which we hear at the ſame time, the diviſions which we have before our eyes, or by the figures which are commonly added to the baſs. The Italians ſhew no regard to the figures, the quickneſs and nicety of their ear ſupplying the want of them, and they accompany extremely well without that apparatus; a faculty of playing, for which they are entirely indebted to their own natural genius. Other people, who are not, like them, born for muſic, when they come to practice, find infinite difficulties in Accompaniment, and require ten or twelve years to ſucceed tolerably well in it. What then can be the cauſes that retard the progreſs of the ſcholar, and embarraſs even the maſters themſelves, for ſo long a time, as the difficulty alone of that art cannot occaſion it?

There are two which are the principals; the one is in the manner of figuring the baſs, and the other in the methods of Accompaniment. The ſigns which are uſed to figure the baſſes are too numerous. If there are ſo few fundamental concords, why muſt there be a multitude of figures to expreſs them? The very ſigns are equivocal, obſcure, and inſufficient; for inſtance, they ſcarce ever determine the nature of the intervals which they expreſs; or, what is ſtill worſe, point them out quite contrary: the one is barred to have the place of dieſis, and the other is barred to hold the place of *b* flat: the greater intervals, and even the leſſer ones, are often expreſſed in the ſame manner. When the figures are doubled, they are too confuſed, and, when ſingle, they ſcarce ever give us any more than the idea of only one interval, ſo that we always have ſeveral others of them to underſtand and expreſs. What method then muſt be taken to remedy theſe inconveniencies? Muſt the ſigns be multiplied, in order to expreſs the whole? To this it may be anſwered, that we complain, that there are too many of them already. Muſt we then reduce them? Why, if we do, we ſhall then leave more things to be gueſſed at by the accompanier, who is already too much taken up. What then is to be done? We muſt invent new ſigns, perfect the fingering, and make ſigns of fingering two ways combined, which at the ſame time concur to help the accompanier. This is what M. Rameau has, with great ſagacity, attempted in his diſſertation on the different methods of Accompaniments.

As the ancient muſic was not ſo well compoſed as ours is, either for harmony or ſinging, and had ſcarcely any other baſs than the fundamental, all the Accompaniments conſiſted in a ſeries of perfect concord, wherein the accompanier from time to time ſubſtituted a ſixth to a fifth, as the ear guided him: this was all the ancients knew; but, of late years, ſince we varied the modulations, and overcharged, and perhaps ſpoiled the harmony by a croud of diſſonances, we are conſtrained to follow other rules. M. Campion conceives, it ſhould be that which we call the rule of the octave; and it is by that method that the major part of the preſent maſters ſhew the Accompaniments.

The concords are determined by the rule of the octave, relatively to the rank which the notes of the baſs take up in any given tone. Thus, the tone being known, the note of the baſs continues the rank of that note in the tone, the rank of the note that immediately precedes it, and the rank of that which follows it; and the player will not be much miſtaken in accompanying by the rule of octave, if the compoſer has followed the moſt natural and ſimple harmony; but this is what we muſt not ſcarce expect in the modern muſic: beſides, how can we have all theſe things preſent? And, notwithſtanding that the accompanier is well acquainted with them, what muſt become of his fingers? He is ſcarce got at one concord but another preſents itſelf; the inſtant of reflection is preciſely that of execution; ſo that there is nothing but a conſummate habitude of muſic, a reflected experience, and a facility of reading a line of muſic at firſt ſight that can help him; and yet, even with this aſſiſtance, the moſt ſkilful muſicians are often guilty of blunders.

Suppoſe, that, before we attempt Accompaniment, we have waited till the ear is formed, till we know how to read muſic faſt, and that we are able to unravel a diviſion upon opening the book; yet we ſhall ſtill be at a loſs, becauſe we ſtill want a habit of fingering, founded upon other principles of Accompaniment than thoſe hitherto laid down by M. Rameau.

The moſt zealous maſters have been perfectly ſenſible of the inſufficiency of their principles; and, in order to remedy them, they have had recourſe to enumeration, and the knowledge of conſonances, whoſe diſſonances are prepared and preſerved. This is a prodigious detail, as is ſufficiently apparent by the multitude of diſſonances.

There are ſome who adviſe us to learn compoſition before we attempt Accompaniment, as if Accompaniment was not compoſition itſelf, excluſive of the talent to which we ought to join the practice of the other. And, on the contrary, how many people are there that would have us begin by Accompaniment to learn compoſition?

The movement of the baſs, the rule of the octave, the manner of preparing and keeping diſſonances, and compoſition in general, occur only to point out the ſucceſſion of one concord to another; ſo that at each concord there is a new object and a freſh ſubject for reflection. What labour is here for the mind? When will it be ſufficiently inſtructed, and the ear ſo thoroughly exerciſed, that the fingers may be no longer ſtopped?

It is to M. Rameau (who, by his invention of new ſigns, and the perfection of fingering, has ſhewn us the means of facilitating Accompaniment) that we are indebted for a new method, which ſecures us from the inconveniences of all the others that we have hitherto followed; and it is he who was the firſt that brought us acquainted with the fundamental baſs, and diſcovered the true foundations of an art in which every thing had appeared arbitrary.

We ſhall, in a few words, lay before the reader the principles upon which his method is founded.

In harmony there are only conſonances and diſſonances; ſo that there are no more than conſonant and diſſonant concords. Each of theſe concords is fundamentally divided by thirds (this is M. Rameau's ſyſtem). The conſonant is compoſed of theſe notes, as *ut*, *mi*, *ſol*; and the diſſonant of four, as *ſol*, *ſi*, *re*, *fa*.

Whatever diſtinction or diſtribution may be made of the conſonant concord, there always muſt be in it three notes, *ut*, *mi*, *ſol*; whatever diſtribution is made of the diſſonant concord, we ſhall always find in it four notes, *ſol*, *ſi*, *re*, *fa*, ſetting aſide the ſuppoſition and ſuſpenſion, which others of them introduce in the harmony, as it were, *per licentiam*. Either the conſonant concords ſucceed each other, or the diſſonant concords are followed by other diſſonants, or the conſonants and diſſonants are intermingled.

The perfect conſonant concord agrees only with the tonic, the ſucceſſion of concords furniſh ſo many tonics, and conſequently the alterations of ſound.

The diſſonant concords commonly ſucceed each other in the ſame tone. The diſſonance connects the harmonic ſenſe. A concord makes us wiſh for another, and gives us to underſtand that the phraſe is not finiſhed. If the tone changes in that ſucceſſion, the alteration is always declared by a dieſis or by a *b* flat. As to the third ſucceſſion, to wit, the intermingling of conſonant and diſſonant concords, M. Rameau deduces that ſucceſſion to two caſes, and aſſerts, in general, that a conſonant concord cannot be preceded by any other diſſonant than that of the ſeventh predominant, or that of the ſixth fifth of the ſubpredominant, excepting in a broken cadence and ſuſpenſions; and he further pretends, that there are no exceptions as to the ground. It appears to us, that the perfect concord may ſtill be preceded by a concord of the ſeventh diminiſhed, and even by that of the ſixth ſuperfluous; two original concords, the latter whereof never defeats itſelf.

Here then are three different temperatures of harmonic phraſes; of tonics that ſucceed themſelves and occaſion a change of tone; of conſonances and diſſonances which intermingle with each other, and where the conſonance is, according to M. Rameau, neceſſarily preceded by the ſeventh of the predominant, or the ſixth fifth of the ſubpredominant; what then remains to be done for the facility of Accompaniment, if it is not to indicate to the accompanier, that it is that of thoſe temperatures which reigns in that which he accompanies? This is what M. Rameau would have executed by characters: one ſingle ſign might eaſily indicate the tone, tonic, and its concord.

From thence we gather the knowledge of the dieſis and of the *b* flats, which ought to enter into the ſeries of the concords of one tonic into another.

The fundamental ſucceſſion, either by fifths or thirds, as well in aſcending as in deſcending, gives the firſt temperature of harmonic phraſes intirely compoſed of conſonant concords.

The fundamental ſucceſſion by thirds or fifths, in deſcending, gives the ſecond temperature, compoſed of diſſonant concords, to wit, of concords of the ſeventh, and that ſucceſſion gives the deſcending harmony.

The principal harmony is furniſhed by a ſucceſſion of fifths in aſcending, or fourths in deſcending, accompanied by the diſſonance proper to that ſucceſſion, which is the ſixth added; and this is the third temperature of harmonic phraſes, which has not hitherto been obſerved by any one; though M. Rameau has found the principle and origin of it in the irregular cadence. Thus by the ordinary rules harmony, which ſprings from a ſucceſſion of diſſonances, always deſcends, though, according to its true principles, and to reaſon, it ought to have in aſcending a progreſſion intirely as irregular as in deſcending.

The fundamental cadences give the fourth temperature of harmonic phraſes, where the conſonances and diſſonances intermingle together.

All theſe temperatures may be denoted by ſingle, clear, and few characters, which will at the ſame time indicate when the diſſonance in general is neceſſary; for its place is always determined by the temperature itſelf.

We begin by exerciſing ourſelves upon theſe temperatures taken ſeparately, ſince we make them ſucceed each other upon each tone and upon each mode ſucceſſively. With theſe precautions M. Rameau aſſerts, that we may make a greater progreſs in Accompaniments in ſix months, than before in ſix years, as he himſelf found by experience. *Diderot's Encycl.*

ACCOMPANIMENTS, in painting, are thoſe objects which are added either by way of ornament or probability; it is natural to ſee guns, dogs, game, &c. in an hunting-piece; but it is not neceſſary, for the ſake of probability, to put all ſorts of them in; when we do introduce them, they are the Accompaniments which always greatly ornament a picture. We ſay of a picture that repreſents ſportſmen, this piece ſhould have ſome Accompaniment, as guns, games, &c. We ſay fine Accompaniments; that thing accompanies that part, group, &c. very well.

ACCOUNT, or ACCOMPT, (*Dict.*)—Is uſed collectively for the ſeveral books which merchants, traders, and bankers, keep, and in which they enter all their buſineſs, traffic, and bargains with each other. Hence they ſay, to make out an Account, to paſs Accounts, &c.

To open an Account, is to enter it for the firſt time into the ledger. This is done by writing in large characters the chriſtian name, ſirname, and place of abode of the perſon with whom an Account is thus opened: Afterwards the articles are poſted to it, either on the debit or credit ſide, as affairs occur.

When an Account is opened in the ledger for any one, his name muſt be entered at the ſame time in the alphabet, and the folio of the book ſet down, where the Account is entered, for the more eaſily referring to it.

Merchants, who keep open Accounts with each other, ſometimes agree to honour the bills of exchange, which they draw reciprocally.

To poſt a ſum to Account, is to enter into the ledger, either on the debit or credit ſide, the articles for which perſons become either debtors or creditors.

Order of an Account, is its diviſion into three heads, of receipt, expence, and defalcation; that is, the deduction of ſuch ſums as are taken into the Account, and not received or admitted. The French call it repriſe.

To examine an Account, is to read it exactly, to point the articles of it, and prove the computation, in order to know if there be no errors, and whether the balance be right. I have examined your Account, it is right, there is nothing to except againſt it.

To ſettle an Account, is to caſt up, and calculating every article of it, and balancing the ſame. In the like ſenſe are uſed the words to ſhut, to balance, to cloſe, to make up an Account. Accounts are balanced upon the ledger on two occaſions; the one, when traders ſettle or adjuſt affairs with ſome debtor or creditor, in order to know what they owe, or what is due to them: The other, when it is neceſſary, to carry over Accounts to ſome new folio's in the ſame book, or into another, in order to continue them, for want of room in the former.

Prudent merchants ought to ſettle their Accounts at the end of every year, in order to open new ones in the beginning of the next.

To place to Account, is to give one credit for a ſum received, either of him, or for him. It ſignifies alſo to make him debtor for a ſum paid to him, or for him. Thus, in a bill of exchange, the drawer puts ſometimes theſe words after the ſum, Which you will place to my Account, or to the Account of, &c.

Balance of an ACCOUNT, is the ſum in which the debt exceeds the credit, or the credit the debt, when the Account is duly examined and ſettled, and the balance taken. I owe you 300 l. for the balance of our Account. There is ſo much due to me for the balance of our Account.

ACCOUNT *in bank*, is a fund which merchants, traders, bankers, and other private perſons, if they think fit, depoſit into the common caſh of ſome bank, to be employed in the payment of bills of exchange, promiſſary notes, bonds, debts contracted, either in trade or otherwiſe, as by buying eſtates in land, &c.

Account *in company*, is a ſpecies of Account between two merchants, or traders, in conſequence of a kind of aſſociation, or partnerſhip between them.

Account *of ſales*, is an Account given by one merchant to another, or by one factor to his principal, of the diſpoſal, charges, commiſſion, and net proceeds of certain merchandizes ſent for the proper, or company Account of him, who conſigned the ſame to ſuch factor or vender. When the like Account is inland or domeſtic, the ſame is tranſmitted in the current money of that country, wherein the buſineſs is tranſacted. As from a Blackwell-hall factor to the clothiers in the country, or from the warehouſe-men in town, who deal by commiſſion for the country manufacturers, as baiz-factors, drugget and duroy-factors, and the like.

The following is the natural form of a Blackwell-hall factor's Account of ſales to a clothier.

Account of ſales, charges, and net proceeds (or produce) C | D | of 20 pieces of ſuperfine cloth, received per A B's 1 a 20. waggon of — —, conſigned to me by C. D. of Wiltſhire, for his Account, marked and numbered as per margin.

	l.	*s.*	*d.*
January 5th, 1754. Sold to E. F. draper, 6 pieces of ſuperfines, per A B, quantity — yards at — per yard, to pay in 6 months.			
January 12th, 1754. Sold to G. H. 14 pieces, ditto, quantity — yards, at — per yard, to pay in 6 months.			
Charges.			
Paid carriage to London —— ——			
Porterage and warehouſe room ——			
Poſtage of letters —— ——			
Commiſſion at — per cloth —— ——			
Deduct charges from the ſales.			

The net proceed is paſt the credit of your Account, without my prejudice.

London, February 10th, 1750. E. E. N. O.

An example of a foreign Account of ſales.

Account of ſales, and net proceeds of 2 bales of druggets, received per the Hollandia, Cap. Jan. Roeloff Smith, for the Account of M. P. of London.

November 4th, 1750. Conſigned the above two bales of druggets, quantity 112 pieces, quantity 4875 yards, as per factory (i. e. invoice which is frequently ſtiled ſo) which, at 3¾ palms per yard, are palms 18280 net, at ſols 9 s. 4 d. per palm, to pay in two months —— —	8530	13	4
Sold and conſigned 2 pieces of white druggets for wrappers as above, for	140	00	0
	8670	13	4
Charges, viz.			
Freight and primage —— ——	106	5	0
Porters landing and carrying to warehouſe	6	0	0
Opening to viſit, aſſorting and making up	4	0	0
Warehouſe room —— ——	8	0	0
Brokerage 2½ per cent —— ——	43	7	0
To commiſſion, and ſtanding to bad debts at 4 per cent.	346	16	4
	514	8	4
	8156	5	0
Aggio deducted at 118⅔ per cent	1283	0	2
Genoa, November 30, 1750. E. E. * Bco.	6873	4	10

* *E. E.* ſignifies errors excepted in the Account rendered, and *Bco.* ſignifies the bank money of Genoa. *Poſtlethwayt.*

ACENTE'TUM, a name given by the ancients to the fineſt ſort of rock cryſtal.

A'CER, in botany, the maple. See MAPLE.

ACE'RRA, in antiquity, and particularly among the Romans, was a ſort of altar erected near the bed of a dead perſon, and upon which the parents and friends of the deceaſed continually burnt incenſe till the inſtant of the funeral.

Acerra, more properly, ſignifies a little pot which held the incenſe and perfumes for ſacrifices, ſuch as are now made in the form of a ſmall boat, and are uſed in the church of Rome at this day. The rich, ſays Horace, offered boxes full of the fineſt perfumes to the deities:

Et plena ſupplex veneratur Acerra:

And the poor, according to Lucian, were excuſed for making a bow, and throwing ſome incenſe into the fire that burnt upon the altars. They were alſo placed, according to Feſtus, before dead bodies, and were quadrangular, like the greater arks or cheſts called κιβωτοὶ.

ACERSECO'MES, a name of Apollo; it ſignifies long-haired, becauſe they commonly repreſented this God with a head of hair like that of a young man.

ACE'STIDES, in foundery, a name given by the ancients to the chimnies of their furnaces, wherein braſs was made. They diminiſhed or narrowed from the bottom to the top, in order that the fumes of the metal when in fuſion might be collected therein, and that the cadmia might be formed there in great quantities.

ACETA'BULUM, in natural hiſtory. The Acetabulum has been formerly claſſed among the marine plants, but is now known to belong to the animal kingdom, and to be produced by ſea inſects: This production, by its ſubſtance, which is ſtony, does not appear to be analogous to plants, and is much leſs ſo when we conſider the figure. It is a ſmall baſon, formed in the ſhape of a cone reverſed, which, at its point, adheres to a very thin, longiſh pedicle: There are ſeveral of theſe pedicles, which ſeem to come out of a ſtone, ſhell, or ſome other hard body, to which they are faſtened. This appearance, together with other circumſtances, had introduced a miſtake in regard to the nature of the Acetabulum, as well as of many other pretended ſea plants, which was currently received till Mr. Peyſſonel diſcovered that they were animal productions. *Diderot's Encyclop.*

ACETO'SA, in botany, ſorrel. See the article SORREL.

ACE'TOUS, or Acetose, ſomething relating to vinegar: We ſay an Acetous taſte, Acetous qualities, &c. wine, and all other vinous liquors, are rendered Acetous, by exciting their ſalts, and tempering or abating their ſulphurs. Chemiſts give the preparation of divers aceta or Acetous liquors.

ACHA'NE, ἀχάνη, in antiquity, an ancient Perſian corn meaſure, containing forty-five Attic medimni. *Arbuthn. Diſſertat.* p. 104.

ACHA'TES. See AGAT.

ACHE'LAA, the name of one of the harpies: her ſiſters were called Alope and Ocypete.

ACHI'LEA, a name given by the ancient phyſicians to that ſpecies of gum called at preſent *ſanguis draconis*, or dragon's blood.

A'CHIA, a kind of cane, preſerved or pickled in vinegar with pepper, ſpices, and other ingredients: It is about the ſame length and conſiſtence with our girkins, of a yellow colour and fibrous texture. The Dutch import it from the Eaſt-Indies in earthern jars.

ACHI'LLEID, or Achilleis, in polite literature, a celebrated poem of Statius, in which that author propoſed to deliver the whole life and exploits of Achilles; but, being prevented by death, he has only treated of what concerns the infancy and education of his hero, and that hiſtory has remained imperfect. We call it a hiſtory, though we are not ignorant, that ſome celebrated authors have called it an epic poem; and that Julius Scaliger has even given Statius the preference to all the Greek and Roman heroic poets. But it is at preſent generally agreed, that Statius has treated his ſubject rather as an hiſtorian than as a poet, without attaching himſelf to that which makes the eſſence and conſtitution of a true epic poem; and that, as to diction and verſification, in endeavouring to raiſe himſelf, and appear great, he has fallen into bombaſt.

An epic poem is not the hiſtory of the whole life of a hero.

ACHIO'TTE, a red drug imported from America, generally called anatta. See ANATTA.

A'CHITH, in natural hiſtory and botany, a ſort of wine that grows in the iſland of Madagaſcar, and yields a fruit, which is called voachit, about the ſize of a green grape, and ripens in December, January, and February.

ACHO'ROU, is a ſpecies of laurel which grows in America, and is called Indian wood. This Indian wood grows to a large ſize, is hard, red, and uſed in works where ſolidity is required; its leaves and fruit are aromatic; the decoction of its leaves is taken in diſorders of the nerves, and in dropſies. Its fruit, which is in ſhape of a grape, and whoſe berries are rather oval than round, is of a deep violet colour, covered with a pellicule, which is thin and full of juice. It incloſes purple-coloured ſeeds, ſhaped like a kidney; the fleſh of thoſe birds who eat theſe ſeeds, is purple-coloured, and of a very bitter taſte.

ACHTE'LING, a liquid meaſure made uſe of in Germany; thirty-two Achtelings make an heemer, and four ſchiltens make an Achteling.

ACHTENDEE'LEN, or Achteling, a corn meaſure uſed in ſome parts of Holland; two hoeds of Gurmiheug make five Achtendeelens; twenty-eight Achtendeelens of Aſpeſen make thirty-two of Rotterdam, but there muſt be but twenty-ſix of thoſe of Worcum; twenty-nine Achtendeelens of Delft make twelve viertels of Antwerp; four Achtendeelens $\frac{24}{35}$ of Delft make the hoed of Bruges.

A'CIDS, *(Dict.)*— Acids are, with great reaſon, looked upon by phyſicians, as one of the general cauſes of diſeaſes, and they undoubtedly occaſion ſeveral accidents, according to the part which they affect, while they are contained in the ſtomach.

mach. They cauſe ſour belchings, ſenſations of hunger, and painful prickings, which bring on the cardialgia, or heart-burn: When they get into the inteſtines, they, in the duodenum, diminiſh the action of the bile, and in others produce ſpaſmi, and the iliac paſſion; by cloſing up the lacteal veſſels they give birth to chronical diarrhœas, which often terminate in dyſenteries; when they mingle with the blood, they alter its quality, and produce a thickening in it, to which the lymph that ſhould ſupply matter for the ſecretions likewiſe finds itſelf ſubject; from thence ariſe obſtructions in the glands of the meſentery, a diſeaſe common to young children, the fibres, of which their parts are compoſed, being as yet too ſoft to blunt the points of the Acids which they meet in moſt parts of the aliments that they take. Sedentary perſons and ſtudents are often attacked with diſeaſes, of which the Acid acrimony is productive; diſſipation and exerciſe are very neceſſary to prevent thoſe diſorders, by promoting and augmenting perſpiration. The green ſickneſs to which girls are ſubject, either before the menſes have appeared, or on their being by any accident ſtopped, are likewiſe owing to an Acid acrimony; and this occaſions that depraved appetite which they have for coals, chalk, the plaiſter of walls, and other things of that ſort; all which are abſorbent, and reſiſt the Acids.

We attain the end in deſtroying the Acids, and ſtopping the ravages which they make, when we are ſo happy as to find their exiſtence in the ſtomach, by partly evacuating them by the help of emetics, which muſt be followed by the uſe of abſorbents, and aperitive and martial remedies, which are very proper to give a ſpring to the ſolids, and fluidity to the liquids: In ſhort, by making uſe of thoſe remedies that, readily fermenting with the Acids, form ſalts of a particular nature, and which have a ſtimulating and diaphoretic virtue, and are capable of reſolving obſtructions.

All theſe remedies muſt be adminiſtered with great caution, and we muſt always have a regard to the ſtrength, age, conſtitution, and ſex of the patient. *James's Med. Dict.*

ACI'DULATED, in pharmacy, ſignifies in general whatever has an acid juice mixed with it, in order to render certain refreſhing liquors of an agreeable taſte; as limonade, gooſberry water, verjuice, juice of barberries, and the tincture of roſes, in which they put ſome drops of ſpirit of vitriol, juſt to give them an agreeable acidity.

Mineral ſpirits, dulcified with ſpirit of wine, muſt here find a place, ſuch as ſpirit of vitriol, ſulphur, nitre, and ſea ſalt. This name is ſuitable to cold water; and ſome phyſicians have given them that appellation, to diſtinguiſh them from Bath waters, which are hot.

ACME'LLA, in botany, a plant which comes from the iſland of Ceylone, where it is very common. P. Hotton, profeſſor of botany at Leyden, gives this account of it. The flowers of this plant grow on the extremities of the ſtalks, and are compoſed of a great many tubulous yellow floſculi, which by their union form a head ſuſtained by a perianthium of ſix leaves; when theſe floſculi fall off, the ſeeds appear, which are of a dark grey, long and ſmooth, except that at the top, immediately under the floſculi, they are furniſhed with a double beard, which make them forked; the ſtalk is ſquare, and cloathed with leaves that grow by pairs like thoſe of the lamium or dead-nettle, but longer and more pointed.

The great reputation it has obtained in diſſolving and curing the ſtone has rendered it famous. In the year 1690, a Dutch officer affirmed to the Dutch Eaſt-India company, that he had cured upwards of a hundred perſons of the ſtone and nephritic complaints, only by the uſe of this plant, and this teſtimony was confirmed by that of the governor of Ceylon. In 1699, the firſt ſurgeon of the hoſpital in the city Columbo wrote the ſame things of the Acmella to P. Hotton; that ſurgeon, in his letter, diſtinguiſhed three ſorts of Acmella, differing from each other, particularly in the colour of the leaves, and he recommends that ſort with a black ſeed and large leaves, as the beſt; the leaves are gathered before the flowers appear; they are dried in the ſun, and taken in powder, in tea, or ſome other convenient vehicle. A ſpirit is alſo prepared by diſtillation from the root, ſtalks, and branches, infuſed in ſpirits of wine; they likewiſe uſe the flowers, the extract of the root, and the ſalt of this plant, in pleuriſies, cholics, and fevers.

As a plant of ſo great an importance and uſe cannot be too well known, we ſhall, to the preceding deſcription, add that of Breynius; that author ſays, the root is fibrous and white, its ſtalk ſquare, and about a foot in height, dividing itſelf into ſeveral branches; that its leaves are long, pointed, rough, and a little dented, and that its flowers grow at the extremity of its branches.

The ſame author adds, that the tincture of Acmella made with ſpirits of wine, or in ſome antinephritic decoction, may be taken twice or three times in a day to facilitate the voiding of gravel and ſtones.

We cannot too much excite the naturaliſts to ſearch into the properties of this plant: What happineſs might there redound to mankind, if upon a ſtrict examination thoſe virtues which are attributed to it, ſhould be diſcovered: And what man would better merit immortality, than he who ſhould undertake the taſk? Perhaps indeed he might be obliged to make a voyage to Ceylon.

Animal ſubſtances acquire ſingular qualities by the uſe which animals make of certain aliments, rather than of others; and why may it not be the ſame with vegetable ſubſtances? If this induction be reaſonable, it follows, that any given plant, gathered on one ſide of a mountain, will have a virtue that is not to be found in a plant of the ſame ſort, gathered on the other ſide; that ſuch a plant had formerly a property, which it has not at preſent, and perhaps will never regain; that fruits, vegetables, and animals, are in perpetual viciſſitude, in reſpect of their qualities, forms, and elements; that our anceſtors, who lived four thouſand years ago, did not, or rather that our poſterity ten thouſand years hence will not, perhaps, know thoſe fruits which we now have, by comparing them with the moſt exact deſcriptions, which we have made of them; and, conſequently, that we ought to be extreamly reſerved in the judgments we paſs on thoſe paſſages, wherein the ancient hiſtorians and naturaliſts treat of form, virtues, and other qualities, which are in a perpetual motion of alteration.

It may indeed be ſaid, if ſalubrious aliments degenerate into poiſons, on what muſt animals live? There are two anſwers to this objection; firſt, that, the form and conſtitutions of animals altering in the ſame proportion, and by the ſame ſenſible degrees, the one is always ſuitable to the other. Secondly, that, if a ſubſtance happen to degenerate with too great rapidity, animals will abandon the uſe of it. We are told, that the malum Perſicum, or peach, was firſt brought to us from Perſia as a poiſon; however, it is in our climate an excellent fruit, and a very wholſome food.

A'CORN, in natural hiſtory and agriculture, the fruit produced by trees of the oak kind. For the method of planting acorns, &c. ſee the article OAK.

A'CRIMONY, in the humours, is a malignant quality, which they contract by a great number of cauſes, as too much agitation, &c. This quality conſiſts in looſening the ſalts, and ſome tendency to alkalization, in conſequence of the extream diſſipation of the aqueous vehicle that envelops them; from whence we plainly ſee, how hurtful long abſtinence muſt be to the generality of conſtitutions.

A'CTION, is a term ſometimes made uſe of in mechanics, to denote the effort which one body or power makes againſt another body or power, and ſometimes the effect itſelf of that effort.

It is in order to conform ourſelves to the common language of mechanics, and natural philoſophers, that we give this double definition: For if we are aſked, what we ought to underſtand by Action, by attaching to that term clear ideas only, we anſwer, that it is a motion that a body really produces, or tends to produce, in another, that is to ſay, ſuch a motion as it would have produced if nothing had hindered it. See MOTION in the dictionary.

In effect, all power is no more than a body which is actually in motion, or which tends to move itſelf, that is to ſay, a body which would move itſelf, if nothing hindered it. Whence it follows, that, in a body which actually moves, or that tends to move, we clearly ſee the motion only which it has, or that it would have, if it had no obſtacle. The Action therefore of body manifeſts itſelf to us by its motion only, and, therefore, we muſt not fix any other idea of the word Action, than that of an actual motion, or a ſimple tendency; and it is only confounding that idea to join thereto that of I know not what metaphyſical being, which we imagine reſides in the body, and of which no one can have a clear diſtinct notion; it is to the ſame miſtake that we are indebted for the famous queſtion of living forces, which, according to all appearances, had never been a ſubject of diſpute, if we had thoroughly obſerved, that the only preciſe and diſtinct notion that one can give to the word force, reduces it to its effect, that is, to the motion it produces or tends to produce.

Action, in the military art, is an engagement between two armies, or between different bodies of troops belonging thereto. The word is likewiſe uſed to ſignify ſome memorable act done by an officer or commander of a body of troops.

Action, in law, is a judiciary demand, founded upon a title or law, whereby the plaintiff ſummons the defendent to ſatisfy him for that to which he is obliged, in virtue of the one or the other, and, for defect whereof, he requires that he ſhould be condemned by the judge.

Actions are divided, by Juſtinian, into two general kinds; real, or thoſe againſt the thing, and perſonal, or thoſe againſt the perſon; for whoever brings an Action, either does it againſt one obnoxious to him, in reſpect either of contract or of offence; in which caſe ariſe Actions againſt the perſon, which require to do or give ſomething; or he does it againſt one not obnoxious, yet with whom a controverſy is riſen, touching ſome matter; as if Caius holds a field, which Julius claims as his property, and brings his Action for the ſame. See the Inſtitut. l. 4. tit. 4. where the principal Actions introduced by the Roman law are ſummarily explained.

There is alſo a third kind of Action, which ariſes out of the two former claſſes of real and perſonal Actions, and which is called a mixed Action.

Real Action, is that whereby the plaintiff ſues for the right which he has to lands, tenements, rents, or other payments; and of this there are two ſorts, either the poſſeſſion or demand. An Action is merely real when it ſingly attacks the thing, and the detainer is clear upon giving it up; but, if he is perſonally obliged to the reſtitution of fruits or intereſts, in that caſe it is mixed.

Perſonal Action, is that which one man has againſt another, in conſequence of a contract, whereby he is obliged to pay or do ſomething, or by reaſon of an offence done by him, or by ſome other perſon for whoſe fact he is anſwerable. In the firſt caſe the Action is civil, and in the other it is or may be criminal.

Mixed Action, is that which is either laid againſt the perſon of the detainer of the thing, or for the thing detained, being thus called, becauſe it hath a mixed reſpect, both to the thing and to the perſon.

They generally reckon three ſorts of mixed Actions, the Action of partition between coheirs, of diviſion between aſſociates, and limitations between neighbours.

Actions, are alſo divided into civil, penal, or criminal: The civil Action, is that which tends only to the recovery of that which belongs to a man, by virtue of a contract, or of ſome ſome ſuch-like cauſe; as if any one ſhould endeavour to recover, by way of Action, a ſum of money which he has lent.

Penal or *criminal* Action, tends to the puniſhment of the party accuſed or proſecuted, either corporally or pecuniarily.

French Actions, in commerce. There are at preſent three ſorts of them, to wit, ſimple Actions, rentiere Actions, and intereſted Actions.

The ſimple Actions, are thoſe which have a ſhare in all the profits of the company; and are likewiſe liable to bear all loſſes, having no other ſecurity than the funds of the company.

The rentiere Actions, are thoſe which are intitled to a ſure profit of two per cent. for which the king is ſurety, as he was for the rents upon the city.

The intereſted Actions hold, if I may ſay ſo, the middle place between the other two: They have two per cent. fixed income with the king's warrantry, in the ſame manner as the rentiere Actions; and, beſides which, they are alſo to ſhare the overplus of the dividend with the ſimple Actions. Theſe laſt Actions have been created in favour of eccleſiaſtical communities. *Savary's Dict. Com.*

A'CULER, in the menage, is uſed for the motion of a horſe, when in working upon volts he does not go far enough forward, at every motion, ſo that his ſhoulders take in too little ground, and his croupe comes too near the center of the volt.

ADA'MICA *Terra*, in natural hiſtory. The bottom of the ſea is covered with a ſalt, glutinous, fat, and mucilaginous mud, like a jelly, as is eaſily diſcovered after the tide is out. This mud makes thoſe places it has abandoned ſo ſlippery, that it is difficult to walk upon them; it appears to be a ſettlement of all the moſt ſlimy and unctuous parts contained in the waters of the ſea, which is continually precipitating themſelves in the ſame manner as the ſediment which freſh water inſenſibly throws down to the bottom of thoſe veſſels wherein it is contained, from a kind of ſlime or ſilt, which is called Adamica terra. It is conjectured, that, beſides the great quantity of fiſh and plants which continually die and periſh in the ſea, the air ſtill contributes ſomething to the augmentation of that mud we are ſpeaking of, for it is obſerved that the Adamic earth is found in greater quantities in ſuch veſſels as are only covered with a cloth, than in thoſe which have been hermetically ſealed. Memoirs of the Royal Academy of Sciences, for the year 1700, page 29.

A'DAR, in ancient hiſtory and theology, the twelfth month of the holy year of the Hebrews, and the ſixteenth of their civil year. It conſiſts but of 29 days, and anſwers to our February; ſometimes it enters into the month of March, according as the moon's courſe falls out.

As the lunar year, which the Jews followed in their calculations, is ſhorter than the ſolar year by eleven days, which, at the end of three years, makes one month, they then intercalate a thirteenth month, which they call Veadar, or the ſecond Adar, which has twenty-nine days.

A'DDER, in natural hiſtory, a venomous reptile of the ſerpent kind, generally called a viper. See VIPER in the dictionary.

A'DDER'*s Tongue*, in botany. See OPHIOGLOSSUM.

ADDI'TIONS, in diſtillation, a general name for whatever is added to the waſh in the time of fermentation, in order to increaſe the vinoſity of the ſpirit, procure a larger quantity, or give it a particular flavour.

Theſe Additions may be included under the four heads of ſalts, acids, aromatics, and oils. A little finely powdered tartar, nitre, or common ſalt, may be thrown into the fermenting liquor, at the beginning of the operation: or in their ſtead a little of the vegetable, or fine mineral acids, may be dropt in, at different times, where they are found neceſſary: As particularly in the caſe of treacle, honey, and other ſweet and rich vegetable juices, which either want a natural acid, have been robbed of it, or hold it but in a ſmall proportion. To this end may be uſed juice of lemon, oranges, &c. ſpt. ſal. Glaub. ol. ſulphur. per campan. &c. But the moſt effectual thing for the purpoſe is a particular aqueous ſolution of tartar; a ſuccedaneum for which may be tamarinds, or the robs of ſome very acid fruits; or, better ſtill, the media ſubſtantia vini. On which foundation ſtands the ingenious practice of conſtantly uſing a ſuitable proportion of the ſtill-bottoms, or remaining waſh, in the ſubſequent brewing. The Additions are manifeſtly deſigned to give a vinous acidity, or improve that naturally afforded by the ſubject, without any expectation of conſiderably increaſing the quantity of the ſpirit; which is the more immediate uſe and deſign of aromatics and oils; at the ſame time that they give, alter, or improve a flavour.

All the pungent aromatics have a ſurprizing property of increaſing the quantity of ſpirit; but their uſe requires a cloſe or compreſſed fermentation; and, if the quantity intended be large, that the Addition be not made all at once, leſt the oilineſs of the ingredients ſhould hinder the operation. But, if flavour be the only thing required from them, theſe Additions ſhould be delayed till towards the end of the fermentation. After the ſame manner a very conſiderable quantity of any eſſential vegetable oil may, by the proper encheireſis, be converted into a ſurpriſingly large quantity of inflammable ſpirit; but great care muſt here again be had not to drop it in too faſt, or too much at a time; which might eaſily damp the fermentation; and is one of the known ways of checking, or totally ſtopping this operation at any point of time required. The beſt method of introducing the oil, ſo as to avoid all inconvenience, is to bring it into an elæoſaccharum; which will readily enter the body of the liquor, and directly ferment along with it. In the like prudent manner of proceeding, a large proportion of brandies, or highly rectified ſpirit of wine, may be introduced into any fermenting liquor. *Shaw's Diſtil.*

A'DDITIVE *Equations*, in aſtronomy, are thoſe which are to be added to the ſun's mean anomaly, in order to diſcover the true anomaly.

ADENO'GRAPHY, in anatomy, a deſcription of the glands. This word is compounded of the Greek ἀδὴν, a gland, and γράφω, to deſcribe.

We have a book wrote by Wharton, intituled Adenography, printed in 12°. at London, in 1650, and another work under the ſame title wrote by Nucke printed in octavo at Leyden, in 1691 and 1722.

ADHE'SION, in philoſophy.—The Adheſion of leaden balls is ſo very conſiderable, that with two (not weighing above a pound each, nor touching upon more than $\frac{1}{30}$ of a ſquare inch ſurface) I have lifted above 150 pounds weight. In order to this, the ſurfaces by which they touch, muſt be finely planed with the edge of a ſharp penknife, and equally preſſed together with a conſiderable force, with a gentle turn of the hand at the ſame time; and thus two common leaden bullets will adhere ſo firmly together, as to require upwards of 50 pounds, to ſeparate them.

In poliſhed ſurfaces that are very hard, as glaſs, braſs, &c. It is impoſſible to bring them into ſuch cloſe contact as to cohere without the interpoſition of water, or ſomething humid to fill the pores by expelling the air contained therein, which prevents the planes coming together while dry; the humidity in this caſe proves a cement which holds the planes together by all its force of attraction on either ſide.

This force of attraction between the braſs planes is greater with oil than with water; and greater with any ſort of greaſe or fat that will harden with cold, than with oil. I never yet could meet with two men ſtrong enough to ſeparate planes thus put together, which are but four inches and a half diameter; and, therefore, they cohere with a force much ſuperior to the force or preſſure of air on ſuch a ſurface, which contains about 14 ſquare inches, and, allowing 15 pounds for preſſure to every inch, it will amount to but 210 pounds, which is not near equal to the ſtrength of two men pulling againſt each other to the beſt advantage.

Profeſſor Muſchenbroeck has made many experiments to ſhew the force of coheſion between planes of various ſubſtances, and about 2 inches diameter, well poliſhed, having firſt heated them in boiling water, and then beſmeared them firſt with a cold tallow-candle, and afterwards with boiling greaſe, and the weights to ſeparate them were as in the following table:

	cold greaſe	hot greaſe
Planes of glaſs ——	130 lb.	300 lb.
of braſs ——	150	800
of copper ——	200	850
of marble ——	225	600
of ſilver ——	150	250
of iron ——	300	950

Theſe planes adhere by other ſorts of matter with forces, as in the table below, where the weights neceſſary to ſeparate them are ſpecified:

With water	12 ounces.
With oil	18 ounces.
With Venice turpentine	24 ounces.
With roſin	850 pounds.
With tallow candle	800 pounds.
With pitch	1400 pounds.

Though theſe experiments would not always give the ſame numbers, yet they ſufficiently ſhew the vaſt attractive forces, and the very great difference between them.

After this he gives us an account of his experiments made, to find the force with which bodies cohere naturally, or what is the abſolute force of coheſion in various bodies, which he eſtimates by the weights required to pull them aſunder, drawing according to their length; this he tried firſt in wood, and afterwards in metal. His pieces of wood were of a long ſquare form, of which each ſide was $\frac{26}{100}$ of an inch, and by weights ſuſpended they were drawn aſunder, according to the ſeveral ſorts, as mentioned below:

Wood of linden-tree	1000 lb.
of alder	1000
of fir	600
of oak	1150
of elm	950
of beech	1250
of aſh	1250

The trial he made with metals, was of weights ſuſpended to wires of each ſort, whoſe diameter was $\frac{1}{10}$ of a Rhindland inch; or, becauſe the Rhindland foot is to ours as 139 to 135, the wire was $\frac{135}{1390}$ part of an inch Engliſh.

The metals and weights were as follow:

Of copper	299$\frac{1}{4}$ lb.
Of yellow braſs	360
Of gold	500
Of ſilver	370
Of iron	450
Of tin	40$\frac{1}{4}$
Of lead	29$\frac{1}{4}$

Theſe experiments ſhew the abſolute force of coheſion in bodies. That which he calls the relative force, is that by which any body reſiſts the force of any other body, acting upon it in a direction perpendicular to its length; and this he eſtimated in the ſame pieces of wood as before, by putting one end into a ſquare hole of a metal plate, and hanging weights towards the other end ſufficient to break each piece of wood at the hole. Theſe weights and diſtances from the hole were in his experiments as follow:

	diſtances.	weights.
Fir	9 inches	40 ounces.
Oak	8$\frac{1}{2}$	48
Elm	9	44
Pine	9$\frac{1}{2}$	36$\frac{1}{2}$
Alder	9$\frac{1}{4}$	48
Beech	7	56$\frac{1}{2}$

Such as would ſee more on this ſubject, may conſult the author's admirable *Eſſai de Phyſique*; and his treatiſe of the coheſion of bodies, altogether on the ſubject.

ADIA'NTUM. See the article MAIDENHAIR in the dictionary.

A'DMIRAL, a name given a very beautiful ſhell of the voluta kind. (See *Plate* III. *fig.* 1.) The enamel which covers it is very bright and elegant, and variegated with bands of yellow, repreſenting, in ſome meaſure, the flags of a ſhip of war; whence it obtained its name. Its diſtinguiſhing character is a fine denticulated line, running along the center of the large yellow band.

There are four ſpecies of theſe ſhells. 1. The grand admiral. 2. The vice admiral. 3. The orange admiral, and 4. The extra admiral. But the firſt is by far the moſt valuable.

ADRA'STIA, in antiquity, an epithet given to the goddeſs Nemeſis, or revenge; becauſe king Adraſtus firſt erected a temple to that Deity.

ÆGAGRO'PILA, or ÆGAGROPILUS, in natural hiſtory; ſee the article *German* BEZOAR, in the dictionary.

A'EM, or AM, a liquid meaſure uſed in moſt parts of Germany, and contains generally 20 vetals, or 80 maſſes. At Heidelberg it is 12 vertels, and the vertel 4 maſſes, which reduces the Aem to 48 maſſes: and in Wirtemberg the Aem is 16 yunes, and the yune 10 maſſes, which makes the Aem amount to 160 maſſes.

AERO'GRAPHY *, a deſcription of the air or atmoſphere, its properties, limits, dimenſions, &c.

* The word is compounded of the Greek ἀὴρ, air, and γράφω, to deſcribe.

AFFECTA'TION, in language and converſation, is a very common fault in thoſe who paſs under the denomination of fine ſpeakers. It conſiſts in uſing far fetched terms and hard words, thoſe too, ſometimes ridiculouſly choſen, in ſpeaking of trivial or common ſubjects: for this reaſon fine ſpeakers are ſo intolerable to men of genius, who are more ambitious of thinking than ſpeaking well, or rather becauſe men of genius are of opinion, that in order to ſpeak well it is ſufficient to think well; that a thought, which is new, ſtrong, juſt, and clear, carries its own expreſſion along with it; and that a common thought ſhould never be dreſſed above itſelf, that is to ſay, higher than in common language.

AFFECTATION, in ſtyle, is nearly the ſame thing as Affectation in language, but with this difference, that what we write muſt naturally be more correct, than what we ſpeak, becauſe we are ſuppoſed to think more accurately on what we write; whence it follows, that thoſe who are ſometimes affected in their converſation, are not always ſo in their writing.

AFFE'CTION, in a phyſiological ſenſe, may be taken in general for the impreſſion that internal or external Beings make on the ſoul. But Affection is taken more commonly for that lively ſenſe of approbation or diſlike, which objects, whatever they are, create in us; thus we ſay of a picture, which repreſents things offenſive in nature to the ſenſes, that we are ſhocked, or diſagreeably affected at it. We ſay of an heroic action, or rather of its recital, we are delightfully affected by it.

Such is our frame and the conſtruction of our bodies, that, when the ſoul is in a diſpoſition to conceive love or hatred, pleaſure or averſion, there ariſe in the body certain muſcular motions, on which, in all probability, the intenſeneſs or relaxation of theſe conceptions depends. Joy is attended with a great dilatation of the heart, the pulſe beats high, the heart palpitates in a very ſenſible degree, the tranſpiration is ſo extraordinary as often to have been followed by ſwoonings, and ſometimes even death itſelf. Anger either ſuſpends or increaſes all the motions in the body, eſpecially the circulation of the blood, which makes the body hot, red, trembling, &c. Now it is evident, theſe ſymptoms are more or leſs violent, according to the diſpoſition of the parts and the mechaniſm of the body. The mechaniſm of the body is rarely ſuch, that it can ſuſpend the free action of the ſoul by the force of its impreſſions. But, that this has ſometimes happened, there is no room to doubt; it is in the mechaniſm of the body we muſt ſeek the cauſe why different men are ſo differently affected by the ſame object. In this we reſemble muſical inſtruments which have ſtrings of a different extenſion. External objects perform on us the office of bows on theſe ſtrings, and we all give ſounds more or leſs ſharp. Our conſtitutions, our education, our principles, our ſyſtems, our prejudices, all modify our Affections, and the motions of the body, which are the conſequences of them. An Affection may be ſo inſtantaneous and ſo ſtrong, that what cauſes the Affection may ſeem to produce effects which make free agency a queſtion. But it is evident by what has been ſaid above, that the firſt motion is more or leſs durable, according to the difference of conſtitutions and in infinite number of other circumſtances. Let us therefore be very cautious how we judge of thoſe actions that proceed from violent paſſions. It is better in theſe caſes to be favourable than ſevere in our ſentence; to ſuppoſe that the weakneſs rather than the wickedneſs of men may have carried them beyond themſelves: we pity weakneſs, abhor wickedneſs; and ſurely pity is more ſuitable to the human character than hatred.

A'GATE, ſee ACHATES in the Dictionary.

Agate and jaſper ſtones are eaſily tinged, but ſuch of theſe ſtones as are naturally ſmooth, are for the ſame reaſon compoſed of ſo many heterogeneous parts, that the colour will not ſtrike uniformly, ſo that we can only make ſpots, to compleat the regularity of thoſe we find in them; but not entirely change their colour, as we can in the white Agate called the chalcedony. If you put a ſolution of ſilver in ſpirit of nitre, on a piece of the white Agate, or chalcedony, and expoſe it to the ſun, you will find it tinged at the end of ſome hours, of a brown colour, approaching to red; and, if ſome freſh ſolution be applied, it will pierce deeper ſtill, and the tincture will entirely penetrate the ſtone. If the Agate exceeds not the thickneſs of two twelfth parts of an inch, and the tincture be applied on both ſides, it does not act uniformly. There are in this ſort of Agate, and the generality of other hard ſtones, veins, which, tho' almoſt imperceptible, are more eaſily penetrated by the tincture than by the other parts, become more deeply tinged, and form a very agreeable variety. If you add to the ſolution above one fourth of it's weight, or thereabouts, of ſoot and red tartar mixed together, the colour will be brown of a grey caſt. Inſtead of ſoot and tartar if you apply the ſame quantity of allum, the colour will be a deep violet, approaching to black. A ſolution of gold only gives the Agate a light brown, which penetrates very little; of tin, a colour that in a direct light looks of a darkiſh white, but brown in a ſide-light. Other ſolutions of metals and minerals applied in the ſame manner have no effect.

To ſucceed in this operation, it is neceſſary to expoſe the Agate to the ſun. Monſieur Du Fay tried ſome under a muffle, but the colour ſtruck very weak and imperfectly. He has frequently obſerved even that thoſe expoſed to the ſun have taken leſs colour in the courſe of the whole firſt day, than in half an hour of the ſecond, without adding any freſh ſolution, which made him ſuſpect that a humidity of air is requiſite to make the metalline particles penetrate. In ſhort, he made Agate take their tinge very readily, by carrying them into a damp place, as ſoon as the ſun had dried the ſolution, and then expoſing them to the ſun again.

To trace figures of ſome regularity on the chalcedony, or white Agate, the beſt way is to take the ſolution of ſilver on a feather or little cleft ſtick, and trace the contour or outlines with a pin; if the Agate be unpoliſhed, the ſtroke is never very fine, becauſe the ſolution ſoon ſpreads itſelf; but, if it be well charged with ſilver, and the Agate immediately expoſed to the ſun, there is no great riſk of too much diffuſion, and the ſtrokes will be neat enough; they will not, however, be ſo fine as thoſe drawn by a pencil, and, conſequently, inferior to thoſe little trees which we ſee ſo delicately formed in the dentrite.

Suppoſing, however, we could find a method of imitating them, there are two ways of diſtinguiſhing the natural from the artificial; firſt, if you heat the Agate coloured by art, it loſes a great quantity of its colour, which it will not recover without a freſh application of ſolution of ſilver. The ſecond, which is, indeed, the eaſieſt and moſt ſimple way, is to put a little aqua fortis, or ſpirit of nitre, on coloured Agate, keep it from the ſun, and, in one night's time, it will take the tinge entirely out: after the experiment is made, the colour may be reſtored by expoſing the Agate ſeveral days following in the ſun; but we muſt not depend much on this, as you will ſee in the ſequel.

It is very well known, we can change the colour of moſt precious ſtones by fire; thus you may make ſapphires and amethiſts white: put theſe ſtones into a crucible, ſurround them with ſand, or ſteel filings, and they loſe their colour in proportion as they receive heat; they are ſometimes taken out perfectly white. If you heat the common chalcedony in the ſame manner, it becomes a darkiſh white; if you make ſpots in it with a ſolution of ſilver, they turn into a yellow citron, on which aqua fortis effects no mutation. Solution of ſilver put on the chalcedony, blanched in this manner, and ſet in the ſun ſeveral days following, makes brown ſpots in it.

Solution of ſilver gives the oriental Agate a deeper black than the common chalcedony. To the Agate interſperſed with yellow ſpots it gives a purple. See Mem. of the Acad. 1728, by M. Du Fay. I have obſerved before, ſpeaking of the method to diſcover whether the colour of Agate be natural or artificial, we ſhould not truſt too much to aqua fortis. In ſhort, M. De la Condamine put two natural dendrites into aqua fortis three or four days, and they ſuffered no mutation; the ſame dendrites, on which the experiment had been made, being accidentally left in a window fourteen or fifteen days, in a wet ſeaſon, a little rain caſually got into the aqua fortis, by which means the branches and lines in the dendrites were totally effaced; the ſame thing happened to another, at leaſt, as much of it as had been dipped in the aqua fortis.

AGRICULTURE (*Dict.*)—To cultivate lands to advantage, we muſt be previouſly acquainted with the nature of the ſoil; this requiring one culture, that another; this is better adapted to one kind of grain, that to another. Under the articles LAND and SOIL the reader will find what generally relates to this ſubject; and, under the names of the different ſpecies of corn and plants, their proper ſoil and culture: we ſhall here only conſider Agriculture or tillage in general. This conſiſts in dividing the ground by the ſpade, plough, hoe, or other inſtruments, which divide by a ſort of attrition, or contuſion, as dung does by fermentation. See DUNG.

Every time the earth is broken by any ſort of tillage, or diviſion, there muſt ariſe ſome new ſuperficies of the broken parts which never has been open before: for, when the parts of earth are once united and incorporated together, it is morally impoſſible that they, or any of them, ſhould be broken again, only in the ſame places; for, to do that, ſuch parts muſt have again the ſame numerical figures and dimenſions they had before ſuch breaking, which, even by an infinite diviſion, could never be likely to happen; as the letters of a diſtich, cut out and mixed, if they ſhould be thrown up never ſo often, would never be likely to fall into the ſame order and poſition with one another, ſo as to recompoſe the ſame diſtich.

Although the internal ſuperficies may have been drained by a preceding crop, and the next plowing may move many of the before-divided parts, without new breaking them, yet ſuch as are new broken, have, at ſuch places where they are ſo broken, a new ſuperficies, which never was, or did exiſt before; becauſe we cannot reaſonably ſuppoſe, that any of thoſe parts can have in all places (if in any places) the ſame figure and dimenſions twice.

For, as matter is diviſible ad infinitum, the places or lines whereat it is ſo diviſible muſt be, in relation to number, infinite, that is to ſay, without number; and muſt have at every diviſion ſuperficies of parts of infinite variety in figure and dimenſions.

And, becauſe it is morally impoſſible the ſame figure and dimenſions ſhould happen twice to any one part, we need not wonder how the earth, every time of tilling, ſhould afford a new internal ſuperficies (or artificial paſture;) and that the tilled ſoil has in it an inexhauſtible fund, which, by a ſufficient diviſion (being capable of an infinite one) may be produced.

Tillage, as well as dung, is beneficial to all ſorts of land. Light land, being naturally hollow, has larger pores, which are the cauſe of its lightneſs: this, when it is by any means ſufficiently divided, the parts being brought nearer together, becomes, for a time, bulk for bulk, heavier, i. e. the ſame quantity will be contained in leſs room, and ſo is made to partake of the nature and benefits of ſtrong land, viz. to keep out too much heat and cold, and the like.

But ſtrong land, being naturally leſs porous, is made, for a time, lighter, as well as richer, by a good diviſion; the ſeparation of its parts makes it more porous, and cauſes it to take up more room than it does in its natural ſtate; and then it partakes of all the benefits of lighter land.

When ſtrong land is plowed, and not ſufficiently, ſo that the parts remain groſs, it is ſaid to be rough, and it has not the benefit of tillage, becauſe moſt of the artificial pores, or interſtices, are too large; and then it partakes of the inconveniences of the hollow land untilled.

For, when the light land is plowed but once, that is not ſufficient to diminiſh its natural hollowneſs, or pores; and, for want of more tillage, the parts into which it is divided by that once (or perhaps twice) plowing, remain too large; and conſequently the artificial pores are large alſo; and, in that reſpect, are like the ill-tilled ſtrong land.

Light land, having naturally leſs internal ſuperficies, ſeems to require more tillage or dung to enrich it; as when the poor, hollow, thin downs have their upper part (which is the beſt) burnt, whereby all, except a caput mortuum, is carried away; yet the ſalts of this, ſpread upon that barren part of the ſtaple which is unburnt, divide it into ſo very minute particles, that their paſture will nouriſh two or three good crops of corn: but then the plough, even with a conſiderable quantity of dung, is never able afterwards to make a diviſion equal to what thoſe ſalts have done; and therefore ſuch burnt land remains barren.

Artificial pores cannot be too ſmall, becauſe roots may the more eaſily enter the ſoil that has them; quite contrary to natural pores; for theſe may be, and generally are, too ſmall, and too hard for the entrance of all weak roots, and for the free entrance of ſtrong roots.

Inſufficient tillage leaves ſtrong land with its natural pores too ſmall, and its artificial ones too large. It leaves light land with its natural and artificial pores both too large.

Pores that are too ſmall, in hard ground, will not eaſily permit roots to enter them.

Pores that are too large, in any ſort of land, can be of little other uſe to roots, than only to give them paſſage to other cavities more proper for them; and, if in any place they lie open to the air, they are dried up and ſpoiled before they reach them.

For fibrous roots (which alone maintain the plant, the other roots ſerving to receive the chyle from them, and convey it to the ſtem) can take in no nouriſhment from any cavity, unleſs they come into contact with, and preſs againſt, all the ſuperficies of that cavity which includes them; for it diſpenſes the food to their lacteals by ſuch preſſure only: but a fibrous root is not ſo preſſed by the ſuperficies of a cavity whoſe diameter is greater than that of the root.

The ſurfaces of great clods form declivities on every ſide of them, and large cavities, which are as ſinks to convey, what rain and dew bring, too quickly downwards below the plowed part.

The firſt and ſecond plowings with common plows ſcarce deſerve the name of tillage; they rather ſerve to prepare the land for tillage.

The third, fourth, and every ſubſequent plowing, may be of more benefit, and leſs expence, than any of the preceding ones.

But the laſt plowings will be moſt advantageouſly performed by way of hoeing. See HOEING.

For, the finer land it is made by tillage, the richer will it become, and the more plants it will maintain.

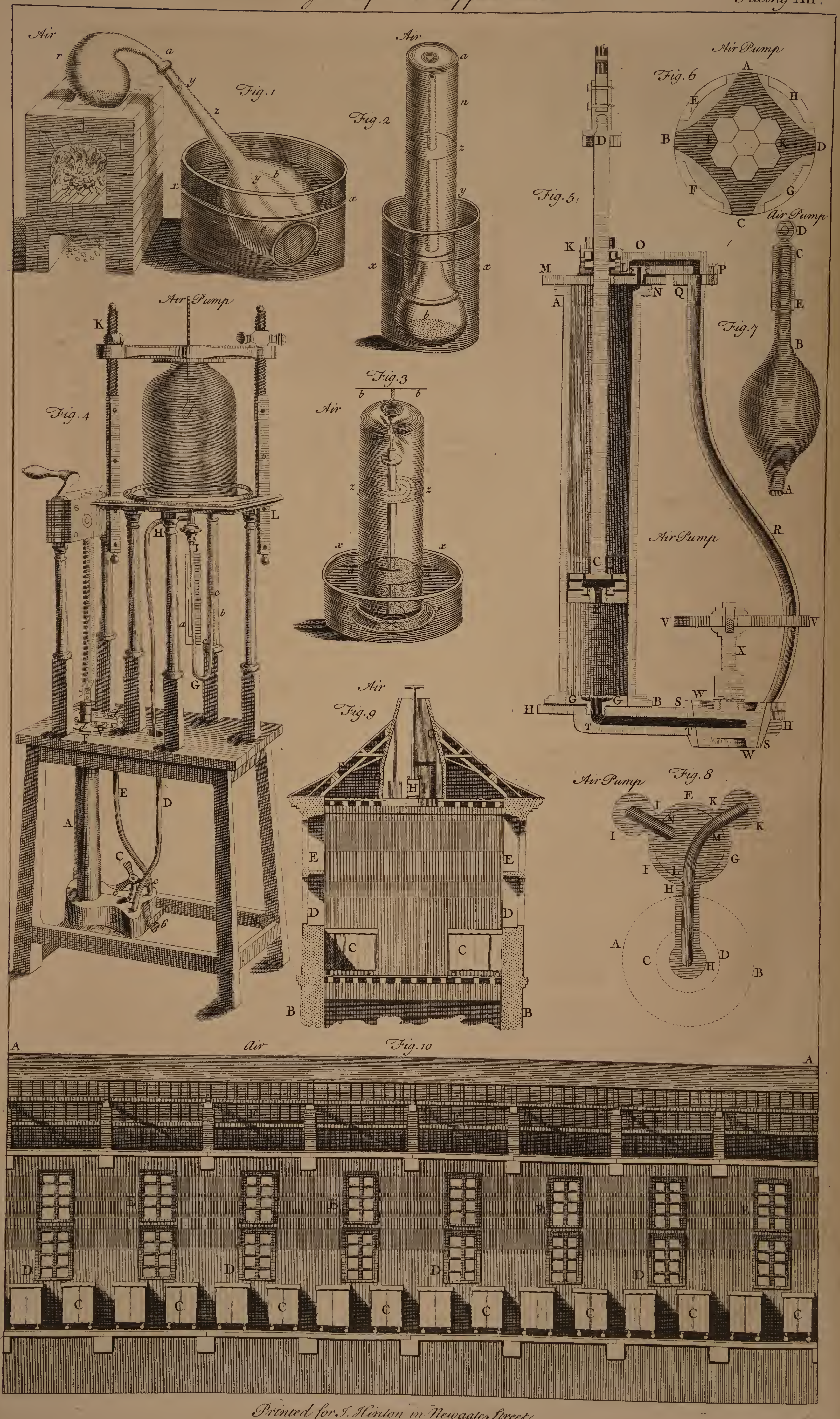
It has been often obſerved, that when part of a field has been better tilled than the reſt, and the whole ground conſtantly managed alike afterwards for ſix or ſeven years ſucceſſively; this part that was but once better tilled, always produced a better crop than the reſt, and the difference remained very viſible every harveſt.

One part being once made finer, the dews more enriched it; for they penetrate in and beyond the ſuperficies, whereto the roots are able to enter: the fine parts of the earth are impregnated, throughout their whole ſubſtance, with ſome of the riches carried in by the dews, and there repoſited; until, by new tillage, the inſides of thoſe fine parts become ſuperficies; and, as the corn drains them, they are again ſupplied as before; but the rough large parts cannot have that benefit; the dews not penetrating to their centers, they remain poorer.

I think nothing can be ſaid more ſtrongly to confirm the truth of this, than what is related by the authors quoted by Mr. Evelyn, to this effect, viz.

‘ Take of the moſt barren earth you can find, pulverize ‘ it well, and expoſe it abroad for a year, inceſſantly agitated; it will become ſo fertile as to receive an exotic plant ‘ from

PLATE I. *Engraved for the Supplement.* *Facing* Air.



Printed for J. Hinton in Newgate Street.

" from the fartheſt Indies to cauſe all vegetables to proſper in " the moſt exalted degree, and to bear their fruit as kindly " with us as in their natural climates."

This artificial duſt, he ſays, will entertain plants which refuſe other violent applications; and that it has a more nutritive power than any artificial dung or compoſt whatſoever: and further that, by this toil of puverizing, " it is found, " that ſoil may be ſo ſtrangely altered from its former nature, as " to render the harſh and moſt uncivil clay obſequious to the " huſbandman, and to bring forth roots and plants, which " otherwiſe require the lighteſt and holloweſt mould."

It is to be ſuppoſed, that the Indian plants had their due degree of heat and moiſture given them; and I ſhould not chuſe to beſtow this toil upon the pooreſt of earth in a field or garden, though that is the moſt proper wherein to make the experiment.

I never myſelf tried this way of pounding or grinding, becauſe impracticable in the fields.

But I have had the experience of a multitude of inſtances, which confirm it ſo far, that I am in no doubt, that any ſoil, be it rich or poor, can ever be made too fine by tillage.

For it is beyond diſpute, that one cubical foot of this minute powder may have more internal ſuperficies, than a thouſand cubical feet of the ſame, or any other earth tilled in the common manner; and, I believe, no two arable earths in the world exceed one another in their natural richneſs twenty times; that is, one cubical foot of the richeſt is not able to produce an equal quantity of vegetables, cæteris paribus, to twenty cubical feet of the pooreſt; therefore it is not ſtrange, that the pooreſt, when by pulverizing it has obtained one hundred times the internal ſuperficies of the rich untilled land, ſhould exceed it in fertility; or, if a foot of the pooreſt was made to have twenty times the ſuperficies of a foot of ſuch rich land, the pooreſt might produce an equal quantityof vegetables with the rich. Beſides, there is another extraordinary advantage, when a ſoil has a larger internal ſuperficies in a very little compaſs; for then the roots of plants in it are better ſupplied with nouriſhment, being nearer to them on all ſides within their reach, than it can be when the ſoil is leſs fine as in common tillage; and the roots in the one muſt extend much farther than in the other, to reach an equal quantity of nouriſhment; they muſt range and fill perhaps above 20 times more ſpace to collect theſame quantity of food. But, in this fine ſoil, the moſt weak and tender roots have free paſſage, to the utmoſt of their extent, and have alſo an eaſy, due, and equal preſſure every-where, as in water.

Hard ground makes a too great reſiſtance, as Air makes a too little reſiſtance, to the ſuperficies of roots.

Farmers, juſt when they have brought their land into a condition fit to be further tilled to much greater advantage, leave off, ſuppoſing the ſoil to be fine enough, when, with the help of harrows, they can cover the ſeed; and afterwards with a roller they break the clods, in order, that, if the crop ſucceed, they may be able to mow it, without being hindered by thoſe clods: by what I could ever find, this inſtrument, called a roller, is ſeldom beneficial to good huſbandry, it rather untils the land, and anticipates the ſubſiding of the gound, which in ſtrong land happens too ſoon of itſelf.

But more to blame are they, who neglect to give their land due plowing, truſting to the harrow to make it fine; and, when they have thrown in their ſeed, go over it twenty times with the harrows, till the horſes have trodden it almoſt as hard as a highway, which in moiſt weather ſpoils the crop; but, on the contrary, the very horſes, when the earth is moiſt, ought all to tread in the furrows only, as in plowing with a hoe-plough they always do, when they uſe it inſtead of a common plough. *Tull's Horſe-hoeing Huſbandry.*

AGROSTOGRA'PHIA *, in phyſiology, the hiſtory or decription of gramens, or plants of the graſſy kind.

* The word is formed from the Greek, ἄγρωστις, graſs, and γράφω, to deſcribe.

AIR, *(Dict.)*—— Air is a principal cauſe of the vegetation of plants, an inſtance of which we have from Mr. Ray, in the Philoſophical Tranſactions, of lettice-ſeed, that was ſown in the glaſs receiver of the Air-pump, which was exhauſted and cleared from all Air, which grew not at all in eight days time; whereas ſome of the ſame ſeed that was ſown at the ſame time in the open Air, was riſen to the height of an inch and an half in that time; but, the Air being let into the exhauſted receiver, the ſeed grew up to the height of two or three inches in the ſpace of one week.

Another inſtance of the uſefulneſs of the Air in vegetation, is the ſedum, which will puſh out roots without earth and water, and live for ſeveral months: and ſome ſort of aloes, if hung up in a room entirely ſecured from froſts, will remain freſh for ſome years, though they will ſenſibly loſe in their weight.

Air is capable of penetrating the porous and ſpongy parts of plants, and being there contracted, and dilating itſelf again.

The Air operates alſo within the bowels of the earth, and, by its ſubtilty perſpiring thro' the pores, aſſiſts in the rarefaction of the crudities of the earth, and in the diſpelling all ſuperfluous moiſture entering into the very pores and veins of the trees, plants, herbs, &c. carrying along with it thoſe ſalts contained either in itſelf, or lodged in the earth; which ſalts or juices are altered according to the ſeveral figures or dimenſions of the different ſtrainers or veſſels of thoſe ſeveral plants which grow upon the ſame ſpot of earth, which is ſo impregnated with theſe ſalts: and thence thoſe varieties in taſte and ſmell proceed, notwithſtanding they all receive their nouriſhment from the ſame ſtock that is lodged in the earth.

The Air alſo affects the branches, leaves, and flowers of trees, plants, and herbs, entering and perſpiring through them, and even thro' the bark and body of trees; and by the ſame kind of ſubtilty it does, by its refreſhing breezes, moderate the intenſeneſs of the ſun-beams, cooling, chearing, blowing, opening, and extending all the offspring of nature. The Air fixes and inſinuates its aereal ſubſtance into the liquid ſap of vegetables: and, as all the agitations in nature proceed from the contrariety of parts inhabiting together, in this aereal and liquid ſubſtances, being mixed, cauſe the agitation and motion in vegetables, or, more properly, ſet it all into a ferment, whether it be in the roots, or in the ſtem; and it riſes by co-operation of the ſun, which is the third agent in vegetation, up to the top of a tree, &c. as liquids riſe by fire to the top of the containing veſſel.

The Air, we find, produces a vibratory motion in ſeveral bodies; and, particularly in plants, the Air-veſſels thereof perform the office of lungs: for the Air contained in them, ſometimes contracting, and ſometimes expanding, according as the heat is increaſed or diminiſhed, preſſes the veſſels, and eaſes them again by turns; and thus promotes a circulation of their juices, which could ſcarce be otherwiſe effected.

Air, ſays the learned Dr. Hales, is a fine elaſtic fluid, with particles of very different natures floating in it, whereby it is admirably, fitted by the great author of nature, to be the breath or life of vegetables, as well as animals, without which they can no more live nor thrive than animals can. As a proof of the great quantities of Air in vegetables, he refers to the third chapter of his excellent treatiſe of vegetable ſtatics, where, he ſays, in the experiments on vines, the great quantity of air was viſible, which was continually aſcending through the ſap in the tubes; which manifeſtly ſhews what plenty of it is taken in by vegetables, and is perſpired off with the ſap through the leaves.

He adds ſeveral experiments, as to an apple-branch, apricot-branch, birch, and other plants, to prove the ſame thing.

And Dr. Grew has obſerved, that the pores are ſo large in the trunks of ſome plants, as in the better ſort of thick walking-canes, that they are viſible to a good eye without a glaſs; but, with a glaſs, the cane ſeems as if ſtuck at top full of holes with great pins, ſo large as very well to reſemble the pores of the ſkin in the ends of the fingers, and ball of the hand.

In the leaves of pines, they likewiſe, through a glaſs, make a very elegant ſhew, ſtanding almoſt exactly in rank and file thro' the length of the leaves. Whence it may be thought probable, that the Air freely enters plants, not only with the principal fund of nouriſhment by the roots, but alſo through the ſurface of their trunks and leaves, eſpecially at night, when they are changed from a perſpiring to a ſtrongly imbibing ſtate.

Dr. Hales likewiſe tells us, that, in all thoſe experiments that he tried to this purpoſe, he found that the Air entered very ſlowly at the bark of young ſhoots and branches, but much more freely through old bark; and that in different kinds of trees it had different degrees of more or leſs free entrance.

And likewiſe, that there is ſome Air both in an elaſtic and unelaſtic ſtate, mixed with the earth (which may well enter the roots with the nouriſhment) he found by ſeveral experiments, which he gives in the above-mentioned treatiſe.

The excellent Mr. Boyle, in making many experiments on the Air, among other diſcoveries found, that a good quantity of Air was produceable from vegetables, by putting grapes, plums, gooſeberries, peaſe, and ſeveral other ſorts of fruits and grain, into exhauſted and unexhauſted receivers, where they continued for ſeveral days emitting great quantities of Air.

This put the curious Dr. Hales upon further reſearches to find out what proportion of Air he could obtain out of the vegetables in which it was lodged and incorporated; this he performed by divers chymico-ſtatical experiments, which he gives in many inſtances, in his treatiſe of the analyſis of the Air, plainly ſhewing in what manner he performed them.

One of which was by diſtillation; another by fermentation. That by diſtillation is as follows: The matter to be diſtilled is put into the retort r (*plate* I. *fig.* 1.) and then at a is cemented very faſt the glaſs veſſel $a b$, which was very capacious at b, and had an aperture cd, or hole at the bottom. The bolt-head $a b$ being immerſed in water, with one leg of an inverted ſyphon put up as far as z, the water would riſe in the bolt-head, and drive out the Air through the ſyphon, which being taken out, the water will remain in the veſſel to the part z; at the ſame time, while the bolt-head is under water, it is placed in the veſſel $x x$, which, with the bolt-head and retort, is carried to the chymical furnace, where the retort has the heat and fire gradually communicated to it, and the bolt-head $a b$ and veſſel $x x$ well ſkreened from the heat of the fire.

As the matter diſtilled, all except the Air, would go down into the water of the bolt-head and veſſel; the Air that was generated or deſtroyed by the proceſs, would be ſhewn by cauſing the ſurface of the water in the bolt-head to ſtand below or above the point *z*, as at *y*, when all was ſet aſide till it became quite cold. Thus, if the body diſtilling generates Air of an elaſtic quality, that added to the former will not permit the water *y* to riſe ſo high as *z*, and the ſpace between *z* and *y* below will ſhew how much Air was produced from its fixed ſtate.

But if, when all is cold, the ſurface of the water *y* be ſeen above the point *z*, it then ſhews that the diſtilled body did deſtroy, that is, imbibe or abſorb, a part of the natural air above *z*; and the ſpace between *z* and *y*, filled with water, will ſhew what quantity was changed from a repellent elaſtic to a fixed ſtate, by the ſtrong attraction of the abſorbing particles of the diſtilled body. This quantity of generated or abſorbed Air it is eaſy to meaſure in cubic inches, by ſtopping the end of the bolt-head with a cork, and then from a quantity of water of a known weight to fill it firſt to *z*, and afterwards to *y*; and the difference of weight in the two bulks of water gives the number of cubic inches, from a table of ſpecific gravities.

The other method which the doctor made uſe of for eſtimating the ſurprizing effects of fermentation, from various mixtures of ſolid and fluid ſubſtances, in generating and abſorbing Air, was as follows: He put the ingredients into the bolt-head *b*, (*fig.* 2.) and then run the long neck thereof into a tall cylindric glaſs *ay*, and inclining both almoſt horizontally, in a large veſſel of water, the water ran into the veſſel *ay*, and, driving out part of the Air, would poſſeſs its place upon turning them up, and placing both in a veſſel of water *xx*, as you ſee in the figure, where the ſurface of the water ſtands in the inverted glaſs *a y* at the point *z*.

If the ingredients generated Air, then the water would fall from *z* to *y*, and the empty ſpace *zy* was equal to the quantity of generated Air; but, if on fermentation they abſorbed or fixed the active particles of Air, then the ſurface of the water would aſcend from *z* to *n*; and the cylinder *zn* would be the bulk of Air abſorbed, which is eaſily known in cubic inches.

When the ſubjects for trying theſe experiments were a burning candle, burning brimſtone, nitre, gun-powder fired, living animals, &c. the doctor uſed to make uſe of a pedeſtal, on the top of which was a plate, whereon he laid the matter to be fired; then inverting the tall cylindric glaſs over it, and drawing the water up to *zz* (*fig.* 3.) with an inverted ſyphon, he ſet fire to the matters lying on the plate, by means of a burning-glaſs, concentering the ſun's rays in its focus upon the ſame. See the figure.

But the beſt way is, inſtead of having the cylindric glaſs cloſe upon the top at *bb*, to have it open by a ſmall neck, on which a braſs cap is cemented with a female-ſcrew to receive a ſtop-cock, to take off the communication of the external Air, when occaſion requires. Thus the uſe and trouble of the ſyphon is ſuperſeded; and in caſe of noxious fumes, vapours, &c. from aquafortis, burning brimſtone, &c. a ſyringe ſcrewed on to the ſtop-cock will draw off the Air, and raiſe the water to what height you pleaſe, without the cumberſome uſe of a large pair of bellows, as the doctor made uſe of.

From half a cubic inch, or 135 grains of heart of oak, freſh cut from a growing tree, he found there were 108 cubic inches of Air generated, which is a quantity equal to 216 times the bulk of the piece of oak; that the weight of it was above 30 grains, one quarter part of the weight of 135 grains.

And he adds, that he took the like quantity of thin ſhavings from the ſame piece of oak, and dried them at ſome diſtance from a gentle fire, for 24 hours; in which time they evaporated 44 grains of moiſture; which 44 grains being deducted from 135 grains, there remain 91 grainsfor the ſolid part of the oak: then 30 grains will be one-third of the weight of the ſolid part of the oak.

He gives us another experiment of Indian wheat, which grew in his own garden: he took 388 grains of it, when it was not come to its full maturity, and there were generated from it 270 cubic inches of Air; the weight of which Air was 77 grains, viz. one-fourth of the whole weight of the wheat.

He alſo found, that a cubic inch, or 318 grains, of peaſe generated 396 cubic inches of Air, or 113 grains, i. e. ſomething more than one-third of the weight of the peaſe.

And again, that from one ounce, or 437 grains of muſtard-ſeed, 270 cubic inches of Air were generated, or 77 grains, which is more than one-ſixth part of the ounce weight. He likewiſe adds, that there is a great plenty of Air incorporated into the ſubſtance of vegetables, which, by the action of fermentation, is rouſed into an elaſtic ſtate, as is evident from theſe experiments following.

On the ſecond day of March, he poured 42 cubic inches of ale from the tun, which had been there ſet to ferment 34 hours before, into a bolt-head; and from that time, to the 9th of June, it generated 639 cubic inches of Air, with a very unequal progreſſion, more or leſs, as the weather was warm, cool, or cold; and ſometimes, upon a change from warm to cool, it reſorbed Air, in all 32 cubic inches.

From the 2d of March to the 16th of April, 12 cubic inches of Malaga raiſins, with 18 cubic inches of water, generated 411 cubic inches of Air; and then, again, it reſorbed 35 cubic inches in two or three cold days. From the 21ſt of April to the 16th of May, it generated 78 cubic inches; after which, the 9th of June, it continued in a reſorbing ſtate, ſo as to reſorb 13 cubic inches: that there were at that ſeaſon many hot days, with much thunder and lightning, which deſtroy the elaſticity of the Air: there were generated in all 489 cubic inches, of which 48 were abſorbed. The liquor was at laſt vapid.

On the 10th of Auguſt, 26 cubic inches of apples being maſhed, they generated 986 cubic inches of Air in 13 days time, which is a quantity equal to 48 times their bulk; after which they reſorbed a quantity equal to their bulk, in three or four days, notwithſtanding the weather was then very hot; after which time they were ſtationary for many days, neither generating nor abſorbing.

From the above-mentioned experiments on raiſins and ale, the ingenious author concludes, that wine and ale do not turn vapid in warm weather by imbibing the Air, but by fermenting and generating too much; by which means they are deprived of their enlivening principle, the Air: for which reaſon, theſe liquors are beſt preſerved in cool cellars, whereby this active invigorating principle is kept within due bounds; which when they exceed, wines are upon the fret, and are in danger of being ſpoiled. Upon theſe, and many other experiments, which the learned author has given in his aforeſaid treatiſe, he obſerves, that the Air which ariſes in ſo great quantities from fermenting and diſſolving vegetables, is true permanent Air; which is certain, by its continuing in the ſame expanded and elaſtic ſtate for many weeks and months; which expanded watery vapours will not do, but ſoon condenſe, when cold.

Upon the whole, he concludes, that Air abounds in vegetable ſubſtances, and bears a conſiderable part in them: and, if all the parts of matter were only endowed with a ſtrongly attracting power, all nature would then immediately become one unactive cohering lump.

Wherefore it was abſolutely neceſſary, in order to the actuating this vaſt maſs of attracting matter, that there ſhould be every-where mixed with it a due proportion of ſtrongly repelling elaſtic particles, which might enliven the whole maſs by the inceſſant action between them and the attracting particles.

And ſince theſe elaſtic particles are continually in great abundance reduced by the power of the ſtrong attracters, from an elaſtic to a fixed ſtate, it was therefore neceſſary, that theſe particles ſhould be endued with a property of reſuming their elaſtic ſtate, whenever they were diſengaged from that maſs in which they were fixed, that thereby this beautiful frame of things might be maintained in a continual round of the production and diſſolution of vegetable, as well as animal bodies.

The Air is very inſtrumental in the production and growth of vegetables, both by invigorating their ſeveral juices, while in an elaſtic active ſtate, and alſo by greatly contributing, in a fixed ſtate, to the union and firm connection of the ſeveral conſtituent parts of thoſe bodies, viz. their water, fire, ſalt, and earth.

To conclude, by reaſon of thoſe properties of the Air beforementioned, it is very ſerviceable to vegetables, in that it blows up and breaks open the clouds, thoſe treaſures of rain, which nouriſhes the vegetable tribe.

The Air alſo helps to waft or diſperſe thoſe foggy humid vapours which ariſe from the ſoil, and would otherwiſe ſtagnate, and poiſon the whole face of the earth.

The Air, by the aſſiſtance of the ſun, aſſumes and ſublimates thoſe vapours into the upper regions; and theſe foggy humid vapours are, by this ſublimation, and the coercive power of the Air and ſun, rarefied, and made again uſeful in vegetation.

And, on the contrary to the benign quality of the Air, which is ſo many ways ſubſervient to vegetables, it is alſo ſometimes, and upon ſome accounts, injurious and pernicious to them; not only to the ligneous, herbaceous, and flowery parts above, but alſo to the roots and fibres below: for, becauſe the Air penetrates into the earth, it is eaſy to be concluded, that a dry, huſky, ſcorching Air may be very prejudicial to the tender fibres of new-planted trees.

It may be likewiſe ſuppoſed, that all bodies of earth are more or leſs capable of imbibing the fluid air, and of attracting ſuch ſalts as either can give, or the earth is capable of receiving.

In chymiſtry, it is by no means indifferent whether the proceſs be made in the Air or out of it, whether in a confined or open Air. Thus camphire, burnt in a cloſe-ſtopped veſſel, goes all into ſalts; inſtead of which, during the proceſs, if you open the veſſel and approach it with a wax taper, it all diſſipates into ſmoke. In like manner, to make ſulphur inflammable, there muſt be an open Air. In a cloſe cucurbit you may ſublimate it even a thouſand times without its taking fire. If ſulphur be put under a bell glaſs with fire underneath it, a ſpirit of ſulphur will ariſe; but, if there be the leaſt crack in the glaſs, to permit a communication between the interior and exterior Air, the ſulphur will immediately take fire. An ounce of charcoal, incloſed in a well-luted crucible, will remain there without decay fourteen or fifteen days in the middle of a furnace with a ſtrong fire, though, in open Air, the thouſandth part of the fire would have reduced it into aſhes in a minute; Van Helmont even adds, that all this time the charcoal keeps its black colour, but, on the intromiſſion of a little Air, it immediately changes into white aſhes. The ſame thing may be ſaid of all animal and vegetable ſubſtances, which can only be calcined in open fire, but in ſtopped veſſels can only be reduced to black coals. The Air can effect infinite mutations in ſubſtances, not only with regard to its mechanical properties, as gravity, denſity, &c. but alſo on account of the heterogeneous parts which enter into all ſubſtances. As, for example, where there is a great many, the Air is impregnated with a biting vitriolic ſalt, which deſtroys every thing on the earth round about, and frequently appears on the ſurface of the ground in a kind of whitiſh effloreſcence.

At Fohlun, in Sweden, a town famous for its copper mines, which have procured it the name of Copperburgh, the mineral exhalations affect the Air ſo ſenſibly, that the ſilver and copper money people carry in their pockets, changes colour by the means of it; and M. Bayle was informed by a gentleman of property in thoſe parts, that from the veins of metals and minerals, frequent in that country, columns of a kind of ſmoke or ſteam frequently aroſe, ſome of which had a very bad ſcent, others none at all, and ſome an agreeable one. In Carniole and other places, where there are mines, the Air is at ſome ſeaſons very unhealthy: from whence proceed ſeveral epidemical diſtempers. We ſhall add, that, about the cape of Good-hope, the mines of arſenic, which are numerous in that neighbourhood, emit ſuch noxious vapours, that no animal can live, and they were therefore obliged to ſhut them up again, after having been opened ſome time.

Dr. Hales has lately contrived a machine for evacuating foul Air. We are not yet ſufficiently acquainted of what importance it is, that the Air we breathe ſhould be pure and free from all mixture of nauſeous and offenſive particles; but, if ſuch a quality of Air is ſo much to be deſired by every body, how much more eſſentially neceſſary is it for thoſe whom ſickneſs has made ſuſceptible of every external impreſſion, and thoſe who, pent up in a ſhip, during the courſe of a long voyage, are obliged to live between decks, and are forced to hard labour in different places of the lower part of the veſſel, which receive very little Air from without, and where it is always motionleſs, and as it were ſtagnated? What renders this ſtill more deplorable, is thoſe very places into which we would chuſe to have pure Air are in general filled with the contrary; the Air of hoſpital-rooms is almoſt always mixed with the vapours that continually exhale from the bodies of the ſick, their cloſe-ſtools, and the different remedies adminiſtered to them: the terrible ſickneſſes ſome people of the ſtrongeſt conſtitutions have been attacked with, on their entering into theſe places at firſt, are a proof paſt contradiction of the impurity of the Air and its effects. The ſame thing happens in ſhips, where the exhalations that ariſe from the proviſions, from the pores of the men and living creatures on board, produce effects nearly like to thoſe obſerved in hoſpitals.

In order to prevent the accidents, which Air mixed with theſe noxious vapours may occaſion more certainly, it will be right, firſt, to examine into the nature of theſe vapours. The leaſt attention will convince us, they are almoſt entirely volatile; we muſt conclude, therefore, they will always naturally riſe toward the ceiling of the rooms, and this motion upward muſt be increaſed by the motion of the Air, which aſcends in proportion to its rarefaction.

If this propoſition wanted proof, it is eaſy to demonſtrate it; only raiſe a ladder againſt the wall of a room in an hoſpital, and you will find, as you advance towards the ceiling, the ſmell, which you could ſupport below, grow continually more offenſive, and the Air hotter; this being admitted, it will be eaſy to let out the foul Air and introduce freſh, only by placing windows cloſe under the ceiling, and leaving the top ſquares always open; for the hot and putrified Air would continually go off, and a circulation of freſh Air be promoted every moment.

The ſame effect might be produced by erecting a cupola or dome at each extremity of a ward in an hoſpital; the Air would naturally be drawn to them, and paſs off by them; this has been practiſed at Lyons with ſo much ſucceſs, that you can ſcarce perceive any ſmell at all in the hoſpital, but, if you ſhould go up on the inſide of the cupola, the ſtench is inſupportable.

However certain the means we have mentioned, of renewing Air in hoſpitals, may appear to be and really are, they can only be uſed in new fabrics of this kind; to attempt it in the old, would be often impracticable, and always expenſive.

Monſieur Duhamel has found out a method of remeding this inconvenience; he, in the room at one end, makes a large fire-place, like one of your great kitchen chimnies; the opening of this ſtock is on a level with the cieling, and abuts above on a funnel, like thoſe of common chimnies; but three or four times as large, and this is ſufficient to procure a circulation of Air; one of this kind built in a ſtable entirely freed ſome neighbouring apartments from the ſmell of the dung, which before affected them: but to increaſe the draught of Air, and determine it in a more certain manner to take this courſe, put a ſtove within the chimney, the funnel of which muſt go out at its opening, and the mouth diſcharge itſelf in the garret; light a fire in it ſufficient to heat the Air contained within the chimney; the rarefied Air will aſcend in the funnel, and the draught conſequently become quicker. The hotter the weather, the more this adventitious help will be required, becauſe the difference between the ſuperior and inferior Air will become ſo much leſs; and the machine will introduce new Air in proportion as the fire is increaſed.

As we ſhall be obliged to increaſe the draught in ſummer, it will ſometimes perhaps be neceſſary to leſſen it in winter; it might pump too powerfully, and the room be chilled by it. For this, however, M. Duhamel has contrived a very eaſy remedy, that is, by putting a kind of cover either on the chimney or its funnel, which you may open or ſhut at pleaſure, and ſo increaſe or diminiſh the draught, as ſhall be found neceſſary.

But there is no danger of rendering the Air of the room too chilly, even by the briſkeſt draught, if we make funnels behind the ſtock or underneath the hearth, for through theſe a ſufficient quantity of Air will paſs to fill the ſpace that is diſſipated by the chimney; or it will be the ſame thing if the funnels are made near the ſtove in which a continual fire is kept, ſomething after the manner propoſed by M. Gauger in his treatiſe on mechanics by fire, for thus, in whatever quantity this Air enters, it will ſupply the place of the Air in the room, without chilling it.

But how are we to apply theſe means to the under decks of ſhips, in which we can neither build cupola nor chimney? M. Duhamel propoſes a very eaſy method, notwithſtanding the ſeeming difficulty of applying them to theſe purpoſes; with very little alteration in the machine, he places, under the hearth of the chimney in the cook-room, a great box of hollow iron, the top of this ſerves for the fire-place. This box has two funnels, one goes down toward the under decks, the other is carried directly up in the brick-work, and diſcharges itſelf above; the Air, being continually rarefied in the box, by the action of the fire becomes lighter and goes off through the aſcending funnel, which is continually ſupplied by that which the deſcending funnel draws from the under decks; by this contrivance a circulation of Air is obtained by a draught through the ſcuttles and other openings of the veſſel, and the Air which otherwiſe would have ſtagnated, is carried off through the aſcending funnel: thus we ſhall find ourſelves delivered from the accidents that might happen from corrupted Air, without expence, or any inconvenience to the veſſel.

Plate I. *fig.* 9, 10, repreſents two profiles of the ward of an hoſpital, the one A A, the length; the other B B, the breadth; C C, beds of the patients, D D, uſual poſition of the windows, E E, a better poſition, F F, timbers of the roof. In the ſecond profile, the correſponding places are marked by the ſame letters. G, G, the fire-place, on the floor of the garret, at one of the ends of the ward. H, a ſtove in the fire-place, the tube of which riſes above it, and is carried above the funnel. I, the place where the ſtove is to be faſtened to one of the ſides of the fire-place, for lighting the fire by an aperture at the other ſide of this wall.

Dr. Deſaguliers and Dr. Hales have invented two different machines for the ſame uſe, the former of which the reader will find under CENTRIFUGAL *Wheel*, and the latter under VENTILATOR.

AIR-*bladder*, a ſmall bladder or veſicula, found in the bodies of fiſhes. Its uſe is to enable them to either riſe or ſink in the water, or ſuſtain themſelves at any depth.

A bubble of Air, immerſed in a fluid, dilates itſelf in proportion as it approaches the ſurface; becauſe the weight or preſſure of the incumbent water thereon continually decreaſes; and from hence the diſcovery of the uſe of Air-bladders took its riſe. For the Air in the bladder is like the bubble, more or leſs compreſſed according to the depth the fiſh ſwims at, and takes up more or leſs ſpace; and, conſequently, the body of the fiſh, part of whoſe bulk this bladder is, is greater or leſs according to the ſeveral depths, though it retains the ſame weight. The rule of hydroſtatics is, that a body heavier than ſo much water, as is equal in quantity to the bulk of it, will ſink; a body lighter will ſwim: a body of equal weight will reſt in any part of the water. By which rule, if the fiſh in the middle region of the water be of equal weight with an equal bulk of the water, the fiſh will reſt there, without any tendency either upwards or downwards; and, if the fiſh be deeper in the water, its bulk becoming leſs by the compreſſion of the bladder, and yet retaining the ſame weight, it will ſink and reſt at the bottom: on the other ſide, if the fiſh be higher than the middle region, the Air dilating itſelf, and the bulk of the fiſh conſequently increaſing, without any increaſe of the weight, the fiſh will riſe and reſt at the top of the water.

Perhaps the fiſh by ſome action, can emit Air out of the bladder, and afterwards out of its body; and alſo, when there is not enough, take in more Air, and convey it to this bladder; in which caſe it will be no wonder, that there ſhould be always a fit proportion of Air in the bodies of all fiſhes, to ſerve their uſe, according to the depth of water they live in: perhaps alſo, by ſome muſcle, the fiſh can contract this bladder beyond the preſſure of the weight of water; and perhaps it can by its ſides, or ſome other defence, keep off the preſſure of the water, and give the Air leave to dilate itſelf. In theſe caſes, the fiſh will be helped in all intermediate diſtances, and may riſe or ſink from any region without moving a fin. *Phil. Tranſ.* N°. 114. p. 310.

If the Air-bladder of a fiſh be pricked or broken, the fiſh preſently ſinks to the bottom, unable either to ſupport or raiſe itſelf up again. Flat fiſhes, as ſoles, plaiſe, &c. which always lie groveling at the bottom, have no Air-bladder.

In moſt fiſhes there is a manifeſt channel, leading from the gullet, or upper orifice of the ſtomach, to the Air-bladder, which doubtleſs ſerves for conveying Air into it. In a ſturgeon, Mr. Willoughby obſerved, that, upon preſſing the bladder, the ſtomach preſently ſwelled; ſo in that fiſh it ſeems the Air paſſes freely both ways. Poſſibly the fiſh, while alive, may have a power to raiſe up this valve, and let out Air on occaſion.

AIR-*pump*. Under this article in the dictionary we have given an account of the ſtructure of the common Air-pump, and alſo that of a portable one; we ſhall here add an account of a very great improvement made in that machine, by the ingenious Mr. Smeaton, from the *Philoſ. Tranſact.* vol. 47. pag. 415.

The principal cauſes of imperfection in the common pumps ariſe, firſt, from the difficulty in opening the valves at the bottom of the barrels; and, ſecondly, from the piſton's not fitting exactly, when put cloſe down to the bottom; which leaves a lodgment for Air, that is not got out of the barrel, and proves of bad effect.

In regard to the firſt of theſe cauſes, the valves of Air-pumps are commonly made of a bit of thin bladder, ſtretched over a hole generally much leſs than one tenth of an inch diameter; and to prevent the Air from repaſſing between the bladder and the plate, upon which it is ſpread, the valve muſt always be kept moiſt with oil or water.

It is well known, that at each ſtroke of the pump the Air is more and more rarefied, in a certain progreſſion, which would be ſuch, that an equal proportion of the remainder would be taken away, was it not affected by the impediments I have mentioned: ſo that, when the ſpring of the Air in the receiver becomes ſo weak, as not to be able to overcome the coheſion of the bladder to the plate, occaſioned by the fluid between them, the weight of the bladder, and the reſiſtance that it makes by being ſtretched, the rarefaction cannot be carried farther, though the pump ſhould ſtill continue to be worked.

It is evident, that the larger the hole is, over which the bladder is laid, a proportionably greater force is exerted upon it by the included Air, in order to lift it up; but the aperture of the hole cannot be made very large, becauſe the preſſure of the incumbent Air would either burſt the valve, or ſo far force it down into the cavity, as to prevent its lying flat and cloſe upon the plate, which is abſolutely neceſſary.

To avoid theſe inconveniences as much as poſſible, inſtead of one hole, I have made uſe of ſeven, all of equal ſize and ſhape; one being in the center, and the other ſix round it: ſo that the valve is ſupported at proper diſtances, by a kind of grating, made by the ſolid parts between theſe holes: And to render the points of contact, between the bladder and grating, as few as poſſible, the holes are made hexagonal, and the partitions filed almoſt to an edge. As the whole preſſure of the atmoſphere can never be exerted upon this valve, in the conſtruction made uſe of in this pump; and as the bladder is faſtened in four places inſtead of two; I have made the breadth of the hexagons three tenths of an inch, ſo that the ſurface of each of them is more than nine times greater than common. But as the circumference of each hole is more than three times greater than common, and as the force, that holds down the valve, ariſing from coheſion, is, in the firſt moment of the Air's exerting its force, proportionable to the circumference of the hole; the valve over any of theſe holes will be raiſed with three times more eaſe than common. But as the raiſing of the valve over the center-hole is aſſiſted on all ſides by thoſe placed round it; and as they altogether contribute as much to raiſe the bladder over the center-hole, as the Air immediately acting under it; upon this account the valve will be raiſed with double the eaſe, that we have before ſuppoſed, or with a ſixth part of the force commonly neceſſary.

It is not material to conſider the force of the coheſion, after the firſt inſtant: for, after the bladder begins to riſe, it expoſes a greater ſurface to the Air underneath, which makes it move more eaſily. I have not brought into this account the force, that keeps down the valve, that ariſes from the weight of the bladder, and the reſiſtance from its being ſtretched; for I look upon theſe as ſmall, in compariſon of the other.

I was not however contented with this conſtruction of the valves, till I had tried what effect would be produced, when they were opened by the motion of the winch, independent of the ſpring of the Air: and though the contrivance I made uſe of ſeemed to me leſs liable to objection than any thing I was acquainted with, that had been deſigned for that purpoſe; yet I did not find it to anſwer the end better than what I have already deſcribed; and therefore laid it aſide, as it rendered the machinery much more complex, and troubleſome to execute.

But, ſuppoſing all thoſe difficulties to be abſolutely overcome, the other defect, that I mentioned in the common conſtruction, would hinder the rarefaction from being carried on beyond a certain degree. For, as the piſton cannot be made to fit ſo cloſe to the bottom of the barrel, as totally to exclude all the Air; as the piſton riſes, this Air will expand itſelf; but ſtill preſſing upon the valve, according to its denſity, hinders the Air within the receiver from coming out: hence, were this vacancy to equal the 150th part of the capacity of the whole barrel, no Air could ever paſs out of the receiver, when expanded 150 times, though the piſton was conſtantly drawn to the top; becauſe the Air in the receiver would be in æquilibrio with that in the barrel, when in its moſt expanded ſtate. This I have endeavoured to overcome, by ſhutting up the top of the barrel with a plate, having in the middle a collar of leathers, through which the cylindrical rod works, that carries the piſton. By this means, the external Air is prevented from preſſing upon the piſton; but that the Air, that paſſes through the valve of the piſton from below, may be diſcharged out of the barrel, there is alſo a valve applied to the plate at the top, that opens upwards. The conſequence of this conſtruction is, that, when the piſton is put down to the bottom of the cylinder, the Air in the lodgment under the piſton will evacuate itſelf ſo much the more, as the valve of the piſton opens more eaſily, when preſſed by the rarefied Air above it, than when preſſed by the whole weight of the atmoſphere. Hence, as the piſton may be made to fit as nearly to the top of the cylinder, as it can to the bottom, the Air may be rarefied as much above the piſton, as it could before have been in the receiver. It follows therefore, that the Air may now be rarefied in the receiver, in duplicate proportion of what it could be upon the common principle; every thing elſe being ſuppoſed perfect. Another advantage of this conſtruction is, that, though the pump is compoſed of a ſingle barrel, yet, the preſſure of the outward Air being taken off by the upper plate, the piſton is worked with more eaſe than the common pumps with two barrels: and not only ſo, but when a conſiderable degree of rarefaction is deſired, it will do it quicker; for the terms of the ſeries expreſſing the quantity of Air taken away at each ſtroke do not diminiſh ſo faſt, as the ſeries anſwering to the common one.

I have found the gages, that have been hitherto made uſe of, for meaſuring the expanſion of the Air, very unfit to determine in an experiment of ſo much nicety. I have therefore contrived one of a different ſort, which meaſures the expanſion with certainty, to much leſs than the 1000th part of the whole. It conſiſts of a bulb of glaſs ſomething in the ſhape of a pear, and ſufficient to hold about half a pound of quickſilver. It is open at one end, and at the other is a tube hermetically cloſed at top. By the help of a nice pair of ſcales, I found what proportion of weight a column of mercury, of a certain length, contained in the tube, bore to that, which filled the whole veſſel. By theſe means I was enabled to mark diviſions upon the tube, anſwering to a 1000th part of the whole capacity, which, being of about one tenth of an inch each, may, by eſtimation, be eaſily ſubdivided into ſmaller parts. This gage, during the exhauſting of the receiver, is ſuſpended therein by a ſlip-wire. When the pump is worked as much as ſhall be thought neceſſary, the gage is puſhed down, till the open end is immerged in a ciſtern of quickſilver placed underneath: the Air being then let in, the quickſilver will be driven into the gage, till the Air remaining in it becomes of the ſame denſity with the external; and as the Air always takes the higheſt place, the tube being uppermoſt, the expanſion will be determined by the number of diviſions occupied by the Air at the top.

The degree, to which I have been able to rarefy the Air in experiment, has generally been about 1000 times, when the pump is put clean together: but the moiſture, that adheres to the inſide of the barrel, as well as other internal parts, upon letting in the Air, is in the ſame ſucceeding trials worked together with the oil, which ſoon renders it ſo clammy, as to obſtruct the action of the pump upon a fluid ſo ſubtile as the Air is, when ſo much expanded; but in this caſe it ſeldom fails to act upon the Air in the receiver, till it is expanded 500 times, and this I have found it to do, after being frequently uſed for ſeveral months, without cleaning. I have alſo generally found it to perform beſt, the firſt trial at each time of uſing; though nothing had been at it from the time preceding; which, after a great many trials made with this view, I alſo attribute to the vapours of the

Air mixing with the oil. An experiment, where the Air was expanded 1000 times, was tried about two years ſince in your preſence; at which were preſent alſo Dr. Knight and Mr. Canton; and I lately did the ſame thing with Mr. Watſon. The pump, which I intend myſelf the honour of ſhewing the Society, is the ſame, that I juſt now mentioned, and the ſecond that I made, with a view to improve upon this principle.

The degree of rarefaction, produced by the beſt of the three pumps, that you procured the trial of, and which you eſteemed good in their kind, and in complete order, never exceeded 140 times, when tried by the gage above deſcribed.

I have alſo endeavoured to render the pneumatic apparatus more ſimple and commodious, by making this Air-pump act as a condenſing engine at pleaſure, by ſingly turning a cock. This not only enables us to try any experiments under different circumſtances of preſſure, without changing the apparatus, but renders the pump an univerſal engine, for ſhewing any effect, that ariſes from an alteration in the denſity or ſpring of the Air. Thus, with a little addition of apparatus, it ſhews the experiments of the Air-fountain, wind-gun, &c.

This is done in the following manner: the Air above the piſton being forcibly driven out of the barrel at each ſtroke, and having no-where to eſcape, but by the valve at the top; if this valve be connected with the receiver, by means of a pipe, and at the ſame time the valve at the bottom, inſtead of communicating with the receiver, be made to communicate with the external Air, the pump will then perform as a condenſer.

The mechaniſm is thus ordered. There is a cock with three pipes placed round it, at equal diſtances. The key is ſo pierced, that any two may be made to communicate, while the other is left open to the external Air. One of theſe pipes goes to the valve at the bottom of the barrel; another goes to the valve at the top, and a third goes to the receiver. Thus, when the pipe from the receiver, and that from the bottom of the barrel, are united, the pump exhauſts: but turn the cock round, till the pipe from the receiver, and that from the top of the barrel, communicate, and it then condenſes. The third pipe, in one caſe, diſcharges the Air, taken from the receiver into the barrel; and, in the other, lets it into the barrel, that it may be forced into the receiver.

The figures delineated on *plate* I. will ſufficiently explain this inſtrument.

Fig. 4. Is a perſpective view of the principal parts of the pump together. A is the barrel. B the ciſtern, in which are included the cock, with ſeveral joints. Theſe are covered with water to keep them air-tight. A little cock to let the water out of the ciſtern, is marked 6. C *c c* is the triangular handle of the key of the cock: which, by the marks on its arms, ſhews how it muſt be turned that the pump may produce the effect deſired. D H is the pipe of communication between the cock and the receiver. E is the pipe that communicates between the cock and the valve, on the upper plate of the barrel. F is the upper plate of the pump, which contains the collar of leathers *d*, and V the valve, which is covered by the piece *f*. G I is the ſiphon-gage, which ſcrews on and off, and is adapted to common purpoſes. It conſiſts of a glaſs tube hermetically ſealed at *c*, and furniſhed with quickſilver in each leg; which, before the pump begins to work, lies level in the line *a b*; the ſpace *b c* being filled with Air of the common denſity. When the pump exhauſts, the Air in *b c* expands, and the quickſilver in the oppoſite leg riſes, till it becomes a counter-balance to it. Its uſe is ſhewn upon the ſcale I *e*, by which the expanſion of the Air in the receiver may be nearly judged of. When the pump condenſes, the quickſilver riſes in the other leg, and the degree may be nearly judged of by the contraction of the Air in *b c*: marks being placed at $\frac{1}{2}$ and $\frac{1}{3}$ of the length of *b c* from *c*; which ſhews when the receiver contains double or treble its common quantity. K L is a ſcrew-frame to hold down the receiver, in condenſing experiments, which takes off at pleaſure; and is ſufficient to hold down a receiver, the diameter of whoſe baſe is 7 inches, when charged with a treble atmoſphere: in which caſe it acts with a force of about 800 pounds againſt the ſcrew-frame. M is a ſcrew, that faſtens a bolt, which ſlides up and down in that leg, by means whereof the machine is made to ſtand faſt on uneven ground.

Fig. 5. Is a perpendicular ſection of the barrel and cock, &c. where A B repreſents the barrel. C D the rod of the piſton, which paſſes through M N the plate, which cloſes the top of the barrel. K is the collar of leathers, through which the piſton-rod paſſes. When the piſton is at the bottom of the cylinder, the upper part of K is covered by the cap at D, to keep out duſt, &c. L is the valve on the upper plate, which is covered by the piece O P, which is connected with the pipe Q R, which makes the communication between the valve and cock. C E is the piſton; and E F F is the piſton-valve. I I are two little holes to let the Air paſs from the piſton-valve into the upper part of the barrel. G G K is the principal valve at the bottom of the cylinder. H H is a piece of metal, into which the valve G G K is ſcrewed, and cloſes the bottom of the cylinder; out of which alſo is compoſed S S the cock, and K T T the ducts from the cock to the bottom of the barrel. W W is the key of the cock. X the ſtem; and V V the handle.

Fig. 8. Is an horizontal ſection of the cock, through the middle of the duct T T. A B repreſents the bigneſs of the circular plate, that cloſes the bottom of the barrel. C D repreſents the bigneſs of the inſide of the barrel. E F G is the body of the cock; the outward ſhell being pierced with three holes at equal diſtances, and correſponding to the three ducts H H, I I, K K, whereof H H is the duct that goes to the bottom of the barrel. I I is the duct that communicates with the top of the barrel; and K K is the duct that paſſes from the cock to the receiver. L M N is the key, or ſolid part of the cock, moveable round in the ſhell E F G. When the canal L M anſwers to the ducts H H and K K, the pump exhauſts, and the Air is diſcharged by the perforation N. But, the key L M N being turned till the canal L M anſwers to I I and K K, the perforation N will then anſwer to H H; and in this caſe the pump condenſes. Laſtly, when N anſwers to K K, the Air is then let in or diſcharged from the receiver, as the circumſtance requires.

Fig. 6. Is the plan of the principal valve. A B C D repreſents the bladder faſtened in four places, and ſtretched over the ſeven holes I K, formed into an hexagonal grating, which I ſhall call the honey-comb. E F G H ſhews where the metal is a little protuberant, to hinder the piſton from ſtriking againſt the bladder.

Fig. 7. Repreſents the new gage, which I call the pear-gage. It is open at A; B C is the graduated tube, which is hermetically cloſed at C, and is ſuſpended by the piece of braſs D E, that is hollowed into a cylinder, and claſps the tube.

AIR-*Shafts*, in minerology, imply ſhafts or holes cut from the ſurface to the adits, in order to furniſh freſh Air.

AIR-*Veſſels*, in plants, are certain ducts or canals, whereby a kind of reſpiration is performed in vegetable bodies. See PLANT in the Dictionary and Supplement.

AI'RING *of horſes*. Airing brings ſeveral advantages to horſes. Firſt, it purifies their blood, if the Air be clear and pure; it purges the body from many groſs and ſuffocating humours, and by that means ſo hardens a horſe's fat, that it is not near ſo liable to be diſſolved by ordinary exerciſe.

Secondly, it teaches him how to let his wind rake equally, and keep time wlth the other actions and motions of his body.

Thirdly, it ſharpens the appetite, and provokes the ſtomach, which is of great advantage both to gallopers and hunters, which are apt to loſe their ſtomach either through exceſs or want of exerciſe, for the ſharpneſs of the Air will drive the horſes natural heat from the outward to the inward parts, which heat, by furthering concoction, creates an appetite. Markham directs, if a horſe be very fat, to Air him before ſun-riſe, and after ſun-ſetting; and another author ſays, that nothing is more wholeſome than early and late Airings: others again do not approve of this, and urge, that all things that any ways hinder the ſtrength and vigour of nature, are to be avoided; now that extremity of cold and being out early and late do ſo, is evidently ſeen by horſes that run abroad all winter, which, however hardily bred and kept with the beſt care and fodder, yet cannot by any means be advanced to ſo good caſe in winter, as an indifferent paſture will raiſe them to in ſummer; and, as this holds true of nocturnal colds, it muſt needs be verified in ſome proportionate meaſure of the morning and evening dews, and that piercing cold which is obſerved to be more intenſe at the opening and cloſe of the day, than any part of the night.

Beſides that, the dews and moiſt rimes do as much injury to a horſe as the ſharpeſt colds or froſts, and, if a horſe is any ways inclinable to catarrhs, rheums, or any other cold diſtemper, he is apt to have the humours augmented, and the diſeaſe ſenſibly increaſed by theſe early and late Airings.

But, if he be not had forth to Air till the ſun be riſen, it will chear his ſpirits; and it is ſeen that all horſes love the ſun's warmth, as in thoſe that lie out at nights, who will repair to thoſe places where they can have moſt benefit of the beams of the ſun, after he is riſen, to relieve them from the coldneſs of the preceding night.

And, beſides the benefit of the ſun, the Air will be more mild and temperate, as that it will rather invigorate than prey upon his ſpirits, and more increaſe his ſtrength than impair it.

And, as for bringing down a horſe's fat, we need not be at a loſs for that, and to keep him from being purſive, and too high in fleſh, to reduce him to cleanneſs, and a more moderate ſtate of body: for it is but keeping him out ſo much longer at a time, both morning and evening, and you will undoubtedly obtain your end by ſuch long Airing, joined with true ſound heats; and it is from the length of Airings that you muſt expect to bring your horſe to a perfect wind and true courage. *Markham's Farriery.*

ALABA'STER, *Alabaſtrum*, (*Dict.*)— This is of a ſubſtance that may be calcined, being leſs hard than marble. It is of different colours, ſome white, but moſt commonly of a dirty yellowiſh white, ſome reddiſh, ſome variegated with different colours, red, brown, &c. In ſome are diſcovered veins or ſtreaks which may be compared to thoſe of the onyx ſtone. In this ſenſe we may ſay there is onyx Alabaſter; and there is ſome found with little ſpots and branches, in ſuch a manner as to reſemble the dendrite. Alabaſter is ſomewhat tranſparent, and its tranſparence ſo much the more ſenſible, as its colour approaches nearer to white. They poliſh it: but it is by no means capable of ſo fine and lively a poliſh as marble, becauſe it is more ſoft; beſides, when it has been poliſhed, its ſurface looks as if it had been rubbed with greaſe. This caſt obſcures its poliſh, and, as it is but little tranſparent, it in ſome ſort reſembles wax. Though Alabaſter be ſo ſoft, and takes no fine poliſh, yet it is employed in different uſes; tables, chimney-pieces, vaſes, ſtatues, *&c.* are made of it. There are two ſorts of Alabaſter, the oriental and common; the oriental is much the beſt, fineſt and hardeſt, as well as that its colours are more lively, which makes it more valuable and more ſought after than the common, but this is ſcarce; we meet with it indeed in France, about Cluny, and other places. There is ſome in Lorain and Germany, but eſpecially in Italy about Rome. It is however more common than one would imagine.

ALABASTR'ITÆ, or *alabaſters*, in natural hiſtory, the name of a genus of foſſiles, compoſed of large ſeparate concretions, of great brightneſs, and an elegant, but ſtately ſtructure, not very hard, ſoluble in acids, and eaſily calcinable.

ALA'RM, the name of an inſtrument for awaking perſons at a certain hour. The weavers uſe a very ſimple contrivance of this kind. See WEAVER'*s Alarm.*

ALATE'RNUS, in botany, the name of a genus of plants, whoſe characters are: the flower has no empalement, and conſiſts of one leaf, which is divided into four parts; this is ſucceeded by a round berry, reſting upon part of the flower, which is divided into three cells, each containing a ſingle ſeed. To which may be added, the leaves growing alternately upon the branches, by which, at any time of the year, it may be diſtinguiſhed from the phillyrea.

Mr. Miller has enumerated ſix pieces of Alaternus, and Tournefort eight.

ALBU'GO, (*Dict.*) ——This is a troubleſome diſeaſe, which is more or leſs offenſive to the ſight, according to the greater or leſs portion of the tranſparent part of the cornea affected by it. For ſometimes it fixes on the exterior ſurface only of this membrane, ſometimes on the interior, and ſometimes it runs more or leſs deep into it.

It is moſt commonly the conſequence of inflammations, by the extravaſation of humours, between the membranes of this tunicle; and particularly in the ſmall-pox, by the ſuppuration of puſtules upon this part.

I have made uſe of two methods of cure for this diſorder of the ſight; the one in the outward ſort, the other in the inward. In the former caſe I ordered the following powder:

Take of common glaſs any quantity. Pound it in a mortar, into very fine powder; then add an equal quantity of white ſugar-candy, and levigate the mixture on a marble with great labour, till it becomes quite impalpable.

A little of this powder, put into the eye with a quill, every day, gradually abſterges and wears off the ſpot by its inciding quality. The other method above-mentioned of removing this ſpeck is, to order a dexterous ſurgeon to pare it cautiouſly every day with a knife; for this tunicle is compoſed of ſeveral lamellæ one over another, and has thickneſs enough to bear paring off ſome of its parts. I have ſeen ſeveral inſtances of cures by the eye-powder; but the paring of the coat has not ſucceeded with me above once or twice. However, it is better to try a doubtful remedy than none. *Mead's Monita & Præcepta.*

ALCA'NNA, or *Alcana*, a drug uſed in dying, being the leaves of the Egyptian privet. The colour extracted from the leaves is either red or yellow, according to the menſtruum made uſe of; yellow, when infuſed in common water, and red, when ſteeped in vinegar or allum-water.

ALCE'A, in botany, *vervain mallow*, a genus of plants whoſe characters are: it hath the whole habit of the mallow or althæa, but differs from both in having its leaves deep divided, ſomewhat like the vervain.

Tournefort has enumerated twenty ſpecies of Alcea. It is ſometimes uſed in medicine as an emollient, its virtues being much the ſame with thoſe of the mallow, but in a leſs degree.

ALCHIMI'LLA, *ladies mantle*, in botany, the name of a genus of plants, of which Mr. Miller has enumerated 13 ſpecies. The characters are theſe: The leaves are ſerrated: the cup of the flower is divided into eight ſegments, which are expanded in form of a ſtar: the flowers are collected into bunches upon the tops of the ſtalks: the ſeed-veſſels contain, for the moſt part, two ſeeds in each.

ALCHIMILLA, in the Linnæan ſyſtem of botany, the name of a genus of plants, the characters of which are theſe: the cup is a tubular perianthium, remaining till the ſeed ripens; it is compoſed of one leaf, divided at the extremity into eight ſegments alternately larger and ſmaller; it has no petals; the ſtamina are four very ſmall erect, pointed filaments, inſerted in the rim of the cup; the antheræ are roundiſh; the germen of the piſtillum is of an oval figure; the ſtyle is ſlender, of the length of the ſtamina, and inſerted on the baſis of the germen; the ſtigma is of a globoſe figure. The neck of the cup, ſhutting together, makes it ſerve in the place of a fruit, containing a ſingle compreſſed ſeed of an elliptic figure. *Linnæus, Gen. Plantar.*

AL'CORAN, (*Dict.*) ——The Alcoran is allowed to be written with the utmoſt elegance and purity of language, in the dialect of the Koreiſhites, the moſt noble and polite of all the Arabians; but with ſome mixture of other dialects. It is the ſtandard of the Arabic tongue, and, as the orthodox believe, and are taught by the book itſelf, inimitable by any human pen; and therefore inſiſted as a permanent miracle, greater than that of raiſing the dead, and alone ſufficient to convince the world of its divine original; and to this miracle did Mahomet himſelf chiefly appeal, for the confirmation of his miſſion, publickly challenging the moſt eloquent ſchoolmen in Arabia to produce a ſingle chapter comparable to it. A late ingenious and candid writer, who is a very good judge, allows the ſtyle of the Alcoran to be generally beautiful and fluent, eſpecially when it imitates the phrophetic manner, and ſcripture phraſe; conciſe, and often obſcure; adorned with bold figures, after the eaſtern taſte; enlivened with florid and ſententious expreſſions; and, in many places, eſpecially where the majeſty and attributes of God are deſcribed, ſublime and magnificent. *Sale.*

The moſt elegant paſſage in the whole Alcoran, in the judgment of all the commentators, is that in the chapter of Hud, wherein God, to put a ſtop to the deluge, ſays, "O earth, "ſwallow up theſe waters! and thou, O heaven, withdraw "thy rain! And immediately the waters abated; the decree "was fulfilled; the ark reſted on the mountain, and a voice "was heard, Woe to the ungodly". *Alkor.* c. 11. p. 180. *Herbel. Bibl. Orient.*

The Alcoran, beſides the inconveniencies to which all books of revelation are ſubject, viz. to be differently underſtood and interpreted, has ſome peculiar ones. Mahomet placed the ſtreſs and merit of his Alcoran on the excellency of the ſtyle. This is ſubject to inconveniencies; the compoſition and argument of words admit of infinite varieties, and it can never be abſolutely ſaid, that any one is the beſt poſſible. Accordingly Hamzah Benahmed wrote a book againſt the Alcoran, with at leaſt equal elegancy; and Moſelema another, which even ſurpaſſed it, and occaſioned a defection of a great part of the muſſulmen.

AL'DER *Tree.* See ALNUS.

A'LIMENT.— The health of the human body evidently depends upon the quantity and quality of the blood and juices; whence it is plain, that all thoſe Aliments which preſerve and maintain a juſt temperament, and a due quantity of theſe, are beneficial to health, and that ſuch as have a contrary tendency are to be reckoned unwholſome.

For blood of a juſt temperament, and neither exceeding nor falling ſhort in quantity, as it circulates moſt eaſily through the body, and is clear of all foreign particles, is admirably adapted to nouriſh the parts and increaſe ſtrength; ſo that it may be called the real treaſure of life.

Blood of a due temperament, and benign quality, by its progreſſive as well as inteſtine motion, which continues during the whole courſe of life, is not only continually waſted, but likewiſe requires a morbid diſpoſition, and degenerates into an impure and excrementitious maſs.

Experience proves, that the blood of thoſe who have faſted long is converted into ſaline and bilious excrements, which are diſcharged by ſtool, urine, and ſweat, and even loſes that natural balſamic quality which is neceſſary to health, and the maſs of humours is by this means rendered ſo thin and fluid, that it becomes intirely unfit for nouriſhing the parts. This appears ſtill more plainly from continual fevers, and hectic diſorders, the nature of which diſeaſes is to waſte the juices, and convert the moſt benign humours into uſeleſs, ſalt, and bilious excrements. Labour alſo, and exerciſe, becauſe they augment the inteſtine and progreſſive motion of the blood conſiderably, leſſen the quantity of ſuperfluous humours, as perſons of full plethoric habits experience, to the no ſmall advantage of their health.

Becauſe the blood, by its continual motion, is waſted and converted into an excrementitious maſs, utterly unfit to nouriſh the ſolids, or recruit that fine fluid which ſupplies the body with ſenſe and motion, it is plain that life and health cannot be preſerved, unleſs theſe natural motions be continually repaired, and new juices ſubſtituted in the room of thoſe thrown out of the body as excrementitious.

The reaſon is therefore plain, why people ſtand in need of continual ingeſtion and egeſtion, or, in other words, of eating, drinking, and evacuations; for health cannot long be preſerved, unleſs the place of the corrupted humours diſcharged be ſupplied by new juices.

Solid foods of a good quality, as well as liquors, recruit the loſt juices; and, therefore, all thoſe Aliments that are nearly of the ſame nature with the blood, and eaſily mix with it, ought to be reckoned amongſt wholeſome Aliments.

Blood and juices, fit for nouriſhment, are of a benign quality, of a due temperament, and reſemble a jelly, conſiſting of ſmall earthy, aqueous, oily, and eaſily moveable particles, thoroughly mixed with each other: hence all thoſe Aliments, which abound with a mucilaginous juice of a due temperament, are moſt fit for ſanguification, or the production of new blood.

The fleſh of young animals, their juices, and broths made of them, eſpecially of young beef, veal, and mutton, afford a large quantity of jelly, and on that account are juſtly reckoned among the Aliments which are moſt quickly turned into blood. All ſorts of the hen kind and pigeons, with their young, are likewiſe well diſpoſed for nouriſhment, becauſe they afford a more ſubtile jelly than the animal-fleſh abovementioned, though in a ſmaller quantity.

It is worth while to obſerve, that the clean animals, which, according to Moſes, were uſed by the Iſraelites in their ſacrifices, were principally ſuch as afforded a good and wholeſome nouriſhment, ſince they abounded more than others with nutritive mucilaginous juices.

Broths and jellies made of fleſh are, therefore, not without reaſon, preſcribed for recruiting the ſtrength of thoſe who either by large hæmorrhages or violent fevers have ſuſtained a loſs of blood; and people who feed much on theſe mucilaginous Aliments, which the French above all other people in the world do, can bear to have blood taken from them more frequently, and in larger quantities, than people who are not ſo much accuſtomed to them.

The chyle is the immediate matter of the blood, and reſembles a natural emulſion, made of ſoft, oily, inſipid, watery, and mucilaginous particles; for this reaſon all thoſe Aliments, into the compoſition of which parts, reſembling chyle, enter, are proper for nouriſhing the parts, and producing lymph and blood.

Milk, which is nothing but chyle, is an univerſal Aliment, and, in reſpect of nouriſhment, to be preferred to all others.

And, for this reaſon, milk is given as the firſt Aliment, not only to children, but to robuſter animals, that their bodies may grow the faſter, and acquire ſtrength and maturity the ſooner; for food that is ſolid, of a firm coheſion, or hard digeſtion, does not well agree with young and tender bodies, becauſe the ſtomach and inteſtines have not that ſtrength and force which are neceſſary for the digeſtion and expulſion of ſolid foods. Hence, a reaſon may be aſſigned, why ſome people, eſpecially the Swiſs, who are great lovers of milk, and make much uſe of it in food, grow ſo very large and tall, that ſcarce any nation in Europe can ſurpaſs them in that particular.

All mild ſeeds which abound with a milky juice are to be reckoned among the claſs of nouriſhing Aliments.

Hence appears the reaſon, why ſeeds and grains of moſt kinds, ſuch as barley, wheat, oats, rye, beans, peaſe, almonds, cheſnuts, pine-nuts, peſtachia-nuts, rice, maiz, and Turkiſh corn, are extremely proper for nouriſhing animals, and why the meals of theſe baked into bread are the principal and moſt general Aliments made uſe of; from this likewiſe one may account for people's being able to live tolerably on bread and water only.

Among all other Aliments, bread holds the principal place, nor can we poſſibly want it without injuring health. Its uſe is proper at all ſeaſons, and accommodated to all conſtitutions, and may therefore properly be called an univerſal Aliment; nor can fleſh and other ſubſtances be taken alone, and without it, ſince in that caſe they create a nauſea.

The texture of the parts of bread is admirably adapted to the nature of the nutritious juices; for it is mixed with mild, oily, and mucilaginous particles, and likewiſe with a ſubtile acid ſalt, which are very grateful to the ſtomach, and quicken the diſſolving power of the ſalival and fermentative juices. But, as all bread is not made of one and the ſame grain, ſo one kind of bread is preferrable to another with regard to its healthful qualities. The beſt and moſt nouriſhing bread is made of dry rye-meal, not very white, but mixed with the ſmaller and finer parts of the bran. For, by a chymical analyſis, blackiſh coarſe bread upon diſtillation affords more oil, which diffuſes a more agreeable flavour, and more effectually recruits ſtrength, than that which is drawn from fine bread. But that which is made of barley, oats, Turkiſh corn, or even of acorns or cheſnuts, is heavier on the ſtomach, nor is it ſo effectual for repairing loſt ſtrength.

Eggs, becauſe they contain a very fine, balſamic, pellucid lymph, which approaches neareſt to the immediate matter of nouriſhment, therefore afford a very ſpeedy nouriſhment to the parts.

Eggs afford a very ſpeedy nouriſhment, if they are new laid and ſoft, according to that maxim of the Scola Salernitana, Si ſumas ovum, molle ſit atque novum, *i. e.* If you incline to eat an egg, let it be ſoft and new laid. The yolk contains many unctuous, fat, and ſulphureous parts; the white, on the other hand, conſiſts of moiſt, balſamic parts like thoſe of the ſerum, ſo that, if any food is univerſal, this is certainly ſuch, and is in a peculiar manner adapted to increaſe the ſeminal liquor. Eggs are particularly proper, when the body, either weakened by an effuſion of blood, or waſted by the ſhocks of a fever, requires a very ſpeedy ſupply of nouriſhment.

Cheeſe and butter are univerſal and moſt excellent Aliments. Since milk is reſolved into butter and cheeſe, and ſince the butter contains its oily, and the cheeſe its mucilaginous and terreſtrial parts, it is therefore plain that theſe two, eſpecially with the addition of bread and water, muſt be a very valuable and univerſal nouriſhment, fit for perſons of all ages and conſtitutions. The newer butter is, it is of conſequence at once the more grateful to the ſtomach, and the more conducive to health; but, when long kept, it grows fœtid and rancid. The too great or too frequent uſe of it, by relaxing the fibres of the ſtomach, weakens its tone, and excites nauſeas. Butter joined with cheeſe is likewiſe very nouriſhing; but cheeſe ſhould be neither too new nor too old. If too new, it loads the ſtomach, and binds the belly; if too old, it increaſes the acrimony and impurity of the humours, as it is endowed with a poignant taſte, and a fœtid ſmell.

As the blood, the nutritive juice, and in general all the parts of the body, are made up of three elements, viz. Firſt, of one white, ſulphureous, oily, and inflammable: Secondly, one of an earthy, ſubtile, alcaline nature, which is nevertheleſs more fixed: Thirdly, one of an aqueous; ſo the ſeveral kinds and virtues of Aliments may be moſt commodiouſly reduced to theſe three claſſes.

Aliments of theſe three ſeveral qualities, duly mixed with one another, afford a proper nouriſhment for the human body.

The fleſh of animals, eſpecially when roaſted, affords the body its principal ſupply of the ſulphureous part; but it is to be obſerved, that wild animals are preferrable in this reſpect, to thoſe of the tame and domeſtic kind, becauſe their oils and ſalts are exalted by their habitual exerciſe.

That the fleſh of animals contains more of a ſubtile oil, than vegetables, is plain from this, that in the ſummer fleſh very ſoon turns putrid and offenſive, which is not found to be the caſe with reſpect to vegetables.

Vegetables have an acid in their compoſition, and their oils, excepting ſome of the hotter herbs, are for that very reaſon ſo much the milder. Animals, on the other hand, have no acid in their compoſition; for all the parts of them, ſubjected to diſtillation, yield a ſubtile oil, and a volatile ſalt; and this hot oil is what principally excites an inteſtine and fermentative motion in the blood, and proves the occaſion of the penetrating and diſagreeable ſmell which is felt upon putrefaction.

The roaſted fleſh either of wild beaſts, or wild fowls, furniſh the blood with a greater ſtore of a light ſulphureous ſubſtance, than boiled fleſh, or thoſe of tame animals.

The fleſh of wild animals, and wild fowls, is undoubtedly lighter, more ſubtile and oily, but fraught with a ſmaller quantity of mucous balſamic matter, than the fleſh of tame animals; becauſe wild animals uſe more violent exerciſe, breathe a freer and purer air, and feed upon drier Aliments. Add to this, that by the very roaſting much of the humidity is evaporated, by which means the oily principle, diſentangling itſelf from the reſt of the component parts, and being exalted by the fire, enjoys its full liberty, and has the aſcendant over the other parts.

Among the Aliments which furniſh the blood with its humid parts, of animals fiſh, and of vegetables pot-herbs, the milder roots, and ſome ſummer-fruits, are reckoned the principal.

Fiſh ſubjected to diſtillation yields much phlegm, little oil, and very little volatile ſalt.

Becauſe fiſh contains only a very ſmall quantity of oil and volatile ſalt, it does not ſo eaſily turn putrid as fleſh, and for this reaſon is generally leſs hurtful in fevers than fleſh.

To the third claſs of Aliments which ſupply the blood with its fixed and earthy parts, belong all kinds of grains, as the ſeveral kinds of bread, rice, peaſe, beans, lentils, cheſnuts, almonds, cacao, cheeſe, &c.

From what has been ſaid it will appear, that all ſuch Aliments that are of a mild quality, and reſemble the chyle and blood, are fit for nouriſhment.

All ſuch Aliments therefore, as either recede from, or are quite oppoſite to the chyle and blood, are unfit for nouriſhing the parts.

All Aliments in which there is too much of an acid, are improper for nouriſhment; becauſe milk and blood will not mix with an acid, which is quite oppoſite to their natures, and induces a coagulation of the circulating juices.

Hence the reaſon is plain, why the too liberal uſe of ſallads, ſummer fruits, eſpecially whilſt crude and unripe, vinegar, ſour ale, and wines that abound with an acid, are ſo remarkably prejudicial to health.

No ſalt whatever can be mixed with the blood, chyle, and milk, for which reaſon all ſalts, and all foods too high ſalted, muſt be improper and unfit for nouriſhment.

Blood and chyle never incorporate with ſpirituous liquors, but rather ſeparate from them; whence it is eaſy to judge how detrimental the free uſe of them is, both to health and nouriſhment.

All ſweet things, as ſugar and honey, have no affinity with the blood and chyle, but rather recede from their nature, ſince they have an exquiſite taſte which the blood, chyle, and nutritive juices have not.

Though ſweet ſubſtances conſiſt of a temperate mixture of parts, and may on that account ſeem proper for nouriſhment, yet the ſweet particles are ſalts of a peculiar kind, which are diſſoluble in water; hence they cannot be joined to the ſubſtance of the parts, ſince they are liable to be diſſolved by the circulating fluids.

Aliments proper for preſerving health ought not only to contain a laudable juice, but ſhould likewiſe be eaſily diſſolved by the ſtomach. Hence it is plain, that all thoſe kinds of food, which on account of the cloſeneſs and compactneſs of their texture are with difficulty diſſolved, are for that very reaſon leſs conducive to health.

The fleſh of old animals, fleſh dried in the ſmoak, hard eggs, ſea fiſh almoſt of all kinds, and very coarſe bread, on account of the rigid and complicated texture of their parts, are for that very reaſon with ſome difficulty concocted by the ſtomach, and converted into juice and blood.

As theſe hard and compact foods require much warmth, abundance of fermentative and ſalival lymph, and a ſtrong ſtomach to disjoin and break their complicated textures, ſo they do not agree but with robuſt conſtitutions, and people that labour hard; for this reaſon the inhabitants of ſome northern countries, ſuch as the Swedes, the Norwegians, the Laplanders, the Finlanders, the Weſtphalians, and the Pomeranians are not eaſily injured by foods of this kind, becauſe their ſtomachs, being not only naturally vigorous, but likewiſe ſtrengthened by cuſtom, eaſily diſſolve and digeſt them.

Of vegetables, roots, fruits, and herbs, eſpecially if eat crude, and before they are ſufficiently ſoftened by boiling, are difficultly concocted by the ſtomach, becauſe their fibrous textures are hard to be diſſolved.

Aliments of the vegetable kind are for that reaſon likewiſe heavy on the ſtomach, ſince they produce many flatulences which diſturb and diſorder the primæ viæ.

To this claſs belong all unripe fruits, peaſe, beans, turnips, rape, bulbous roots, the ſeveral kinds of cabbage, garlic, onions, radiſhes, ſallads prepared of lettices and other herbs, pears, apples, prunes; honey and water, honey, muſt, and all ſweet fruits of whatever kind; for ſuch is the nature of theſe that they eaſily run into a fermentation, or even become ſour, and by reaſon of their viſcid tenacity are reſolved into fumes and vapours.

The tenacious and glutinous parts of animals, among which are the ſtomach, the inteſtines, the ſpleen, the kidnies, the beaks, the vulvæ, the ears, the ſkins, and the claws, are of hard digeſtion, and with difficulty yield to the menſtruum of the ſtomach.

Fat ſubſtances are with difficulty digeſted by the ſtomach, for, if an acid, with which vegetables principally abound, be added to them, they run into a coagulum.

Fat foods require an alcaline liquor for breaking and disjoining their complicated textures; for which reaſon a good deal of bile is requiſite to prevent their proving hurtful to the ſtomach; for, when an acid in the ſtomach attempts the ſolution of fat ſubſtances, hot ſulphureous vapours and eructations are cauſed, which are very troubleſome to the alimentary tube.

The more viſcid, rancid, and old fat ſubſtances are, they are for that reaſon ſo much the worſe. The new and recent are better, and ſooner yield to ſolution and digeſtion.

Hence the reaſon is plain, why the fat of beef is not ſo hurtful, when uſed in the preparation of food, as the fat of mutton, or that of the kid, the ſow, or the gooſe. Hence likewiſe, may a reaſon be aſſigned, why old fleſh ſuch as is hardened in the ſmoak, becauſe of the rancidity which fat contracts, and bacon which has acquired a ruſtineſs and yellow colour, are highly improper for the preſervation of health.

In order to the performance of the office of nutrition, it is neceſſary that the ſmall mouths of the internal rough coat of the inteſtines abſorb the chyle, and convey it to the blood; for which reaſon none of thoſe Aliments, which either obſtruct, or too much corrugate its mouths, can be uſed, without in ſome meaſure injuring health.

Since the effete maſs of Aliments, drained and exhauſted by the ſeparation of the chyle from it, ought by the expanſive and contractive motion of the inteſtines to be thrown off from them, it muſt of courſe follow, that all thoſe Aliments are prejudicial to health, which either paſs through the inteſtines with difficulty, ſtop their motions, or weaken their tone, and impair their ſtrength, by ſuppreſſing excretion ſo neceſſary to health.

All Aliments that are acid, aſtringent, mouldy, glutinous, viſcid, auſtere, or ſuch as eaſily run into a coagulum, are for this reaſon prejudicial to health, becauſe they weaken the tone of the inteſtines, and by that means prevent the ſuperfluous fæces from being diſcharged.

This characteriſtic of unwholeſomeneſs belongs to all unripe ſummer fruits, pears, quinces, pomegranates, medlars, the fruits of the thorn and myrtle, ſea biſcuits, the cruſt of bread; bread that is mouldy, hard, too coarſe, or taken warm from the oven; all farinaceous ſubſtances, gruels made of peaſe, beans, lentils, and millet, cakes or bread not ſufficiently fermented, cheeſe eat too freely, ſheeps milk, and in fine all milky and fat ſubſtances; all which Aliments do ſtill more remarkably hurt the conſtitution, if wine, acids, or cold liquors, are uſed along with them; for by this means they are reduced into a firm coagulum, which adheres immoveably to the coats of the inteſtines, and incruſtates the orifices of their ſmall abſorbent veſſels, whence proceed copious flatulences and ſpaſms.

The unwholeſomeneſs of Aliments is to be eſtimated from their impairing the fermentative and ſolutive powers of the ſtomach, ſince by that means crudities are generated.

The action of the fermentative juice is impaired and weakened by all fat, oily, and very ſweet ſubſtances; by honey, hydromel, or honey and wine, new grapes, ſummer fruits, green figs. All pulſes, farinaceous ſubſtances, gruels made of millet, lukewarm Aliments, the fibrous roots of pot-herbs, cheeſe, and curdled milk, all which are the more prejudicial to health, the greater quantities of them are taken into an empty ſtomach.

Every acid, and every putrefaction, are prejudicial to health; and, for that reaſon, all Aliments which eaſily grow ſour or putrid in the ſtomach, may be juſtly reckoned unwholeſome.

An acid is equally injurious to the primæ viæ and to the blood, for it deſtroys the alcaline and balſamic quality of the bile, coagulates the chyle, and retards the expulſion of the excrement. Add to this, that, when it is mixed with the blood, ſtagnations of the juices and infarctions of the viſcera are generated. And, when the firſt organs of digeſtion are affected by putrified Aliments, and the putrefaction extends itſelf towards the more internal parts, it communicates its own bad diſpoſition to the moſt wholeſome juices. Among thoſe foods which by their long continuance in the primæ viæ grow acid, may be reckoned all ſummer fruits, milk, honey, almoſt all ſorts of tarts, ſweet wines of ſeveral kinds, muſt, hydromel, and fermented bread; and thoſe Aliments which ſooneſt grow putrid by a long ſtay in the primæ viæ, are boiled fleſh; for, of all Aliments uſed by us, none have a greater tendency to putrefaction than fleſh. Wherefore it is for very valuable purpoſes, that nature in acute diſeaſes, and in habits abounding with impure juices, does of her own accord loath and abhor fleſh; and thoſe phyſicians laudably aſſiſt nature in carrying on her deſign, who in caſes of that nature forbid their patients the uſe of nouriſhing broths; for Aliments of this kind wonderfully add to the putrefaction, which is the formal cauſe of the malignity. For this reaſon, when peſtilences or other epidemical diſeaſes rage, it is adviſable to abſtain from fleſh, and uſe acidulated liquors, which ſtrongly reſiſt putrefaction, and by that means prove remarkably ſerviceable; but this is to be underſtood of thoſe conſtitutions which are infirm, weakened with fevers, or loaded with impure juices; ſo that Hippocrates was very juſt in his obſervation, that, the more bodies abounding with impure juices are nouriſhed, the more they are injured. Corrupted fiſh, putrid fleſh, or that of animals which laboured under any diſeaſe, have of all other kinds of food the ſtrongeſt and more direct tendency to produce a putrefaction in the body. *Hoffman's Medicina Rationalis Syſtemat.*

ALLIGATION *Alternate* (*Dict.*)—When two kinds of things only are given to be mixed, the rule of Alligation will give but one anſwer; for inſtance, ſuppoſe it were required to mix brandy, at 8 ſhillings per gallon, with cyder, at 1 ſhilling per gallon, ſo as to make the mixture worth 5 ſhillings per gallon? The operation would ſtand as follows:

$$5\left\{\begin{array}{c|c}8 & 4\\ 1 & 3\end{array}\right.$$

And the anſwer will be, 4 gallons of brandy, and 3 of cyder. Nevertheleſs, let it be obſerved, that any other two numbers, that are in the ſame proportion to each other as 4 to 3, will alſo anſwer the queſtion. Thus, 8 and 6, 12 and 9, 16 and 12, &c. are anſwers to the queſtion; for in theſe the quantity of the mixture is the double, triple, quadruple, &c. of the quantity in the former; and ſo are the parts of which it is compoſed. If three kinds of things are given to be mixed, the rule of Alligation will give but one anſwer; but then, as before, all numbers that are in the ſame proportion between themſelves as the numbers which compoſe that anſwer, will alſo ſatisfy the queſtion.

But this is not all, for, by the help of an artifice, now to be explained, innumerable other anſwers may be obtained, the numbers compoſing which are not in the ſame proportion as above.

Let it be required to mix brandy, at 8 ſhillings per gallon, with wine, at 7 ſhillings per gallon, and cyder, at 1 ſhilling per gallon, ſo that the mixture may be worth 5 ſhillings per gallon? The work, by the rule of Alligation, will ſtand as follows:

$$5\left\{\begin{array}{c|c|c}8 & 4 & 4\\ 7 & 4 & 4\\ 1 & 3{,}2 & 5\end{array}\right.$$

Which ſhews, that 4 gallons of brandy, 4 of wine, and 5 of cyder will anſwer the queſtion.

For 4 galls. of brandy, at 8 s. per gall. are worth 32 s.
4 galls. of wine, at 7 s. per gall. are worth 28 s.
5 galls. of cyder, at 1 s. per gall. are worth 5 s.

Therefore 13 galls. of the mixture are worth — 65 s.

And 1 gall. of the mixture is worth $\frac{65}{13}$ s. = 5 s.

Now let us ſuppoſe, that it ſhould be determined to uſe 5 gallons of cyder in the mixture conſtantly, but to uſe any quantities of brandy and wine that will anſwer the queſtion.

Then may the quantity of brandy be increaſed or diminiſhed by 2, the difference between the prices of the wine and mixture; if, at the ſame time, the quantity of the wine be diminiſhed or increaſed by 3, the difference of the prices of the brandy and mixture.

That is to ſay, to (4) the quantity of brandy, given by the above anſwer, add 2; and, from (4) the quantity of wine, take 3; ſo ſhall the ſum 6, and difference 1, be reſpectively quantities of brandy and wine, which, mixed with 5 gallons of cyder, will anſwer the queſtion.

For 6 galls. of brandy, at 8 s. per gall. are worth 48 s.
1 gall. of wine, at 7 s. per gall. is worth 7 s.
5 galls. of cyder, at 1 s. per gall. are worth 5 s.

Therefore 12 galls. of the mixture are worth — 60 s.

And 1 gall. of the mixture is worth $\frac{60}{12}$ s. = 5 s.

Again; if, from (4) the quantity of brandy given in the firſt anſwer, 2 be ſubtracted; and if, to (4) the quantity of wine, 3 be added; then will 2 and 7, the remainder and ſum, be reſpectively quantities of brandy and wine, which will anſwer the queſtion.

For 2 galls. of brandy, at 8 s. per gall. are worth 16 s.
7 galls. of wine, at 7 s. per gall. are worth 49 s.
5 galls. of cyder, at 1 s. per gall. are worth 5 s.

Therefore 14 galls. of the mixture are worth — 70 s.

And 1 gall. of the mixture is worth $\frac{70}{14}$ s. = 5 s.

Now, if, inſtead of the numbers of the firſt anſwer 4, 4, and 5, larger numbers, in the ſame proportion, viz. 12, 12, and 15, were taken, the following eight anſwers would be found, by increaſing and diminiſhing the quantities of brandy and wine as above directed, the quantity of cyder remaining conſtantly 15, viz.

Brandy 18. 16. 14. 12. 10. 8. 6. 4. 2.
Wine 3. 6. 9. 12. 15. 18. 21. 24. 27.
Cyder 15. 15. 15. 15. 15. 15. 15. 15. 15.

And if, inſtead of theſe, ſtill larger numbers in that proportion, or in proportion as any of the laſt found anſwers, be aſſumed, a greater number of other anſwers may be found.

If, inſtead of ſuppoſing the quantity of cyder invariable, the quantity of brandy be taken for ſuch; then an infinite number of anſwers may be found, by continually increaſing the quantity of wine by (4) the difference between the prices of the cyder and mixture; and the quantity of cyder by (2) the difference between the price of the wine and mixture.

Thus, aſſuming the ſecond anſwer 6, 1, and 5, as the baſis of our work, and eſteeming the 6 gallons of brandy as invariable, the following ſyſtem of anſwers will ariſe:

Brandy 6. 6. 6. 6. 6. 6. 6. 6. 6, &c.
Wine 1. 5. 9. 13. 17. 21. 25. 29. 33, &c.
Cyder 5. 7. 9. 11. 13. 15. 17. 19. 21, &c.

Laſtly, eſteeming the quantity of wine as invariable, the quantity of brandy muſt be increaſed by (4) the difference of the prices of the cyder and mixture; and the quantity of cyder muſt be increaſed by (3) the difference of the prices of the brandy and mixture.

Thus, taking the third anſwer 2, 7, and 5, as the baſis, and making 7 invariable, theſe anſwers ariſe:

Brandy 2. 6. 10. 14. 18. 22. 26. 30, &c.
Wine 7. 7. 7. 7. 7. 7. 7. 7, &c.
Cyder 5. 8. 11. 14. 17. 20. 23. 26, &c.

When there are four kinds of things to be mixed, and two of them are of greater value, and the other two of leſſer value than the mixture, the rule of Alligation will give three anſwers; with either of which, or with any numbers that are in the ſame proportion among themſelves as thoſe, as a baſis, innumerable other anſwers, conſiſting of numbers which are in different proportions among themſelves, may be found, by making any two of them invariable, and changing the reſt in the manner as above.

Note. 1. That the number by which the quantity of any ſimple is to be varied, is always the difference between the price of the mixture, and the price of the other ſimple, which, in any operation, is conſidered as variable.

Note. 2. That if the ſimples, which, in any operation, are conſidered as variable, be both of greater, or both of leſs value than the mixture, then, while the one is increaſed, the other muſt be diminiſhed; but, if the one be of greater value than the mixture, and the other leſſer, then they muſt be both increaſed or both diminiſhed.

Let it be required to mix brandy at 8 ſhillings, wine at 7 ſhillings, cyder at 1 ſhilling, and water at nothing per gallon together, ſo that the mixture may be worth 5 ſhillings per gallon? The three anſwers, by the rule of Alligation, are as follow:

$$5\left\{\begin{array}{c|c|}8 & 5\\7 & 4\\1 & 2\\0 & 3\end{array}\right. \qquad 5\left\{\begin{array}{c|c|}8 & 4\\7 & 5\\1 & 3\\0 & 2\end{array}\right. \qquad 5\left\{\begin{array}{c|c|c|}8 & 5,4 & 9\\7 & 5,4 & 9\\1 & 3,2 & 5\\0 & 3,2 & 5\end{array}\right.$$

Now, taking the laſt anſwer for the baſis of our operation, and making the quantities of wine and cyder invariable, we ſhall have

Brandy 9. 14. 19. 24. 29. 34. 39, &c.
Wine 9. 9. 9. 9. 9. 9. 9, &c.
Cyder 5. 5. 5. 5. 5. 5. 5, &c.
Water 5. 8. 11. 14. 17. 20. 23, &c.

Making the brandy and cyder invariable.

Brandy 9. 9. 9. 9. 9. 9. 9, &c.
Wine 9. 14. 19. 24. 29. 34. 39, &c.
Cyder 5. 5. 5. 5. 5. 5. 5, &c.
Water 5. 7. 9. 11. 13. 15. 17, &c.

Making the wine and water invariable.

Brandy 9. 13. 17. 21. 25. 29. 33, &c.
Wine 9. 9. 9. 9. 9. 9. 9, &c.
Cyder 5. 8. 11. 14. 17. 20. 23, &c.
Water 5. 5. 5. 5. 5. 5. 5, &c.

Making the brandy and water invariable.

Brandy 9. 9. 9. 9. 9. 9. 9, &c.
Wine 9. 13. 17. 21. 25. 29. 33, &c.
Cyder 5. 7. 9. 11. 13. 15. 17, &c.
Water 5. 5. 5. 5. 5. 5. 5, &c.

Making the brandy and wine invariable.

Brandy 9. 9. 9.
Wine 9. 9. 9.
Cyder 10. 5. 0.
Water 1. 5. 9.

Or taking 4 other numbers in the ſame proportion, as 9, 9, 5 and 5, viz. 36, 36, 20 and 20.

Brandy 36. 36. 36. 36. 36. 36. 36. 36.
Wine 36. 36. 36. 36. 36. 36. 36. 36.
Cyder 40. 35. 30. 25. 20. 15. 10. 5.
Water 4. 8. 12. 16. 20. 24. 28. 32.

Laſtly, make the cyder and water invariable.

Brandy, &c. 44. 42. 40. 38. 36. 34. 32. 30. 28, &c.
Wine, &c. 24. 27. 30. 33. 36. 39. 42. 45. 48, &c.
Cyder, &c. 20. 20. 20. 20. 20. 20. 20. 20. 20, &c.
Water, &c. 20. 20. 20. 20. 20. 20. 20. 20. 20, &c.

Not only the ſets of numbers thus found, but their ſums and differences will alſo be anſwers:

	Brandy.	Wine.	Cyder.	Water.
Thus, from or to	42	27	20	20
Take or add	9	9	10	1
The remainder	33	18	10	19
And ſum	51	36	30	21

will be anſwers to the queſtion.

Dodſon.

A'LLUM, or rather ALUM (*Dict.*)—The configurations of this ſalt, examined by the microſcope, are very beautiful and prove more or leſs perfect, according to the ſtrength of the ſolution, and the degree of heat employed in making the experiment; to judge of which a little experience will be found needful.

The ſolution, however, ſated with Allum, will not be found over ſtrong after ſtanding ſome days, for, in that time, it will have precipitated many cryſtals to the bottom, whereby the liquor is ſometimes left too weak for our purpoſe; but then, by holding the phial over or near a fire, the cryſtals will again diſſolve, and be taken up a-new into the fluid. It is not, however, adviſeable to make uſe of it, as ſoon as this is done, unleſs we want to produce nothing elſe but cryſtals; for if, after this, it be employed before it has had a little time to cool and ſettle, it is very apt to form into cryſtals only; but, when it has ſtood about half an hour, a drop placed on a ſlip of glaſs, and heated properly, exhibits commonly, at the beginning, a dark cloud, which appears in motion ſomewhere near the edge, and runs pretty ſwiftly both to the left and right, until it is either ſtopped by the intervention of ſome regular cryſtals, or elſe proceeds onward both ways at once, and nearly of the ſame height; till, having ſurrounded the whole drop, the two ends ruſh together and join: the progreſs towards which is attempted to be ſhewn (*plate* III. *fig.* 2.) at *a a.*

This cloudy part of the drop, that ſeems violently agitated, whilſt it is running round, appears, on a ſtrict examination, to conſiſt of ſalts, ſhot into long and very ſlender lines, much finer than the ſmalleſt hair, which croſs one another at right angles, and form, as they go along, from their internal edges, rows of ſolid cryſtals, compoſed of many oblique plain ſides, *b b.* But it happens frequently, that, in ſome parts of the drop, many minute and circular figures are ſeen, riſing at ſome little diſtances at the edge, whilſt the abovementioned operations are performing in other places thereof; which minute figures, enlarging themſelves continually, appear at laſt of a ſtar-like form, or with lines radiating and diverging from its center, in the manner repreſented at *c c.*

After the buſineſs is over about the edges, a good deal of patience

tience will be requiſite to wait for the configurations in the middle of the drop, which ſeldom begin till the fluid ſeems almoſt wholly evaporated; when, on a ſudden, many ſtraight lines appear puſhing forwards, whoſe ſides or edges are jagged, and from which other ſimilar ſtraight lines and jagged ſhoot out at right angles with the firſt; theſe again have other ſmall ones of the ſame kind ſhooting likewiſe from themſelves, and compoſe, all together, a moſt beautiful and elegant configuration; the order of which is attempted to be ſhewn at D.

Each of theſe lines, increaſing in breadth towards its end, appears ſomewhat club-headed, as *e e e*.

Sometimes, inſtead of ſending branches from their ſides, many of theſe lines riſe parallel to each other, reſembling a kind of palliſadoe, and having numberleſs minute tranſverſe lines running between them, as at F.

But the moſt wonderful part of all, though not produceable without an exact degree of heat and right management, is the dark ground-work ſhewn at G, which conſiſts of an almoſt infinity of parallel lines, having others croſſing them at right angles, and producing a variety ſcarce conceivable from lines diſpoſed in no other manner: the direction of the lines (which are exquiſitely ſtraight and delicate) being ſo frequently and differently counter-changed, that one would think it the reſult of long ſtudy and contrivance.

During the time this ground-work is forming, certain lucid points preſent themſelves to view (on one ſide thereof moſt commonly) which points grow larger continually, with radiations from a center, and become ſtar-like figures, in the manner of thoſe before mentioned. Several of them likewiſe ſhoot out long tails, which give them the appearance of comets: and, at the end of all, a dark lineation, in various directions, darts frequently through, and occupies all or moſt of the ſpaces between them, making thereby no ill repreſentation, when viewed by candle-light, of a night-ſky illuminated with ſhining ſtars, and tailed comets, and rendering the whole ſcene extremely whimſical and pretty.

Nor do theſe configurations break away, or diſſolve, ſoon after their being formed, as many others do; but may be preſerved on the glaſs in good perfection for weeks or months, if care be taken neither to exclude the air wholly from them, nor put them in a moiſt place: for in either caſe they will be ſoon deſtroyed. *Baker's Employment for the Microſcope.*

A'LMOND-TREE, *Amygdalus*, in botany, a beautiful tree, which produces the Almonds. See the article ALMONDS, in the dictionary.

The characters of this genus are, it hath leaves and flowers very like thoſe of the peach-tree; but the fruit is longer, and more compreſſed: the outer green coat is thinner and drier, when ripe, and the ſhell is not ſo rugged.

The ſpecies are: 1. Amygdalus ſativa, fructu majore. C. B. P. The common large Almond. 2. Amygdalus dulcis, putamine molliore. C. B. P. The ſweet Almond, with tender ſhells. 3. Amygdalus amara. C. B. P. The bitter Almond. 4. Amygdalus ſativa, flore albo. The white-flowering Almond.

The firſt, ſecond, and third ſorts are chiefly cultivated in England for the beauty of their flowers, which are produced early in the ſpring, when few other things appear; which renders them worthy of a place in the beſt gardens, where being intermixed with other flowering trees, either in wilderneſs quarters, or in walks, they make a very fine appearance.

They are propagated by inoculating a bud of theſe trees into a plum, Almond, or peach-ſtock, in the month of July (the manner of this operation, ſee under the article of GRAFTING, *Dict.* The next ſpring, when the buds ſhoot, you may train them up either for ſtandards, or ſuffer them to grow for half ſtandards (according to your own fancy) though the uſual method is to bud them to the height the ſtems are intended to be; and the ſecond year, after budding, they may be removed to the places where they are to remain. The beſt ſeaſon for tranſplanting theſe trees (if for dry ground) is in October, as ſoon as the leaves begin to decay; but, for a wet ſoil, February is much preferrable; and obſerve always to bud upon plum-ſtocks, for wet ground; and Almonds or peaches, for dry.

The Almond with white flowers is a greater curioſity than either of the former, and, being intermixed with the other ſorts, and a few of the cherry-plum-trees, which flower all together, add very much to the beauty of theſe plantations: this ſort with white flowers is more difficult to increaſe than either of the former, and will not take upon a plum-ſtock, but muſt be either budded on a peach, or Almond.

The ſort with large fruit produces almoſt every year large quantities with us in England, which, if eaten before they are too dry, are little inferior to thoſe we receive from abroad; but, if kept too long, they are very apt to ſhrivel up, and loſe their plumpneſs; but in other reſpects are very good.

The Jordan Almonds, which are annually brought to England, ſeem to be the ſame as ours with white flowers, by ſome plants which I have raiſed from the nuts, which retain the ſame appearance in leaf and ſhoot, as thoſe with white flowers; but they have not as yet flowered with me, although the trees are grown to a large ſize.

The bitter and ſweet Almonds are only varieties, which will come from the ſame ſeeds; but there is a manifeſt difference between theſe and the white-flowering ſort, both in leaf and ſhoot, ſo as to be diſtinguiſhed thereby at all ſeaſons; yet by later botaniſts they are made but one ſpecies.

The white ſort, coming out earlier in the ſpring than the other, is in greater danger of ſuffering from the froſt in the ſpring, whereby few fruit are ever ſeen upon the trees in this country. *Miller's Dict.*

ALMOND *Furnace*, a ſmall furnace in which the refiners of ſilver out of lead melt flags of the litharge left in this operation, and, with the help of charcoal, reduce them into lead again.

A'LNUS, *the alder-tree*, in botany, the name of a genus of trees, whoſe characters are theſe: the flower is of the amentaceous kind, being compoſed of ſeveral apices, ariſing from four-leaved cups; theſe are affixed in a cluſtering manner to an axis, but theſe are barren. The young fruit appears in a different part of the tree, and is of a ſquamoſe ſtructure, and loaded with embryo ſeeds; this finally increaſes in ſize, and becomes a regular fruit, containing a number of compreſſed ſeeds. *Miller's Dict.*

There are eight ſpecies of this plant enumerated by botanical authors; but the common alder is generally meant by the name.

There is a peculiar beneficial property belonging to this plant, for no beaſt will crop it, be it young or old, which ſaves the great charge and trouble of fencing it after planting. Their propagation is the ſame as the poplar, and, where a place is too wet for that, the alder will flouriſh and become large trees, pollards, or poles for hedges; in ſhort, there is none of the aquatic tribe will raiſe more money and ſooner than the alder, in wet meadow hedges, and in boggy, mooriſh ground, nor make ſtronger and quicker fences, than this excellent plant.

This aquatic will thrive but poorly when raiſed from truncheons, nor much better from the wild ſet or ſucker, which it produces but few of. But there is a way to do this much more to the purpoſe, and that is thus: firſt prepare a bed of well manured fine mould; then lay the full ripe ſeed at a due diſtance from the fire, or in the ſun, and it will cauſe them to open like the fir pine-apple; then ſow the feeds in the bed, and you will have abundance of young plants, that on ſetting out will be ſure to grow, if rightly managed: at midſummer cut away the ſmall ſide ſhoots of this tree, which will prevent their ſecond growth; but, if they are large, you muſt not do it, becauſe it will then make the ſap run out too much, and damage the tree. This is of great conſequence, for, by ſo doing, the large ſide arms are prevented in their growth, which often cauſes knobs and wens that leſſen the value of their wood. *Ellis's Timber-tree improved.*

A'LOE, in botany, the name of a genus of plants, of which Mr. Tournefort has enumerated 14, and Mr. Miller 38 ſpecies. The characters of this genus are theſe: the flower is liliaceous, and conſiſts of one petal, which is of a tubular form, and is divided into ſix ſegments at the edge. In ſome ſpecies of this genus, the cup, and in others the piſtil, finally becomes a fruit, or ſeed-veſſel, of an oblong cylindric form, divided into three cells, and containing flat and ſemicircular ſeeds. The ſoil in which theſe plants thrive beſt, is on half freſh light earth from a common (and if the turf is taken with it, and rotted, it is much better) the reſt ſhould be white ſea-ſand, and ſifted lime-rubbiſh, of each of theſe two a fourth part; mix theſe together ſix or eight months at leaſt before it is uſed, obſerving to turn it over often in this time.

The firſt ſpecies of Aloes is very hardy, in reſpect to cold; and has, in mild winters, endured abroad, being planted in a very dry ſoil, and under a ſouth wall; but, as they are liable to be killed in hard froſts, they generally are kept in pots or tubs in a common green-houſe with oranges, myrtles, &c. but muſt have very little moiſture in winter. Moſt of the other ſorts are better preſerved in an airy glaſs-caſe, in which there is a ſtove to make a little fire in very bad weather; to dry and warm the air in foggy, cold, or wet weather, and to prevent the froſt from entering the houſe.

The fifth, ſixth, ſeventh, eighteenth, thirty-fourth, and thirty-fifth ſorts, require a greater ſhare of heat to preſerve them in winter, and ſhould be ſet in a good ſtove, and kept nearly to the degree of heat marked (upon Mr. Fowler's Botanical Thermometers) temperate. Indeed, moſt of the other ſorts may be kept in the ſame temperature of heat in winter; but then you muſt obſerve, that, the greater the heat is in winter in which you keep them, the more water they will require: and, if they are well managed in this heat, they will grow very much in winter; therefore, great care muſt be taken in the ſevere cold, that it doth not enter the houſe, nor that the heat be at that time leſſened; as alſo how you begin to give them air in the ſpring; for the extreme parts of the plants will be rendered very tender, by their growing freely in winter; and the leaſt check to their growth, at that ſeaſon, is very often their deſtruction.

Moſt of the African ſorts of Aloes produce flowers with us annually, when grown to a ſufficient ſize, which is generally the ſecond, and ſeldom more than the third year, after planting from off-ſets; but the American Aloes (which, for the moſt part, produce their flower-ſtems immediately from the center of the plant) ſeldom flower till they are of a conſiderable age, and this but once during the life of the plant; for when the flower-ſtem begins to ſhoot from the middle of the plant (which, for the moſt part, is of a large ſize, and grows to a great height) it draws all the moiſture and nouriſhment from the leaves, ſo that, as that advances, the leaves decay; and, when the flowers are fully blown, ſcarce any of the leaves remain alive; but, whenever this happens, the old root ſends forth a numerous quantity of off-ſets for increaſe; and it is not till this time that ſome of theſe ſorts can be increaſed, eſpecially the ſecond, third, fourth, fifth, ſixth, and ſeventh ſorts, which never produce any young plants until they flower; at which time, the flower-ſtem of the ſeventh ſort is beſet with ſmall heads from bottom to top, which, being taken off, and planted, will grow as well as ſuckers from the roots.

This Aloe, which, with us, ſeldom makes a very large plant, hath yet produced flower-ſtems of a conſiderable ſize, and fifteen feet in height. The flowers are little leſs than thoſe of the large ſort. I cannot here forbear taking notice of a vulgar error relating to the large American Aloe; which is, that it never flowers till it is an hundred years old; but this is a miſtake; ſince we have had ſeveral of them flower in England, ſome of which were known not to exceed fifty years old; and others, which flowered many years ago, cannot be ſuppoſed to have been in England ſo long as to arrive at that age, ſince they were thought too tender for our climate at that time, when green-houſes were not known; as may be ſeen by looking into Gerrard's and Parkinſon's Herbals.

Thoſe who are deſirous to have this ſort of Aloe flower, may, by giving the plants large tubs for their roots to ſpread, greatly promote their growth, and, in proportion to the growing of the plants, their flowering is haſtened. For, the bud being formed in the center of the plants, when the number of leaves which enfold it are thrown off, the ſtem will advance; ſo that in Spain and Portugal, where the plants grow faſt, they produce flowers in eighteen or twenty years; and in the Weſt-Indies, where they grow faſter, in ſeven or eight.

The African Aloes, for the moſt part, afford plenty of ſuckers, by which they are increaſed; but thoſe few that do not, may be moſt of them propagated, by taking off ſome of the under-leaves, laying them to dry for a week or ten days, as was directed for the off-ſets; then plant them in the ſame ſoil as was directed for them, putting that part of the leaf which did adhere to the old plant, about an inch, or an inch and an half (according to the ſize of the leaf) into the earth, giving them a little water to ſettle the earth about them: then plunge the pots into a moderate hot-bed, obſerving to ſcreen them from the violence of the ſun, and give them gentle refreſhings with water: the beſt ſeaſon for this is in June, that they may puſh out heads before winter. See the article ALOE, in the Dictionary. *Miller's Dict.*

Lignum ALOES, a medicinal wood imported from the Eaſt-Indies, where it is called calambac, or calamba. See CALAMBAC.

ALVE'OLI, among naturaliſts, ſignifies thoſe little waxen cells in the combs of bees, wherein the honey is depoſited. See BEE, *in the Dictionary*.

A'LUM. See the article ALLUM.

ALYSSOI'DES, in botany, a genus of plants, whoſe characters are theſe: it hath a flower in form of a croſs, conſiſting of four leaves, out of whoſe flower-cup riſes the pointal, which afterwards becomes an elliptical thick fruit, divided into two cells by an intermediate partition, which is parallel to the demi-elliptical turgid valves, and filled with round flat ſeeds, having borders round them.

AMARA'NTA, a military order of knighthood, inſtituted, in 1653, by Chriſtina queen of Sweden, daughter of Guſtavus Adolphus, on the following occaſion. At Stockholm, the metropolis of Sweden, is yearly celebrated a feaſt, called wirtſchaft, or feaſt of pleaſure, conſiſting of rich dreſſes, balls, maſquerades, &c. Chriſtina, ambitious of imitating the feaſts of the gods, ordered the nobility to come magnificently apparelled, and repreſent the gods and goddeſſes at the feaſt. The queen took the name of Amaranta, *i. e.* immortal, and joining the young nobles, clad like nymphs and ſhepherds, waited upon the gods at the tables, which were covered with the moſt ſumptuous repaſts. The hall where this feaſt was made, was hung with the richeſt tapeſtry, repreſenting the delightful country of Arcadia, adorned with ſtatues, vaſes, and other ornaments, and ſcented with the moſt agreeable perfumes. Theſe pleaſures laſted a day and night; when the queen, ſuddenly changing her habit, ordered thoſe who had repreſented the gods and goddeſſes to throw away their diſguiſes, and put on their own dreſſes again; and, in memory of ſo elegant a feaſt, inſtituted the order of the Amaranta, from the name which ſhe herſelf had taken.

Aſhmole, in his Hiſtory of the Garter, and Guillim, in his Diſplay of Heraldry, erroneouſly place the inſtitution of this order in the year 1645. Aſhmole ſay that Chriſtina abdicated the crown of Sweden in 1645, in favour of her couſin Charles Guſtavus, on account of her abjuring the Lutheran for the Roman catholic religion; whereas ſhe did not reſign the crown till 1654, nor did ſhe embrace the Catholic religion till 1656; and it was a year before her abdication, that ſhe inſtituted the order of the Amaranta. *Juſtinian's Hiſt. of Military Orders, cap.* 85. 9.

The ceremony of the inveſtiture of the knights of this order is as follows: the queen being ſeated in ſtate, the perſon to be knighted kneels down before her, and, holding his hands between the queen's, takes an oath to defend her perſon from harm, and the perſons of his brother-knights; to incite juſtice, virtue, and piety, and diſcountenance its oppoſers; after which the queen puts about him a crimſon ſilk ſcarf, with the enſign of the order faſtened thereto.— To an abſent prince, or other perſonage, ſhe ſends the jewels, accompanied with her letter, which ſupplies the place of a perſonal inveſtiture.— There have been ſeveral knights and princes of this order.

The chief enſign of this order is a circle of laurel, in which is a cypher compoſed of an A and a V, or two A's, one of which is reverſed. The leaves of the laurel are wreathed about with a white ribbon, upon which is this motto, *Dolce nella memoria.* The whole incircling a gold medal, which hangs to a collar, and is alſo embroidered upon the garment. (See *plate* III. *fig.* 4.) *Trevoux. Hiſt. de Mil. Ord.*

AMARANTHOI'DES *, *globe amaranthus*, or *everlaſting flower*, a genus of plants whoſe characters are theſe: the flowers are ſmall, and cut into four ſegments, which are collected into ſquamoſe heads: from each of theſe ſcales is produced a ſingle flower; the ovary in the bottom of the flower becomes a roundiſh crooked ſeed, which is contained in a thin pellicule, or ſkin.

Theſe plants are ſome of the greateſt beauties amongſt the whole annual tribe: they muſt be ſown very early in a good hot-bed, and treated as will be hereafter directed for the amaranths; with this difference only, that theſe muſt have a greater ſhare of heat, and be forwarded more in the ſpring.

If the autumn ſhould prove cold or wet, it will be very neceſſary to remove the pots, with theſe plants, into ſhelter, otherwiſe they will not perfect their ſeeds, eſpecially if they were not ſown very early in the ſpring. If theſe pots are preſerved in a good green-houſe, their flowers will make a pretty variety amongſt other plants, and will continue until the middle or latter end of November, provided the weather proves not too cold: but what flowers you intend to preſerve, ſhould be gathered ſoon after they arrive at their proper bigneſs; for, if they are ſuffered to remain very long after, the under part of their heads will change brown, and decay.

AMARA'NTHUS, in botany, the name of a genus of plants. The characters are: the flowers have ſeemingly no petals: the cup of the flower is dry and multifid: the ſeeds are included in membranaceous veſſels, which, when come to maturity, burſt open either tranſverſely or horizontally, after the manner of purſlane and pimpernel, in each of which are contained one or more roundiſh ſeeds.

There is a vaſt variety of theſe plants, both in the Eaſt and Weſt-Indies, many of which are extremely beautiful, and as much deſerve our care as any of the flowery tribe. Mr. Miller has enumerated 11, and Tournefort 36 ſpecies of this genus.

All the ſorts of Amaranthus muſt be ſown on a good hot-bed in February, or the beginning of March at fartheſt; and in about a fortnight's time (if the bed is in good temper) the plants will riſe; when you muſt prepare another hot-bed, covered with good rich light earth, about four inches thick; then raiſe up the young plants with your finger, ſo as not to break off the tender roots, and prick them into your new hot-bed about four inches diſtance every way, giving them a gentle watering to ſettle the earth to their roots: but, in doing this, be very cautious not to bear the young plants down to the ground by haſty watering, which rarely riſe again, or at leaſt ſo as to recover their former ſtrength, in a long time, but very often rot in the ſtems, and die quite away.

The Amaranthus tricolor and bicolor muſt be kept longer under the frames than the cock's combs; and, in order to have them very beautiful, it will be proper to make a freſh hot-bed in a glaſs caſe; or, where ſuch a conveniency is wanting, to erect ſome of the lights which were placed over cucumbers, round an hot-bed, and cover thoſe with the ſame lights on the top, ſo as to reſemble a glaſs-ſtove. On this hot-bed you ſhould place your Amaranths, at ſuch a diſtance from each other, as to allow them room to ſpread; obſerving to refreſh them often with water, and in warm weather let them have plenty of freſh air. With this management, the plants may be raiſed five or ſix feet high, and their leaves will come to the moſt beautiful colours; after which they may be expoſed to the open air, and removed to adorn the ſeveral parts of the garden. *Miller's Dict.*

AMBARVA'LIA, in antiquity, the feaſt of perambulation, or proceſſion they made about the plowed and ſown fields in honour of the goddeſs Ceres; like the proceſſion of the papiſts at this day, celebrated upon the feaſt of St. Mark and rogation days, with larger or ſhorter litanies. There were two feaſts at Rome of this name, one in April, or, according to other authors, at the end of January, and the other in July.

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* The word is formed from the Greek ἀμάρανθος and εἶδος, reſemblance.

Twelve prieſts went before a public proceſſion of the citizens, who had lands and vineyards without the city. The ſame ceremony was practiſed in the country by other prieſts among the inhabitants of the villages; they went three times round the ground, every one being crowned with leaves of oak, and ſinging hymns in honour of Ceres, the goddeſs of corn: this ceremony was called Ambervalia, ab ambiendis arvis: the ſacrifices which they offered, after this proceſſion, they called ambarvales hoſtes.

There were three ſorts of them, viz. a ſow, a ſheep, and a bull, which is the reaſon that this threefold ſacrifice was called ſuovetaurilia, which is a word compounded of Sus, Ovis, and Taurus. In the firſt ſacrifice they prayed to the goddeſs Ceres and the god Mars, that they would preſerve their corn from mildew and hail, and bring it to perfect ripeneſs; and, in that of the month of July, they prayed to them to bleſs their harveſt.

Cato has left us the form of prayer uſed on this occaſion, in cap. 141. De Re Ruſtica; but this prayer was made to Mars only. The ſame author hath alſo left us another form of prayer, which was made in the ſecond feaſt of perambulation in the month of July, in which they ſacrificed a ſow. Before they began their harveſt, which they called porca precedanea, this prayer was put up to Janus, Jupiter, and Juno, and not to Ceres, any more than the former. We find likewiſe that this ceremony was performed by the maſter of the family, accompanied with his children and ſervants, every one of them being crowned with oak leaves as well as the ſacrifice, which they led three times round the lanes and vineyards, ſinging hymns to the gods; after which they ſacrificed to them ſweet wine, with honey and milk, as we may ſee by the verſes of Virgil, Georg. lib. 1.

This manner of proceſſion was always uſed in the country where they had no arval prieſts, as at Rome. Virgil, Georg. lib. 1. ver. 343, deſcribes, in a moſt natural and lively manner, the rejoicing of the country people at this feaſt. *Danet's Antiq.*

A'MBER, *Analyſis of* AMBER. Take a capacious glaſs retort, with its neck cut off, ſo as to leave an orifice two inches wide or more; put into it pieces of common Amber, well cleanſed from ſand, duſt, or other foulneſs, ſo that it fill two-thirds of the cavity. Apply a large receiver, and lute the juncture with the common luting; diſtil in a ſand furnace, with a degree of heat a little greater than that of boiling water; thus there will come over a copious, thin, limpid oil: continue this degree of heat, ſo long as any oil comes over, and keep it ſeparate. Then apply the receiver again, and cautiouſly raiſe the fire, till a ſecond oil begins to riſe, which will be yellow, large in quantity, and ſtill tranſparent: proceed patiently with the ſame degree of heat, ſo long as this oil comes over, which it continues to do a conſiderable time; but, for the elegance of the operation, this alſo might be kept ſeparate. Now, again, raiſe the fire gradually, till a white, ſaline, woolly matter appears in the receiver, but particularly in the neck; then gradually raiſe this fire a little, and continue it increaſing, till no more of this matter comes over; but the fire muſt not be increaſed too quick, otherwiſe the volatile ſalt would mix with the groſs oil, that ſhould follow after, and thus be in a great meaſure loſt therein. It is beſt to remove the receiver, take out the productions, and keep them ſeparate; but during the whole time, that this volatile ſalt runs, a red oil alſo comes over, ſtill almoſt tranſparent. The fire being now increaſed to the utmoſt, there comes over a groſs, viſcous, fat oil, thick like turpentine. When this is riſen, if a fire of ſuppreſſion be given, the whole black matter now becomes flatulent, riſes into the neck of the retort, and thus comes into the receiver, in form of a hard black maſs; ſo that, if the neck of the retort be not left wide, it will be thus blocked up, and the glaſs be burſt in a dangerous manner, with a loud noiſe, and often a firing of the matter. But if, before the fire of ſuppreſſion was uſed, a large quantity of ſand were thrown upon this laſt remainder, it will divide the matter, and cauſe it to come over, without danger, in a black and dry form. There remains, at the bottom of the retort, a very ſmall quantity of brittle fæces, of ſcarce any ſignificance, ſo that the whole is volatile. If the operation be carefully performed, ſo many different productions are obtained, which may be purified by a new diſtillation, and be rendered thin and limpid; but the volatile ſalt, collected by itſelf, is perfectly acid, and this is the only method, that I know, whereby a true acid is obtained in a ſolid ſaline form; for we have no inſtance thereof in any other vegetable, animal, or foſſil ſubſtance. Tartar indeed is acid, but, as it is ſcarcely diſſolvable in water, does not deſerve the name of a ſalt. Oil of vitriol, brought to an extreme degree of purity, ſhoots, in winter-time, into tranſparent ſolid cryſtals; but immediately diſſolves again, and appears fluid, as ſoon as the cold is a little diminiſhed; but the ſalt of Amber long continues the ſame.

Remarks.

Amber thus appears to be a very particular body; its oil reſembles the foſſil oils of petroleum, naphtha, and the like; but the remainder, after the firſt and ſecond are come over, nearly reſembles jet, and the acid ſalt ſeems ſomewhat vitriolic. But the ſame thing, concreted, wonderfully differs from thoſe parts, into which chymiſtry reſolves it. Who would think, that Amber, its powder, its liquid ſolution in alcohol, the powder precipitated from its tincture with water after diſtillation, and then waſhed; the oils, ſalt, and colophony after diſtillation; proceeded from the ſame matter? Who could know the proper virtues of each, and who, by joining them together again, could recompoſe Amber? The oils, being purified by a repeated diſtillation, have a ſharp, balſamic, exciting, diaphoretic, dieuritic, emmenagogic, and anti-hyſteric virtue, and when externally uſed, by way of linament, are very ſerviceable in reſtoring contracted, weak, paralytic, torpid limbs: the volatile ſalt is gratefully acid, balſamic, unctuous, penetrating, preſervative, and ſtimulating to the nerves and ſpirits, being a true, volatile, acid, oily ſalt, and therefore a capital anti-hyſteric, and diuretic, eſpecially, if purified by a ſecond diſtillation. *Boerhaave's Chymiſtry.*

The ſhootings of the ſalt of this bitumen obſerved by the microſcope are exceedingly entertaining, though its progreſſions are ſo very ſlow, that ſome patience is neceſſary to wait for and attend to the whole courſe of its configurations: but a curious obſerver will find from it at laſt a pleaſure ſufficient to reward his attention.—Its firſt ſhootings at the edge of the drop, after it has been held for a few ſeconds over the flame of a lamp or candle, appear irregular, as at *a a* (*plate* III. *fig.* 3.) Some figures puſh out ſoon after, beyond the reſt, and are carved and tapering to a point, as *b b*. Very elegant figures will be ſeen forming themſelves in other places at the ſame time, and reſembling ſprigs of fir or yew: numbers of theſe riſe together, each having a main ſtem very thickly beſet with little ſhootings from top to bottom, in ſome on both ſides, but, in others, on one ſide only; which difference will be underſtood by a view of the figures *c c*. The downy feathers of birds appear in the ſame kind of form, when examined by the microſcope. As the progreſſion goes on, branches will be found iſſuing from the ſides of the former ſhootings, vid. *d*: and, in ſome places of the drop, ſeveral gradations of branchings will be perceived to ſucceed one another, to divide and ſubdivide after a moſt wonderful order, repreſenting at the laſt a winter ſcene of trees without leaves, a ſpecimen of which is ſhewn at *e*.— The laſt action of this curious ſalt produces figures exquiſitely delicate, bearing no reſemblance to any thing that preceded, but appearing like the flouriſhes or engravings of a maſterly hand, in the manner repreſented at *f f*. This part of the operation begins not till the water is nearly exhaled, and, whilſt it is performing, the ſcene appears a good deal confuſed; but, after waiting till the water is intirely dried away, a thouſand beauties will preſent themſelves perfectly diſtinct and clear; for the configurations of this ſalt do not break away, or melt in the air, as moſt others do, but may be preſerved on the glaſs ſlip for a long while afterwards, if nothing is ſuffered to rub them off. *Baker's Employment for the Microſcope.*

AMBRO'SIA, in botany, a genus of plants, whoſe characters are: it hath male floſculous flowers, which are produced on ſeparate parts of the ſame plant from the fruit, and have no viſible petals: the fruit, which ſucceeds the female flowers, is ſhaped like a club, and is prickly, containing one oblong ſeed in each.

The ſeeds of this plant ſhould be ſown on a moderate hot-bed in March, and, when the plants are come up two inches high, they muſt be tranſplanted into another moderate hot-bed, allowing each plant three or four inches ſquare; obſerving to water them pretty well, and ſhade them until they have taken new root; afterwards they muſt have a large ſhare of freſh air every day, when the weather is warm, and frequent waterings; for they are very thirſty plants. When the plants are grown pretty ſtrong, they muſt be taken up with balls of earth to their roots, and planted in large pots filled with rich earth; and, if they are placed on a very moderate hot-bed until they are well rooted, it will generally forward their flowering. Toward the latter end of May they ſhould be placed abroad with other hardy annual plants, among which they will make a variety. *Miller's Dict.*

A'MBURY, a kind of wen, or ſpongy wart, growing upon any part of a horſe's body, full of blood.

The manner of curing this excreſcence is, to tie it about hard with a thread, or rather with a horſe-hair, and in eight days it will fall off; then ſtrew upon it the powder of verdigreaſe to kill it at the root, and heal it up again with green ointment; but, if it be flat that nothing can be bound about it, then take it away with an inciſion-knife cloſe to the ſkin, or elſe burn it with a ſharp hot iron, cutting it round-about ſo deep as to leave none of the root behind, and, after having applied turpentine and hog's-lard melted together, heal it up as before: but if this wart grows in a ſinewy part, where a hot iron is improper, eat out the core with oil of vitriol, or white ſublimate; then ſtop the hole with flax dipped in the white of an egg

egg for a day or two, and at laſt dry it up with unſlaked lime and honey. *Markham's Farriery.*

For theſe warts put three ounces of powder of copperas in a crucible, with one ounce of arſenic powdered; place the crucible in the middle of a charcoal fire, ſtirring the ſubſtance, but carefully avoiding the malignant ſteams: when the matter appears ſomewhat reddiſh, take the crucible off the fire, and, after it is cool, break and beat the matter into a very fine powder, incorporate four ounces of this powder, five ounces of album Rhaſis, and make an ointment to be applied cold to warts, anointing them lightly every day, and they will fall off like kernels of nuts, without cauſing any ſwellings in the legs, if the application be ordered ſo as only the warts be anointed, and the horſe be not worked or ridden, during the cure; and, after the warts fall off, dreſs the ſore with the common application called the counteſs's ointment. *Sall. Syl.*

AMENTA'CEOUS, in botany, a term applied to the flowers of certain trees and plants, which are compoſed of a vaſt number of apices, or antheræ, hanging down in form of a rope; ſuch as the hazel, and the like.

A'METHYST (*Dict.*) — Amethyſts may be counterfeited with glaſs, to which the proper colour or ſtain is given. There were fine ones made in France, about the year 1690, which may even impoſe on connoiſſeurs, unleſs the ſtone be taken out of the collet.

The method of giving this colour to glaſs is as follows: take cryſtal-frit, made with the moſt perfect and fine tarſo; then prepare a mixture of manganeſe in powder, one pound; zaffer prepared, one ounce and a half; mix theſe powders well together, and add, to every pound of the frit, an ounce of this powder. Let it be put into the pots with the frit, not into the already made metal. When the whole has ſtood long enough in fuſion to be perfectly pure, work it into veſſels, and they will reſemble the colour of the Amethyſt. *Neri's Art of Glaſs*, p. 92.

AMMONI'ACUM (*Dict.*) — Some of this ſalt diſſolved in water and a drop thereof placed on a ſlip of glaſs, to be examined by the microſcope, will be found to ſhoot with a ſmall degree of heat; which muſt be very carefully obſerved, for, if more heat than juſt enough be given to it, the configurations will run into one another, and make the whole appear in great confuſion.

It begins with ſhooting from the edges great numbers of ſharp, but thick and broad ſpiculæ, from whoſe ſides are protruded, as they riſe, many others of the ſame ſhape, but very ſhort, parallel to each other, but perpendicular to their main ſtem, as at 1. (*Plate* III. *fig.* 5.) Theſe ſpiculæ arrange themſelves in all directions, but for the moſt part obliquely to the plain from whence they riſe, and many are ſeen frequently parallel to one another: which particulars the figure endeavours to expreſs at 1. 1.— As they continue to puſh forwards (which they do without increaſing much in breadth) ſome ſhoot from them the ſmall ſpiculæ only, as at 2. Others, after they are nearly come to their full growth, divide into two branches in a manner different from all other kinds of ſalt I have ever ſeen, by the ſplitting of the ſtem, longitudinally, from the top almoſt to the edges of the drop, but without any ſhootings from the inſide, as is repreſented at 3.— Other branches, beſides the ſmall ſpiculæ mentioned above, protrude longer ones of the ſame form, from whence others alſo proceed: which others ſhoot alſo ſmaller ones from them, and ſo on to many gradations, at at 4.

Before the middle of the drop begins to ſhoot, ſeveral exceedingly minute bodies may be diſcerned at the bottom of the fluid. Theſe riſe to the top in a little while, and as ſoon as their form can be diſtinguſhed, whilſt yet extremely ſmall, they plainly wear the ſame ſhape exactly, which they afterwards appear in when grown much larger, as is ſhewn at 5.— Their growth is very quick, and pretty equal for a time, but at length ſome one branch gets as it were the maſtery, and, ſhooting farther than the reſt, forms the figure at 6. The other branches enlarge but little afterwards, all the attraction ſeeming biaſſed to this alone, from which more branches being protruded, and they again protruding others, the whole appears as at 8.

It is not uncommon to ſee in the middle of the drop ſome different configurations, where, inſtead of the ſtraight ſtems deſcribed above, there is formed a kind of zigzag, with ſpiculæ like thoſe in the other figures, as at 7.

To obtain the cryſtals of this ſalt, it is neceſſary to place a drop of a freſh ſolution (made in warm water) before the microſcope, without giving it any other heat than the warmth of the water. The regular cryſtals will then appear as repreſented at the ſide of the drop A, B, C, *fig.* 6, 7, 8. The laſt of which figures C is produced from the ſecond B, by new formations at each corner of the croſs branches, when the whole proceſs is nearly ended: but the cryſtals are rarely ſeen, unleſs the ſolution be examined, as ſoon as made. *Baker's Employment for the Microſcope.*

AMPHITHE'ATRES, in gardening, are great ornaments to a large and noble garden. If this hill, or riſing ground, is of a ſemicircular figure, it will be ſtill the better.

Theſe Amphitheatres are formed of ever-greens, as hollies, phillyrea's, lauruſtinus's, bays, &c. obſerving to plant the ſhorteſt-growing trees in the front, and the talleſt trees behind, as pines, firs, cedars of Lebanon, &c.

They are alſo formed of ſlopes on the ſide of hills, and covered with turf, and have been eſteemed great ornaments in gardens, but are now generally excluded by perſons of true taſte; for the natural eaſy ſlope of ſuch hills is infinitely more beautiful than the ſtiff angular ſlopes into which theſe Amphitheatres are commonly cut. *Miller's Dict.*

AMY'NTAS, in literature, a beautiful paſtoral comedy compoſed by Taſſo; the model of all dramatic pieces, wherein ſhepherds are actors.

ANA'NAS, the pine-apple, in botany, the name of a genus of plants, whoſe characters are theſe:

It hath a flower conſiſting of one leaf, which is divided into three parts, and is funnel-ſhaped: the embryo's are produced in the tubercles: theſe afterwards become a fleſhy fruit, full of juice: the ſeeds which are lodged in the tubercles are very ſmall, and almoſt kidney-ſhaped.

Tournefort has enumerated three, and Mr. Miller ſix ſpecies of this genus of plants.

Theſe plants are propagated by planting the crowns which grow on the fruit, or the ſuckers which are produced either from the plants, or under the fruit; either of which I have found to be equally good; although, by ſome perſons, the crown is thought preferable to the ſuckers, as ſuppoſing it will produce fruit ſooner than the ſuckers, which is certainly a miſtake; for by conſtant experience I find the ſuckers (if equally ſtrong) will fruit as ſoon, and produce as large fruit as the crowns.

The ſuckers and crowns muſt be laid to dry in a warm place, for four or five days, or more (according to the moiſture of the part which adhered to the old plant or fruit) for, if they are immediately planted, they will rot. The certain rule of judging when they are fit to plant, is by obſerving if the bottom is healed over, and become hard; for, if the ſuckers are drawn off carefully from the old plants, they will have a hard ſkin over the lower part; ſo need not lie ſo long as thoſe which by accident may have been broken. But whenever a crown is taken from the fruit, or the ſuckers from the old plants, they ſhould be immediately diveſted of their bottom-leaves, ſo high as to allow depth for their planting; ſo that they may be thoroughly dry and healed in every part, leſt, when they receive heat and moiſture, they ſhould periſh, which often happens, when this method is not purſued. If theſe ſuckers or crowns are taken off late in the autumn, or during the winter, or early in the ſpring, they ſhould be laid in a dry place in the ſtove, for a fortnight or three weeks before they are planted; but in the ſummer-ſeaſon they will be fit for planting in three or four days.

As to the earth in which theſe ſhould be planted; if you have a rich good kitchen-garden mould, not too heavy, ſo as to detain the moiſture too long, nor over-light and ſandy, it will be very proper for them without any mixture: but, where this is wanting, you ſhould procure ſome freſh earth from a good paſture, which ſhould be mixed with about a third part of rotten neats-dung, or the dung of an old melon or cucumber-bed, which is well conſumed. Theſe ſhould be mixed ſix or eight months at leaſt before they are uſed; but, if it be a year, it will be the better; and ſhould be often turned, that their parts may be the better united, as alſo the clods well broken. This earth ſhould not be ſcreened very fine; for, if you only clear it of the great ſtones, it will be better for the plants than when it is made too fine. You ſhould always avoid mixing any ſand with the earth, unleſs it be extremely ſtiff; and then it will be neceſſary to have it mixed at leaſt ſix months or a year before it is uſed; and it muſt be frequently turned, that the ſand may be incorporated in the earth, ſo as to divide its parts: but you ſhould not put more than a ſixth part of ſand; for too much ſand is very injurious to theſe plants.

In the ſummer-ſeaſon, when the weather is warm, theſe plants muſt be frequently watered; but you ſhould not give them large quantities at a time: you muſt alſo be very careful, that the moiſture is not detained in the pots, by the holes being ſtopped; for that will ſoon deſtroy the plants. If the ſeaſon is warm, they ſhould be watered every other day; but, in a cool ſeaſon, twice a week will be often enough: and, during the ſummer-ſeaſon, you ſhould once a week water them gently all over their leaves; which will waſh the filth off them, and thereby greatly promote the growth of the plants. There are ſome perſons who frequently ſhift theſe plants from pot to pot: but this is by no means to be practiſed by thoſe who propoſe to have large well-flavour'd fruit; for, unleſs the pots be filled with the roots, by the time the plants begin to ſhew their fruit, they commonly produce ſmall fruit, which have generally large crowns on them; ſo that the plants will not require to be new-potted oftener than twice in a ſeaſon: the firſt time ſhould be about the end of April, when the ſuckers and crowns of the former year's fruit (which remained all the winter in thoſe pots in which they were firſt planted) ſhould be ſhifted into larger pots; i. e. thoſe which were in half-penny or three-farthings pots, ſhould be put into penny, or, at moſt, three-half-penny-pots, according to the ſize of the plants; for you muſt be very careful not to over-pot them, nothing being more prejudicial to theſe plants. The ſecond time for ſhifting them is, towards the latter end of Auguſt, or the beginning of September, when you ſhould ſhift thoſe plants which are of a proper ſize for fruiting the following ſpring, into two-penny pots, which are full large enough for any of theſe plants. At each of theſe times of ſhifting the plants, the bark-bed ſhould be ſtirred up, and ſome new bark added, to raiſe the bed up to the height it was at firſt made; and, when the pots are plunged again into the bark-bed, the plants ſhould be watered gently all over their leaves, to waſh off the filth, and to ſettle the earth to the roots of the plants. If the bark-bed be well ſtirred, and a quantity of good freſh bark added to the bed, at this latter ſhifting, it will be of great ſervice to the plants; and they may remain in the tan until the beginning of November, or ſometimes later, according to the mildneſs of the ſeaſon, and will not require any fire before that time. During the winter-ſeaſon theſe plants will not require to be watered oftener than every third or fourth day, according as you find the earth in the pots to dry: nor ſhould you give them too much at each time; for it is much better to give them a little water often, than to over-water them, eſpecially at that ſeaſon. You muſt obſerve never to ſhift thoſe plants which ſhew their fruit, into other pots; for, if they are removed after the fruit appears, it will ſtop the growth, and thereby cauſe the fruit to be ſmaller, and retard its ripening; ſo that many times it will be October or November before the fruit is ripe: therefore, you ſhould be very careful to keep the plants in a vigorous growing ſtate, from the firſt appearance of the fruit, becauſe upon this depend the goodneſs and ſize of the fruit; for, if they receive a check after this, the fruit is generally ſmall, and ill-taſted.

The method of judging when the fruit is ripe, is by the ſmell, and from obſervation; for, as the ſeveral ſorts differ from each other in the colour of their fruit, that will not be any direction when to cut them; nor ſhould they remain ſo long as to become ſoft to the touch before they are cut; for then they become flat and dead, as they alſo do when they are cut long before they are eaten: therefore, the ſureſt way to have this fruit in perfection, is to cut it the ſame day it is eaten; but it muſt be early in the morning, before the ſun has heated the fruit, obſerving to cut the ſtalk as long to the fruit as poſſible, and lay it in a cool, but dry place, preſerving the ſtalk and crown to it, until it is eaten. *Miller's Dict.*

ANA'TTA, or ANNOTTO, a ſort of red dye brought from the Weſt-Indies. It is made of red flowers, which grow on buſhes, or ſhrubs, ſeven or eight feet high. It is thrown, like indigo, into large tubs, or ciſterns, full of water, with this difference, that nothing but the flower is uſed, the leaves of which are ſtripped off, as is done with regard to roſes. Theſe remain in the water till they are rotten; and when, by much ſtirring, they are reduced into a thick liquid ſubſtance, it is expoſed to the ſun to dry, and afterwards made into rolls, or cakes.

There are none but the Spaniards, who now cultivate this plant and prepare the dye in any quantity, the plantations thereof, which the Engliſh of Jamaica had at St. Angels, being ruined. The Engliſh dyers make more account of this drug than of Indigo; and, accordingly, the merchants of Jamaica, who have it from Porto-Rico, buy it 25 per cent. dearer; for they pay but 3 rials per pound for indigo, and 4 for Anatta. The Europeans who trade in this drug have, at preſent, the greateſt part of it from the bay of Honduras. This commodity ſells extremely, and they who buy it at the firſt hand generally get from 40 to 60 per cent. by it. *Savery's Dict.*

A'NCHOR (*Dict.*)— The parts of an Anchor are, 1, The ring *a* (*Plate* III. *fig.* 9.) to which the cable is faſtened. 2, The beam, or ſhank, *b*, *c*, which is the longeſt part of the anchor. 3, The arm *de*, which is that which runs into the ground. 4, The flouke, or fluke, by ſome called the palm, which is that broad and peaked part, with its barbs, like the head of an arrow, which faſtens into the ground, as *e f*. 5, The ſtock, a piece of wood faſtened to the beam near the ring, ſerving to guide the fluke, ſo that it may fall right, and fix in the ground, as *g h*.

There are ſeveral kinds of Anchors. 1, The largeſt is called the ſheet-Anchor, and is never uſed but in violent ſtorms, to hinder the ſhip from being drove aſhore. 2, The two bow-Anchors, or bowers, which are leſs, and are uſed for ſhips to ride in a road, or harbour. They are alſo called the firſt and ſecond bower, or beſt and ſmall bower. 3, When a veſſel is to be brought up or down a river by the winds, though the tide be contrary to it, the ſeamen ſet their fore-ſail, fore-top-ſail, and mizzen-ſail, and let her drive with the tide. If ſhe comes too near the ſhore, they have a little Anchor ready, which is called the rodger, or redgo-Anchor, with a hawſer faſtened to it from the ſhip; and this they drop in the middle of the current, by which means they wind her head about; after which they take up the Anchor again. 4, The ſtream Anchor, is a ſmall Anchor, made faſt to the ſtream-cable, for a ſhip to ride by in gentle ſtreams, and in fair weather. 5, The grapnel, is an Anchor for a ſmall ſhip, or boat.

Merchants, traders, and others, who fit out ſhips for ſea, cannot be too careful with regard to the goodneſs of Anchors, ſince upon them chiefly depends the preſervation of ſhips and cargoes, and even the lives of all thoſe who are on board. In order to make Anchors of a good quality, it is ſometimes the practice to conjoin the brittle iron with ſoft and tough iron; and, for this reaſon, the Spaniſh or Swediſh iron ought to be preferred, and united together, the former being ſoft, and the latter brittle.

Aubin, in his Marine Dictionary, obſerves, that the Anchors of a large veſſel are made ſmaller in proportion than thoſe of a ſmall veſſel. The reaſon of which, ſays he, is, that, though the ſea exerts an equal force againſt a large ſhip as againſt a ſmall one, ſuppoſing that they both have an equal extent of wood in the water, which gives room to the water to act equally againſt an equal extent, yet the ſmall veſſel, on account of its lightneſs, has not the ſame ſtrength with the great one, to reſiſt the force of the water, which muſt be ſupplied by the weight of the Anchor.

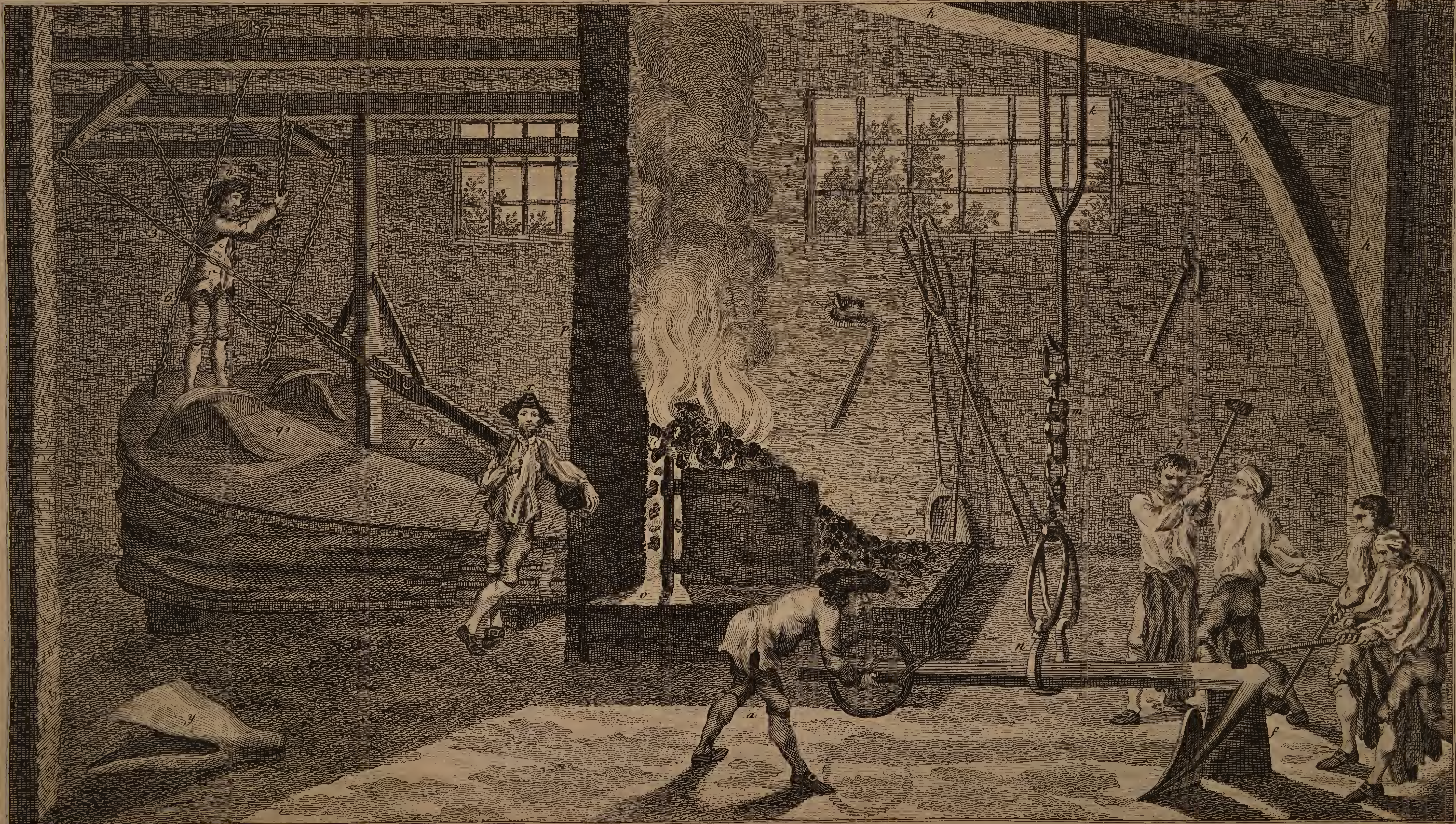
Method of making ANCHORS.— The ſhank, arms, and flukes, are firſt forged ſeparately; then the hole is made at one end of the ſhank for the ring, which, being alſo previouſly forged, is put into the hole in the ſhank, and the two ends ſhut together. After which the arms are ſhut to the ſhank, one after another, and the Anchor finiſhed. But, that the reader may have an idea of the manner how an Anchor is made, we have given a view of it in *Plate* II. where *a* is the foreman, or maſter Anchor ſmith, holding one end of the ſhank of the Anchor, and guiding it under the hammers, as he would have it ſtruck. *b*, *c*, *d*, *e*, Are hammer-men, ſtriking on the Anchor. *f*, The anvil, on which the part of the Anchor to be wrought is laid. *g*, A door which defends the foreman from the prodigious heat of the fire. *h*, *h*, *h*, *h*, the crane which ſupports the Anchor, and which moves on two gudgeons at *i*, *i*. *k*, An iron collar, which may be moved to any part of the crane, as occaſion requires. *m*, The chain, having a ſwivel at the top to admit of turning the Anchor round, when it is carried from the fire to the anvil, and from the anvil to the fire. *n*, The cradle, in which the ſhank of the Anchor is placed near the center of gravity, that the foreman may be able to move it, as he ſees occaſion. Another man generally ſtands by the cradle to aſſiſt the foreman in moving the Anchor; but we have omitted him in the figure, in order to render the cradle and the manner how the Anchor is placed in it more conſpicuous. *o*, *o*, The forge. *p*, The back of the chimney. *q* 1, *q* 2, Two pair of bellows, which are blown by means of the upright piece *r*, the croſs-piece *s* (called, by workmen, the rocking-ſtaff) and the two tumblers *t*, *u*. The man at *x* takes hold of the rocking-ſtaff *s*, and walks forward and backward, by which means both bellows are alternately elevated, and conſequently the fire continually blown. For, as the rocking-ſtaff is moved to or from the back of the chimney, the two ends of the tumblers *t*, *u*, are alternately raiſed and depreſſed, by means of the chains faſtened to them, at is plain from the figure.

In the poſition repreſented in the plate, the upper board of the bellows *q* 1 is raiſed; for the chain 3, having drawn down the end 4 of the tumbler *t*, by that means has raiſed the end 5, which being faſtened by the chain 6 to the upper part of the bellows *q* 1, muſt be alſo raiſed with it. *w*, Is a man ſtanding on the bellows, to give the wind a greater velocity. He ſteps alternately from one pair of bellows to the other, as they deſcend. When a prodigious blaſt is required, ſeveral men ſtand on the bellows at the ſame time. *y*, Is an inſtrument called a tue-iron. It is put in the fire on the noſes of the bellows, which come through the back of the chimney, and not only defends them from the exceſſive heat, but alſo conveys the wind to different parts of the fire. *z*, Is a tool, called a cant-hook. Its uſe is to take hold of the fluke, when the arm is ſhut to the ſhank.

AN'CLE *luxated*, in ſurgery.— The Ancle is ſubject to be luxated, in jumping, or even in walking; and that in all four directions, either inward or outward, backward or forward. When the Ancle is luxated inward, the bottom of the foot is turned outward; and on the contrary, when it is luxated outward, the bottom of the foot is turned inward, which latter caſe indeed is much more frequent than the others. If it is diſlocated forward, the heel becomes ſhorter, and the foot longer than it ſhould be; and, if backward, the contrary ſigns to theſe will appear. The Ancle however can ſcarce poſſibly be luxated outwards, unleſs the fibula be ſeparated from the tibia, or elſe quite broken, which may happen to the external Ancle; nor is it at all uncommon for a luxation of the Ancle to be attended with very grievous ſymptoms, eſpecially when occaſioned by ſome great external violence; nor can it indeed well happen otherwiſe in this caſe, ſince the diſtortion of the foot muſt neceſſarily overſtrain the adjacent tendons, ligaments, and nerves, and thence excite very violent pains, and other bad ſymptoms; or the veins and arteries may alſo be very eaſily lacerated, which will oc-

caſion

PLATE II. *Engraved for the Supplement.* *Facing* Anchor.



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caſion a large extravaſation of blood about the whole foot, which too often gives riſe to a gangrene.

It is however neceſſary to obſerve, that the Ancle is not always luxated, after it has been violently ſtrained by leaping or turning the foot on one ſide; for it ſometimes happens, that the Ancle is not diſlocated on theſe occaſions, but only the parts are violently contuſed and ſtrained. The Ancle, when truly luxated, is more or leſs difficult to be reduced, according to the violence of the force by which the accident was occaſioned. The moſt ready way, however, of reducing a luxation of the Ancle, is, to place the patient upon a bed, ſeat, or table, letting the leg and foot be extended in oppoſite directions by two aſſiſtants, while the ſurgeon replaces the bones with his hands and fingers in their proper ſituation. When the foot is by this means reſtored to its proper poſition, it is to be well bathed with oxycrate and ſalt, and then carefully bound up with a proper bandage. The patient muſt be enjoined to keep his bed for a conſiderable time, till the bad ſymptoms are gone, and the Ancle has recovered its ſtrength ſo far, as to bear the weight of the body, without any uneaſineſs or danger. *Heiſter. Surg.* p. 173.

ANCYLOGLO'SSUM (*Dict.*) ——That operation by which the membrane under the tongue, commonly called the fremulum by phyſicians, is divided or cut; it is ſtyled untying the tongue. This operation is moſt generally performed upon infants, and that with two different intentions; firſt, in very tender infants, when the fore part of their tongue, from the moment of this birth, is ſo cloſely joined to the ſubjacent parts, by means of their membrane, that they cannot move their tongues ſufficiently, or thruſt them ſo far out of their mouths as to be able to ſuck. This operation is alſo performed on children ſomewhat farther advanced, when, by this membrane's being too ſtrait or ſhort, they cannot pronounce articularly, at an age when it might be expected of them. For both theſe reaſons, it is abſolutely neceſſary; but it muſt be remembered, that it is not to be performed promiſcuouſly, and at random, upon all new-born children, as moſt midwives, women, and even ſome men, idly imagine. We have reaſon rather to be aſſured, that it is ſcarce neceſſary in one of a thouſand infants; for experience has ſhewed both myſelf and a great many more ſkilful phyſicians, that this caſe occurs far leſs frequent than hair-lips; for, when a child can thruſt its tongue without its lips, there is nothing amiſs about the fremulum; and it will learn, in proceſs of time, both to ſuck and ſpeak, unleſs there be ſome other defect in the organs neceſſary for theſe purpoſes. On the other hand, if the infant can ſcarce move its tongue, and cannot thruſt it beyond its teeth; or if, in ſome other reſpect, this membrane ſhould fetter the tongue, then a ſkilful inciſion becomes very proper: but becauſe this operation is not to be raſhly performed, leſt, as has frequently been the caſe, the moſt terrible evils, and ſometimes death itſelf, ſhould enſue, it will not be amiſs to direct to the ſafeſt and moſt accurate method of performing it.

The point of the tongue, then, ought to be a little elevated with the left hand, uſing either a linnen cloth, that it may not ſlip through the fingers, (ſee *plate* III. *fig.* 10.) or even with a ſmall fork made for that purpoſe (*fig.* 11.) then as much of the fremulum, as is neceſſary for ſpeech and ſucking, is to be cut with the common blunt-pointed ſciſſars, or an inciſion-knife, betwixt the venæ raninæ and the lower ſalivatory ducts: but this is to be done with a great deal of caution, leſt either the ſalivary ducts, the venæ raninæ, or the nerves of the tongue, ſhould happen to be cut at the ſame time; for, when they are injured, very terrible conſequences enſue. Thus Dionis, in his Surgery, makes mention of an infant, who, by an exceſſive hæmorrhage, in conſequence of the venæ raninæ being cut died very ſoon after the operation. But if a vein ſhould be unluckily cut, which may very readily happen in a fremulum that is too thick and ſhort, a compreſs, ſoaked in vinegar, is to be held a little while under the tongue, till the blood ſtops; but if, at the firſt inciſion, the tongue is not ſufficiently untied, a few days, or even a few weeks after as circumſtances ſhall require, the remaining part of the fremulum is very cautiouſly to be cut with ſciſſars, or an inciſion-knife: then after the operation is over, the finger dipped in honey of roſes, or ſyrup of violets, is very frequently to be rubbed up and down under the tongue, and the wound is to be anointed with it, leſt the cut fremulum ſhould again unite.

From what has been ſaid, it appears that diſorders of this kind are not only leſs frequent, but of more difficult and hazardous cure, than is generally thought. Upon this account, thoſe midwives are miſerably miſtaken, who, concluding with the ignorant multitude, that no infant is born without this defect, thruſt their whole fingers into the infant's mouth, and with their nails deſtroy the fremulum; for it muſt neceſſarily happen, that ſuch a raſh and fool-hardy laceration, by the nails, muſt bring an inflammation of that membrane, convulſions, and often the death of the little patient; for this reaſon, midwives and fooliſh women are not only to be cautioned againſt ſuch practices, but Hildanus is to be carefully conſulted; for he (in Cent. 3. Obſ. 28.) hath very accurately laid down, not only the nature and cure of the diſorder itſelf, but alſo the ſeveral bad conſequences that poſſibly may, and generally enſue, from performing this operation at an unſeaſonable time, or in an uncautious manner. But, when the cutting this fremulum is abſolutely neceſſary, it may be done with much more ſafety, and with much leſs pain to the patient, by the ſciſſars referred to, than by the long nails of a ſimple old woman. *Heiſter's Surgery.*

ANDRA'CHNE, *baſtard orpine*, in botany, the name of a genus of plants, of which there is but one ſpecies, and called by Tournefort and others telephoides. The characters of this genus are theſe:

There are male and female flowers on the ſame plant: the empalement of the male flower is divided into five parts: the flower conſiſts of five leaves, having five ſmall ſtamina in the center: the female flower hath no leaves, but three ſtyles, which reach upon the pointal; which afterwards becomes a capſule with three cells, filled with ſmall ſeeds.

A'NDREW (St.) an order of knights in Muſcovy, founded by Peter Alexiowitz, emperor of Ruſſia, to recompenſe the merits of ſome of his officers, who had diſtinguiſhed themſelves in the war againſt the Turks, in the year 1698. The badge of this order is a golden medal, on one ſide of which is repreſented the croſs of St. Andrew, and on the other are wrote theſe words, Czar Pierre Monarque de tout la Ruſſie. This medal is faſtened to a blue ribbon, which is worn acroſs the right ſhoulder. This order has ſince been conferred on ſuch noblemen as have diſtinguiſhed themſelves in the war againſt the Swedes, as alſo on foreign princes, miniſters, or ambaſſadors. See *plate* III. *fig.* 12.

ANDRO'MEDA, in aſtronomy, the name of a conſtellation of the nothern hemiſphere, repreſenting a woman chained. The number of ſtars in this conſtellation in Ptolemy's catalogue are 23, in Tycho's 22, in Bayer's 27, and in Mr. Flamſteed's 84.

ANE'MONE (*Dict.*)— A ſoil, proper for the blowing theſe flowers to great advantage, may be made as follows:

Take a quantity of freſh untried earth (from a common or ſome other paſture-land) that is of a light ſandy loam, or hazel mould; obſerving not to take it above ten inches deep below the ſurface; and, if the turf be taken with it, the better, provided it hath time to rot thoroughly before it is uſed; mix this with a third part of cow-dung, and lay in an heap, keeping it turned over at leaſt once a month for eight or ten months, the better to mix it, and rot the dung and turf, and to let it have the advantages of the free air: in doing this work, be careful to rake out all great ſtones, and break the clods (but I would by no means approve of ſifting or ſcreening the earth, which I have found very hurtful to many ſorts of roots); for, when earth is very fine, upon the firſt great rains of winter or ſpring, the ſmalleſt particles thereof join cloſely together, and form one ſolid maſs, ſo that the roots often periſh for want of ſome ſmall ſtones to keep the particles aſunder, and make way for the tender fibres, to draw nouriſhment for the ſupport of the root.

The earth ſhould be mixed twelve months before it is uſed, if poſſible; but, if you are conſtrained to uſe it ſooner, you muſt turn it over the oftener, to mellow and break the clods; and obſerve to rake out all the parts of the green ſward, that are not quite rotten, before you uſe it, which would be prejudicial to your roots, if ſuffered to remain. The beginning of September is a proper ſeaſon to prepare the beds for planting (which, if in a wet ſoil ſhould be raiſed with this ſort of earth ſix or eight inches above the ſurface of the ground, laying at the bottom ſome of the rakings of your heap to drain off the moiſture; but, in a dry ſoil, three inches above the ſurface will be ſufficient): this ſoil ſhould be laid at leaſt two feet and an half thick, and in the bottom there ſhould be about four or five inches of rotten neats-dung, or the rotten-dung of an old melon or cucumber-bed, ſo that you muſt take out the former ſoil of the beds to make room for it.

The beſt ſeaſon for planting theſe roots, is about the latter end of September; and, for thoſe of a middle ſeaſon, any time in October; but obſerve to perform this work, if poſſible, at or near the time of ſome gentle ſhowers; for, if you ſhould plant them when the ground is perfectly dry, and there ſhould no rain fall for three weeks or a month after, the roots will be very apt to grow mouldy upon the crown; and, if they once get this diſtemper, they ſeldom come to good after.

In the beginning of April your firſt-planted roots will begin to flower, which continue for three weeks, or more, according to the heat of the weather, or management in covering them, during the heat of the day, with matts or cloths; then the ſecond-planted ſort will come to ſucceed them, and theſe will be followed by thoſe planted in the ſpring, ſo that you may have theſe beauties continued for near two months together, or ſometimes longer, if the ſeaſon be favourable.

Towards the middle or latter end of May, the leaves of your firſt-blown roots will decay; at which time you muſt take them out of the ground, clearing them from decayed ſtalks, and waſhing them, to take the earth clear from the roots; then ſpread them with a matt in a dry ſhady place, till they are perfectly dried, when you may put them up in bags and hang them out of the reach of mice, or other vermin, which will deſtroy many of the roots, if they come at them.

Obſerve alſo to take up the latter-planted roots, as ſoon as their leaves decay; for, if they are ſuffered to remain long after in the ground, and there ſhould fall ſome ſhowers of rain, they would ſoon put forth freſh fibres, and make new ſhoots, when it would be too late to remove them: at the time when you take up the roots, is the proper ſeaſon for breaking or parting them, which may be done by ſeparating thoſe that you would chuſe to make all poſſible increaſe from, into as many parts as you can conveniently, provided each of them have a good eye or bud; but thoſe you intend to blow ſtrong, ſhould by no means be parted too ſmall, which greatly weakens their flowering. *Miller's Dict.*

ANE'MOSCOPE.— Under this article in the Dictionary, we have mentioned the Anemoſcope invented by Otto Gueric; we ſhall here give a deſcription of a very curious machine of this kind, invented by the learned Mr. Pickering.

The Anemoſcope is a machine four feet and a quarter high, conſiſting of a broad and weighty pedeſtal, a pillar faſtened into it, and an iron axis, of about half an inch diameter, faſtened into the pillar. Upon this axis turns a wooden tube, at the top of which is placed a vane, of the ſame materials, 21 inches long, conſiſting of a quadrant, graduated and ſhod with an iron rim, notched to each degree; and a counterpoiſe of wood, as in the figure, on the other. Through the center of the quadrant runs an iron pin, upon which are faſtened two ſmall round pieces of wood, which ſerve as moveable radii to deſcribe the degrees upon the quadrant, and as handles to a velum or ſail, whoſe plane is one foot ſquare, made of canvas ſtretched upon four battens, and painted. On the upper batten, next to the ſhod rim of the quadrant, is a ſmall ſpring, which catches at every notch correſponding to each degree, as the wind ſhall, by preſſing againſt the ſail, raiſe it up; and prevents the falling back of the ſail, upon the leſſening of the force of the wind. At the bottom of the wooden tube is an iron index, which moves round a circular piece of wood faſtened to the top of the pillar on the pedeſtal, on which are deſcribed the thirty-two points of the compaſs. The figure of this machine may be ſeen *plate* III. *fig.* 13. where *a* Is the pedeſtal. *b*, The pillar, in which the iron axis is fitted. *c*, The circle of wood, on which are deſcribed the 32 points of the compaſs. *e*, The wooden tube upon its axis. *f*, The velum. *g*, The graduated quadrant. *h*, The counterpoiſe of the vane.

Fig. 14. The velum taken off. *a*, The plane of the velum. *b*, The ſpring. *c*, *c*, The wooden radii. *d*, *d*, The holes through which the pin in the center of the quadrant goes. Its uſes are the following.

1. Having a circular motion round the iron axis, and being furniſhed with a vane at top, and index at the bottom, when once you have fixed the artificial cardinal points, deſcribed on the round piece of wood on the pillar, to the ſame quarters of the heavens, it gives a faithful account of that quarter from which the wind blows.

2. By having a velum or ſail elevated by the wind along the arch of the quadrant, to an height proportionable to the power of the column of wind preſſing againſt it, the relative force of the wind, and its comparative power, at any two times of examination, may accurately be taken.

3. By having a ſpring fitted to the notches of the iron with which the quadrant is ſhod, the velum is prevented from returning back upon the fall of the wind; and the machine gives the force to the higheſt blaſt, ſince the laſt time of examination, without the trouble of watching it.

I have carefully examined the dependence that may be had upon the machine, during the late ſtorms in February 1743-4, by comparing the height, to which the wind then forced the velum, with the Deal letter. The 19th of February, Sabbath. 8 a. m. the Anemoſcope was at 75: the Deal letter for that day called it a ſtorm. The Saturday following, being the 25th at 8. p m. the machine was at 79: the Deal letter called that a violent ſtorm. The Wedneſday following, the laſt of February it was 84: the Deal letter called that a violent ſtorm. So that it appears, that, in ſuch as the ſailors allow to be violent ſtorms, the machine has hitherto anſwered well, and has had ſix degrees to ſpare for a more violent guſt, before it comes to an horizontal poſition.

It is certainly to be depended upon in ordinary weather, the velum being hung ſo tender, as to feel the gentleſt breeze. But, after all, I muſt freely own, that I fear the expoſing this machine to all winds, for a continuance, muſt ſoon diſorder it; and that irregular blaſts and ſqualls cannot fail in a ſhort time to impair it. It may not therefore be amiſs, to prevent this, for gentlemen to take the machine in, in violent weather; and, by taking the tube of the iron axis, to make their obſervations with the tube, vane, and velum, in their hands; which, as it is very light, and far from cumberſome, is eaſy to do, as I have often experienced. *Philoſ. Tranſ. Numb.* 473.

A'NGEL *(Dict.)* — St. Hilary remarks that the word Angel does not ſo much denote their nature, as their office, ſignifying as much as nuncius, a meſſenger, or perſon employed to carry orders, or declare one's will. Thus it is St. Paul repreſents Angels, Heb. i. 14. where he calls them miniſtring ſpirits. And for the ſame reaſon the name is given in the prophet Malachi to prieſts. Jeſus Chriſt himſelf is called, by the Septuagint, the Angel of the mighty council, a name, ſays Tertullian, which ſhews his office, not his nature. So the Hebrew word Angel, uſed in ſcripture, is alſo a name of office, ſignifying legate, envoy, miniſter. Yet cuſtom has prevailed, and the name Angel is commonly interpreted to ſhew their nature.

Nothing is more frequent, in ſcripture, than the miſſions and apparitions of good and bad Angels: God ſends them to declare his will, to correct, teach, reprove, and comfort: God gave the law to Moſes, and appeared to the old patriarchs by the mediation of Angels, who repreſented him and ſpoke in his name. The exiſtence of Angels is ſuppoſed in all religions.

Though the Jews in general believed the exiſtence of Angels, there was a ſect among them (the Sadduces) who denied the exiſtence of all ſpirits whatever, God only excepted: and yet the Samaritans and Caraites, whom the Jews repreſent as Sadduces, acknowledged ſuch beings. Before the Babyloniſh captivity the Hebrews ſeem not to have known the name of any Angel: the Talmudiſts ſay they brought them from Babylon: it is true, we find many of them, called by their names in the book of Enoch; but this we know is ſpurious, and was written after the captivity we are ſpeaking of. Tobit, who is thought to have lived at Nineveh, ſome time before the captivity, is the firſt who has called an Angel by his proper name; he mentions Raphael, who conducted Tobias into Media, and Daniel, who lived at Babylon ſome time after Tobit, has taught us the names Michael and Gabriel. In the New Teſtament we find only the two latter Angels mentioned by name. It has been queſtioned, whether the antient Hebrews paid divine homage to Angels or not. The form of benediction, which Jacob uſed in bleſſing the ſons of Joſeph, (the Angel which redeemed me from all evil bleſs the lads) may ſeem to imply that they did. The Rabbins in gloſſing upon this text obſerve, that the prayers of their anceſtors were not directly addreſſed to Angels, but it was really God they invoked, when they prayed to them; they only go to them as to the king by his miniſters, and as one that preſents his petition to the firſt officer of the crown, yet ſtill looks to the king, as the ſource and ſpring of his happineſs and favour that he has received. But this expoſition is refuted by others, who remark that, Jacob, after he had directly applied himſelf to God, and begged of him both temporal and eternal bleſſings on his two grand-ſons, then addreſſed himſelf to the Angel, to obtain of him, that he would keep them from all evil; from whence they conclude, that Jacob addreſſed his prayers directly to the Angel, to whom he aſcribed the power of preſerving from evil, whilſt he left to God the privilege of beſtowing all that was good; and if the prayer of the patriarch was implicitly addreſſed to God, as the fountain of goodneſs, yet he certainly prayed explicitly to the Angel. But, notwithſtanding this diſpute, the beſt chriſtian expoſitors deny that this invocation of Jacob implies any thing like a prayer to the Angel. Some indeed conceive, that the Angel in this place is the ſecond perſon in the trinity; an opinion refuted by others, who more juſtly ſay, that Jacob intended no more than a deſire that his children might enjoy the angelic protection, by the ſpecial favour of God to them; for it is ſuch an expreſſion as that of David to a contrary purpoſe, Let the Angel of the Lord perſecute them, where no one will ſay he prays to an Angel, though his words are exactly like thoſe of Jacob.

There are divers opinions concerning the time when Angels were created. Some think they were created at the ſame time as the heavens; and that Moſes included them under this name, ſaying, In the beginning God created the heavens. Others have conjectured, that he inclined to repreſent them under the name of light, which God created the firſt day; of this opinion is St. Cyril. Others again have aſſerted, that they were created before the ſenſible world, which opinion Job ſeems to favour, when he ſays, Where waſt thou when I laid the foundation of the earth, — and all the ſons of God ſhouted for joy? The Hebrews think they were created on the ſecond day of the world, and that God conſulted with the Angels when he ſaid, Let us make man in our own image. Others are of opinion, that Angels were created on the fifth day. Origen, and other Greek and Latin fathers, think they exiſted before the world; and Dr. Hyde thinks a very long time before the world. See Baſnage's Hiſt. des Juiffs, lib. 4. cap. 9. The philoſophers of the Peripatetic ſect believed they were coæval with God, and, conſequently, that they exiſted from all eternity. The Greek fathers of the Chriſtian church were generally inclined to believe they were created before the world. Some few indeed were of different opinions, among whom is Epiphanius.

Though it is an univerſal opinion, that Angels are of a ſpiritual, incorporeal nature, yet many of the old fathers, miſled by a paſſage in Geneſis, where it is ſaid, that the ſons of God (or the Angels) ſaw the daughters of men, that they were fair, and they took them wives of all which they choſe, imagined them to be corporeal and capable of ſenſible plea-

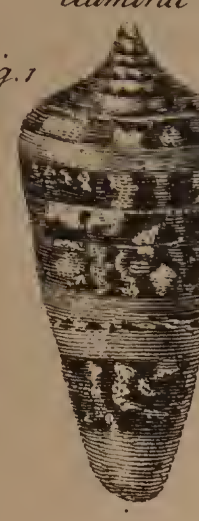
Admiral

Fig. 1

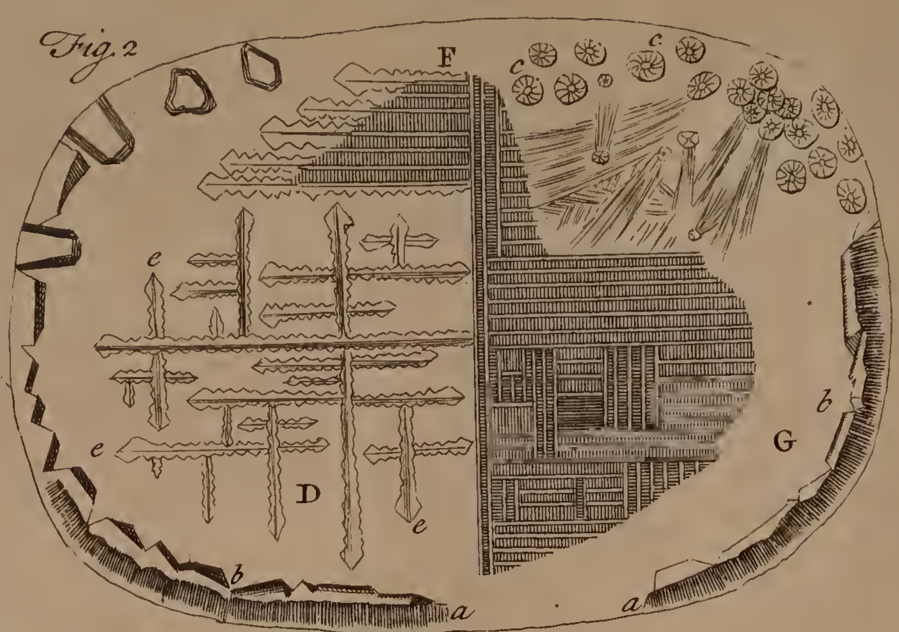
Allum

Fig. 2

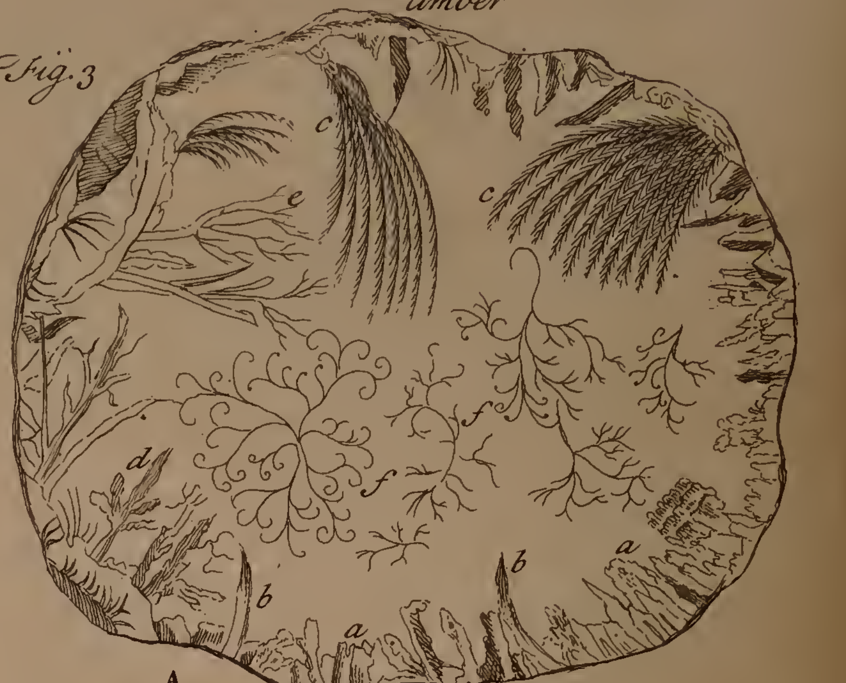
Amber

Fig. 3

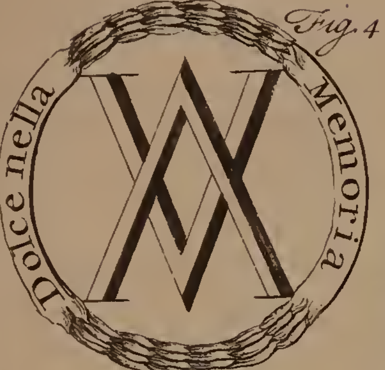
Amaranta

Fig. 4

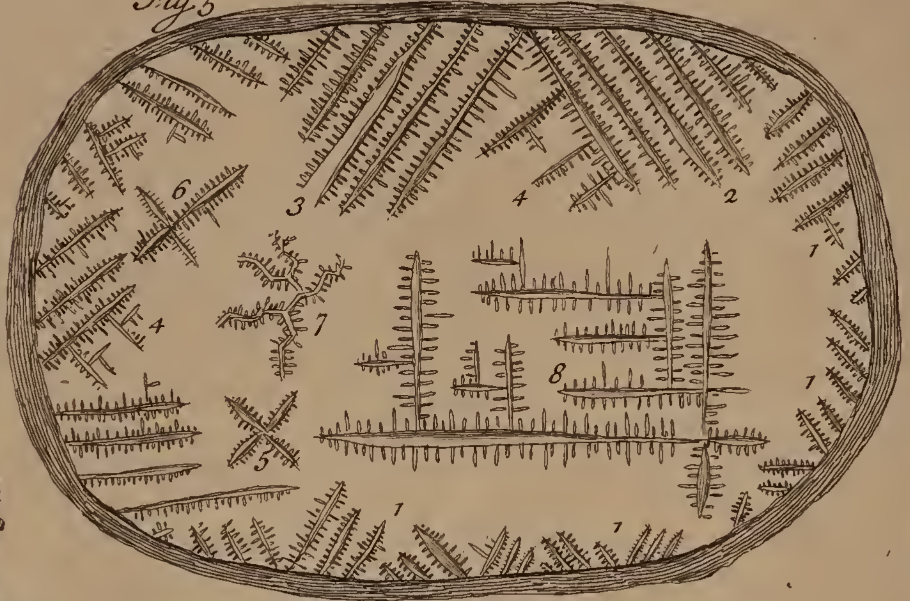
Ammoniacum

Fig. 5

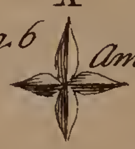
Fig. 6 A *Ammoniacum*

Fig. 7 B *Ammoniacum*

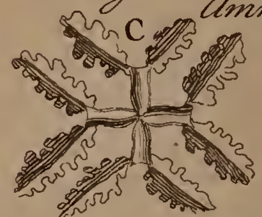
Fig. 8 C *Ammoniacum*

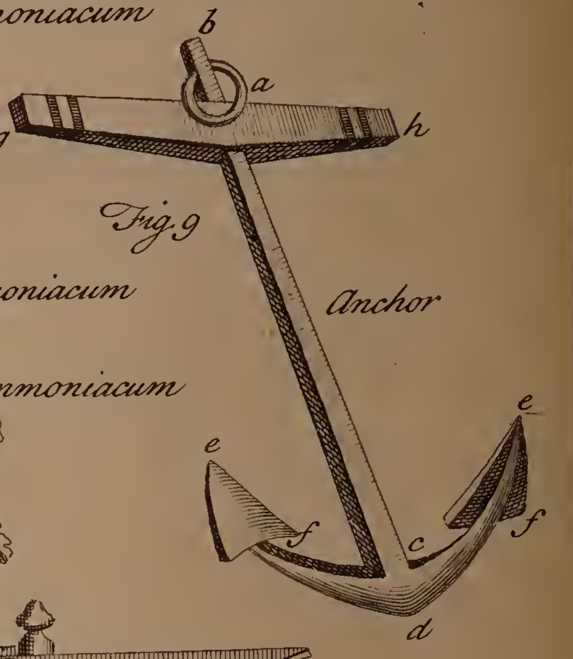
Fig. 9

Anchor

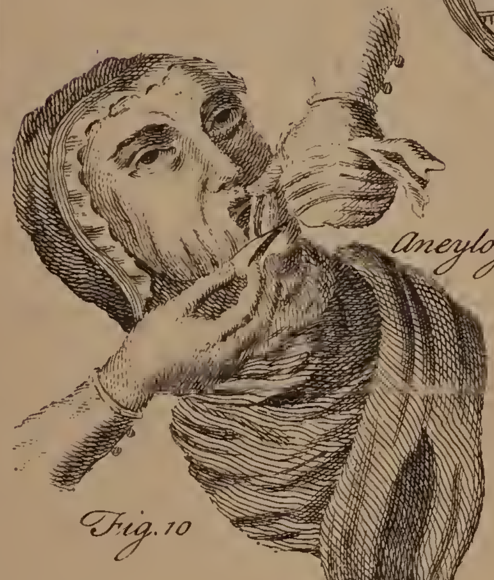
Aneyloglossum

Fig. 10

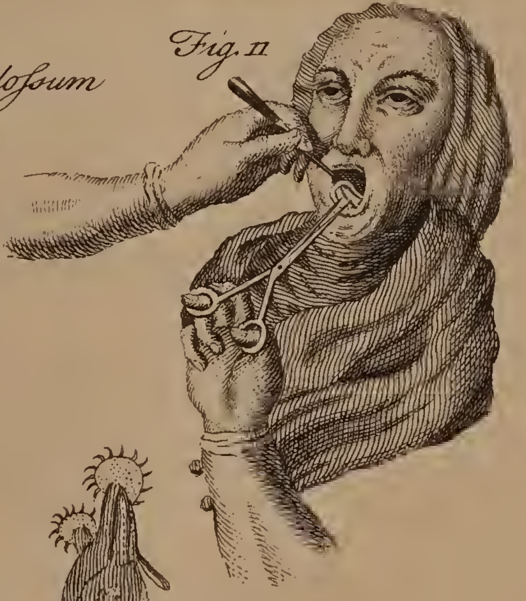
Fig. 11

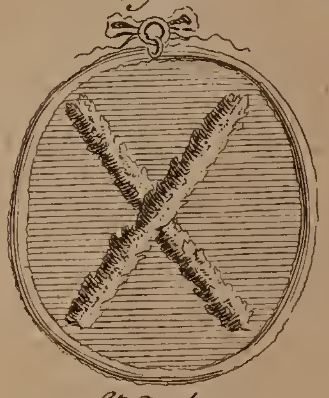
Fig. 12

S.t Andrew

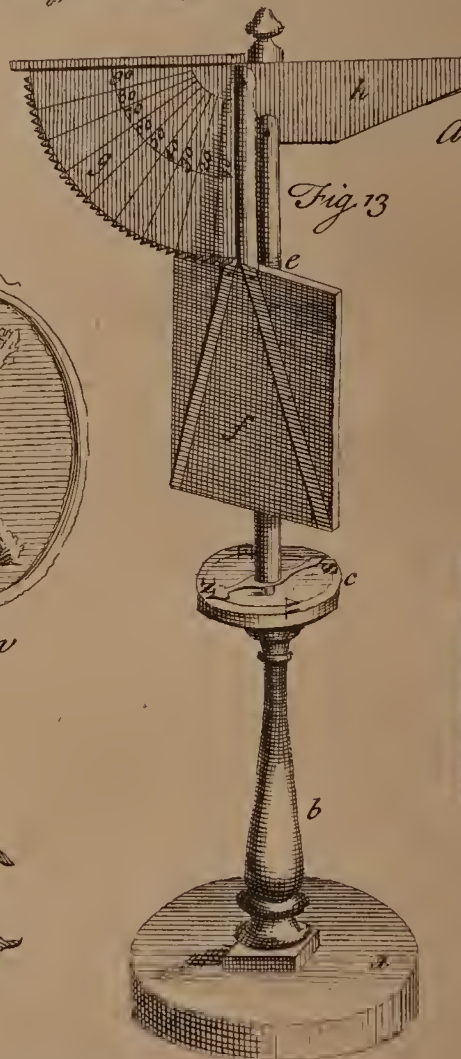
Anemoscope

Fig. 13

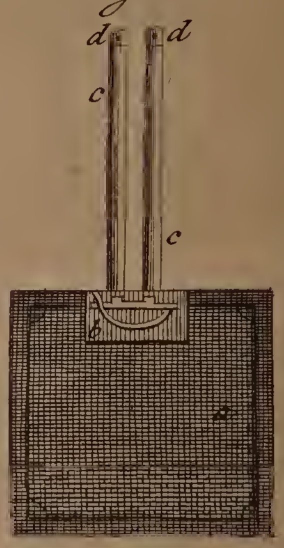
Fig. 14

Wheel Annimal

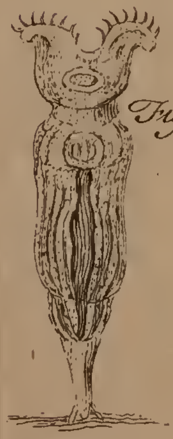
Fig. 15

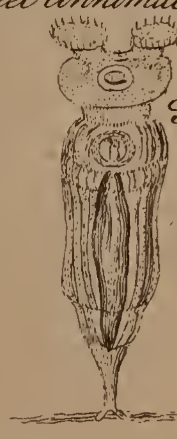
Fig. 16

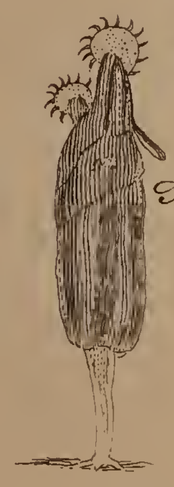
Fig. 17

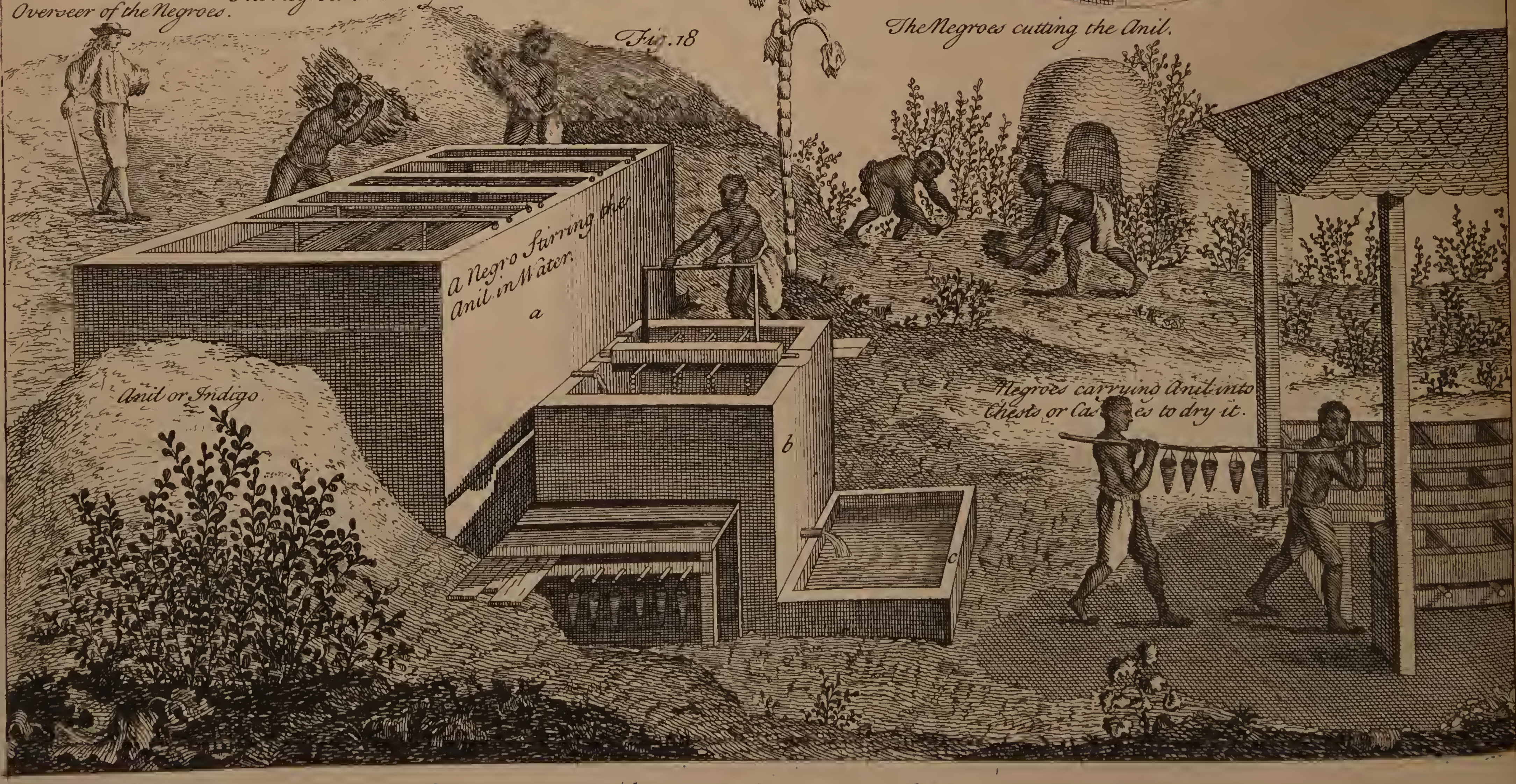
Fig. 18

Overseer of the Negroes.
The Negroes throwing Anil into the Water.
The Negroes cutting the Anil.
A Negro Stirring the Anil in Water.
a
Anil or Indigo.
b
c
Negroes carrying Anil into Chests or Ca[illegible]es to dry it.

pleaſures. Other fathers indeed, and thoſe in great number, have aſſerted Angels to be purely ſpiritual, and this at preſent is the common opinion of the ſchools.

There have been a great many diſputes and varieties of fancy, concerning the number, order, nature, and power of Angels; moſt of which are not to be reſolved by ſcripture or tradition. The author of the books De Hierarchia cœleſti, who wrote about the beginning of the ſixth century, is the firſt who ventures to range the Angels into three hierarchies, and nine orders. The Jews likewiſe diſtinguiſh them into ſeveral orders, and ſet, as it were, a general at the head of them; they call him Metatron, the ſame with the Chriſtian St. Michael.

As to the office or employment of Angels, ſome are ſaid to preſide over empires, nations, provinces, cities, and particular perſons. Theſe latter are ſtiled guardian Angels. Thus St. Michael is acknowledged to be the protector of the people of Iſrael; and the Angel Gabriel ſpeaks of the Angel who was protector of Perſia, according to the generality of interpreters, when he ſays that the prince of the kingdom of Perſia withſtood him one and twenty days. St. John wrote his Revelations to the Angels of the ſeven Chriſtian churches in Aſia minor, whereby he does not mean only the biſhops of thoſe churches, but, in the judgment of many of the fathers, the Angels likewiſe who were appointed for their protection. The learned Dr. Prideaux obſerves, that the miniſter of the ſynagogue, who officiated in offering up the public prayers, being the mouth of the congregation, delegated by them, as their repreſentative, meſſenger, or Angel, to ſpeak to God in prayer for them, was therefore, in the Hebrew language, called the Angel of the church; and from thence the biſhops of the ſeven churches of Aſia are, by a name borrowed from ſynagogue, called the Angels of thoſe churches. As to guardian Angels, they are very clearly deſcribed in the Old Teſtament. Jacob ſpeaks of the Angel who had been his guide in all his journies, and had delivered him out of all his dangers. The pſalmiſt, in ſeveral places, mentions Angels as the protectors of the righteous. In the New Teſtament, we hear of St. Peter's Angel, who ſet him at liberty; and Jeſus Chriſt enjoins us not to deſpiſe little ones, becauſe their Angels continually behold the face of God. The Jews, and the very Heathens, believed that particular Angels were commiſſioned to attend us, and had the care of our conduct. Heſiod, the moſt antient, or, at leaſt, one of the moſt antient Greek authors, ſays, that there are good Angels upon earth, ſent by Jupiter, for the protection of mankind, and to obſerve the good or evil, which they practiſe. Plato ſays, that every one of us has two dæmons, or two genius's, one inclining us to evil, the other directing us to good; though Apuleius ſays, that Plato aſſigned but one dæmon to every man. The antient Chriſtians, as Origen and St. Auguſtine, aſcribe to Angels the office of preſenting our prayers to God; and the Chriſtians, in general, agree with the Platoniſts, that God makes uſe of the miniſtry of Angels, to carry his orders, to work miracles, and to foretel future events.

A'NGLING, is an excellent art, which, as it pleads great antiquity, ſo the knowledge thereof is not without great difficulty to be obtained; but ſome obſervations concerning it will not be amiſs. And, firſt, the angler muſt remember by no means to fiſh in light and dazzling apparel, but his cloathing muſt be of a dark ſky colour; and, at the places where he uſes to angle, he ſhould once in four or five days, or oftener, if for carp or tench, caſt in corn boiled ſoft: he may alſo caſt in garbage, beaſts livers, worms chopped in pieces, or grains ſteeped in blood and dried, which will attract the fiſh thither: and, in fiſhing, to keep them together, throw in half a handful of grains of ground malt, which muſt be done in ſtill water; but in a ſtream you muſt caſt your grains above your hook, and not about it; for, as they float from the hook, ſo will they draw the fiſh after them. If you would bait a ſtream, get ſome tin boxes made full of holes, no bigger than juſt fit for a worm to creep through, which fill therewith; and, having faſtened a plummet to ſink them, caſt them into the ſtream, with a ſtring faſtened thereto, that they may be drawn out at pleaſure; by the ſmallneſs of the holes, the worms can crawl out but very leiſurely, and, as they crawl, the fiſh will reſort about the boxes.

If in a ſtream you would bait for ſalmon, trout, umber, or the like, take ſome blood, and incorporate therewith fine clay, barley and malt, ground, adding ſome water thereunto; all which make into a paſte with ivy gum, then form it into cakes, and caſt them into the ſtream: if you find your bait take no effect in attracting the fiſh, you may then conclude ſome pike or perch lurk there to ſeize their prey, for fear of which the fiſh dare not venture thereabout; take therefore your troll, made either of brandlings or lob-worms, or you may uſe gentles or minows, which they will greedily ſnap at. As for your rod, it muſt be kept neither too dry nor too moiſt, leſt the former make it brittle, and the latter rotten; and, if it be ſultry dry weather, wet your rod a little before you angle, and, having ſtruck a good fiſh, keep your rod bent, and that will hinder him from running to the end of the line, whereby he will either break his hold or hook. And if you would know what bait the fiſh loves beſt, at the time of your fiſhing, when you have taken one, ſlit the gill, and take out the ſtomach, opening it without bruiſing, and there you will find what he fed on laſt, and had a fancy to, whereby you may bait your hook accordingly. When you fiſh, ſhelter yourſelf under ſome buſh or tree, ſo far from the brink of the river, that you can only diſcern your float; for fiſh are timorous, and very eaſy to be affrighted: and you will experimentally find the beſt way of Angling with a fly is down the river, and not up; neither need you ever make above ſix trials in a place, either with fly or ground bait, when you angle for trout, for by that time he will either offer or take, or refuſe the bait, and not ſtir at all; but if you would have fiſh bite eagerly, and without ſuſpicion, you may preſent them with ſuch baits as they are naturally inclined to, and in ſuch manner as they are accuſtomed to receive; and, if you uſe paſte for baits, you muſt add flax or wool, with which mix a little butter to preſerve it from waſhing off the hook: and, laſtly, Note,

That the eyes of ſuch fiſhes as you kill, are moſt excellent baits on the hook for almoſt all ſorts of fiſh.

Cautions to be obſerved in ANGLING, *as to the ſeaſons of the weather, the time of the day and year, &c.*

In Angling you ought ſo to place yourſelf, that your ſhadow do not at any time lie upon the water, if ſhallow; but in deep waters that is not ſo neceſſary to be obſerved; yet, that you may be exact, you ſhould make uſe of all the advantages that the place will afford.

In a pond it is beſt to angle near the ford where the cattle go to drink, and in rivers in thoſe places where ſuch ſort of fiſh as you intend to angle for, uſually frequent; as for breams, in the deepeſt and quieteſt part of the river; for eels under hangings over banks; for chub, in deep ſhaded holes; for perch, in ſcowrs; for roach, in the ſame places as perch; for trouts, in quick ſtreams, and with a fly upon the ſtream on the top of the water.

And, if you fiſh in ſuch places where you can diſcern the gravelly bottom, then be ſure you conceal yourſelf as much as poſſible.

In ſuch waters as are peſtered with weeds, roots of trees, and ſuch-like, fiſh lie cloſe and warm, and reſort thither in great ſhoals, and there they will bite freely; but take great care how you caſt in the hook, and how you ſtrike a bite, for the leaſt raſhneſs loſes hook and line.

And, if the hook happens to be entangled, you ſhould be provided with a ring of lead, about ſix inches round, faſtened to a ſmall pack-thread; this ring you muſt put over the rod, letting it go into the water, holding faſt by the other end of the pack-thread, and work it gently up and down, and it will ſoon diſengage the hook.

It is good Angling in whirlpools, under bridges, at the falls of mills, and in any place where the water is deep and clear, and not diſturbed with wind or weather.

The beſt times are from April to October, for, in cold, ſtormy, and windy weather, the fiſh will not bite; and the beſt times in the day are from three till nine in the morning, and from three in the afternoon till ſun-ſet.

If the wind be eaſterly, it will be in vain to go to angle; but you may angle well enough if it blow from any other point, provided it do not blow hard; but it is beſt in a ſoutherly wind, and a cloſe, lowering, warm day, with a gentle wind, and after a ſudden ſhower to diſturb the water, at which time they will beſt riſe at the fly, and bite eagerly; and, the cooler the weather is in the hotteſt months, the better it is.

In winter, all weathers and all times are much a like, only the warmeſt are the beſt.

It is very good Angling a little before the fiſh ſpawn, for then, their bellies being full, they frequent ſandy fords, to rub and looſen their bellies, at which time they will bite freely.

It is alſo very good Angling in a dull, cloudy day, after a clear, moon-ſhiny night, for in ſuch nights they are fearful to ſtir to get food, lying cloſe, ſo that, being hungry the next day, they will bite boldly and eagerly.

At the opening of ſluices and mill-dams, if you go with the courſe of the water, you can hardly miſs of fiſh that ſwim up the ſtream to ſeek for what food the water brings down with it.

It is beſt Angling at the ebb, in waters that ebb and flow; but yet the flood is to be preferred, if the tide is not ſtrong. *Sportman's Dict.*

A'NGLO-SA'XON *Language*, that ſpoken by the Angles or Saxons ſettled in England. This language is properly the original of our preſent Engliſh, being that ſpoken by our Saxon anceſtors firſt eſtabliſhed in this iſland. It is now called Anglo-Saxon, to diſtinguiſh it from the modern or preſent Engliſh.

A'NIL, in botany, the indigo-plant, the name of a genus of plants, of which there are three ſpecies. The characters are: It hath pinnated leaves, which are terminated by a ſimple lobe at the extremity; the flowers conſiſt of five leaves, of the papilionaceous kind, the uppermoſt petal being larger than the others, rounder, and lightly furrowed on the ſide:

the lower petals are ſhort, and terminate in a point: in the middle of the flower is ſituated the ſtyle, which afterwards becomes a jointed pod, containing one cylindrical ſeed in each partition.

Under the article INDIGO in the Dictionary, we have given a ſhort account of the method of making indigo; but as this is an article of great importance in commerce, dying, &c. we ſhall here, from Father Labat, give a full account of the whole proceſs, with the manner of cultivating this plant.

There was formerly a great deal of indigo made in the pariſh of Macauba: there is not a ſtream nor river in it, where one does not meet with indigo-works, that is, backs or vats of ſtone-work, in which the plant that yields the dye is put to digeſt: there are uſually three of theſe vats one above another, in the manner of a caſcade (See *Plate* III. *fig.* 18.) ſo that the ſecond, which is lower than the bottom of the firſt, may receive the liquor contained in the firſt, when the holes, which are made in the bottom of the firſt, are unſtopped; and that the third may in its turn receive what was in the ſecond.

The firſt, largeſt, and higheſt of theſe vats (as *a*) is called the ſteeper or rot; it is uſually made twenty feet long, twelve or fifteen feet wide, and three or four feet deep: the ſecond (as *b*) is called the battery: it is almoſt half as ſmall again as the firſt; and the third (as *c*) which is much leſs than the ſecond, is called the deviling.

The names of the two firſt perfectly agree with their uſes; for the plant is laid to ſteep in the firſt, where it ferments, is macerated, and becomes like rotten dung: after the ſalts and ſubſtance of the leaves and rind are diffuſed in the water by the fermentation, which the heat and ripeneſs of the plant have excited in it. It is in the ſecond that they agitate and beat this water, impregnated and loaded with the ſalts of the plant, till, having collected, reunited, and as it were, coagulated them with one another, they form the particles which form the dye. As for the name of the third, I do not ſee how it agrees with it, unleſs it be becauſe this vat is deeper coloured than the others; for the indigo already formed, remaining in it, conſequently dyes and colours much deeper than the others.

To which I ſhould add, that it is only at St. Domingo that they make uſe of this name. In the windward iſlands they call this laſt vat the ſettler, and this name ſuits it perfectly well; becauſe it is in this that the indigo, begun in the ſteeper, and perfected in the battery, unites, grows into a maſs, ſeparates itſelf from the particles of water which remained in it, leaves them at top, and ſettles at the bottom of the vat, whence it is taken out to be put into little bags, and then into the boxes, as I ſhall mention hereafter.

Nothing ought to be omitted in the building and making theſe vats ſubſtantial: the ſtrength of the fermentation is ſo great, that unleſs the ſtone-work and plaiſter be done very well, and the mortar carefully choſen and wrought, they crack; and a very moderate crack is ſufficient to let out a vat of indigo, and cauſe a conſiderable loſs to the owner.

When this misfortune happens, the following is an eaſy and infallible remedy, which I can anſwer for, having experienced it: take ſome ſea-ſhells, of any kind whatever; pound them without burning them, and ſift them through a fine ſieve. Take an equal quantity of quick-lime, and ſift it; mix theſe together with water enough to make a ſtiff mortar, and, as quick as you can, ſtop the cracks of your vats with it. This mixture incorporates, ſticks, and dries in a moment, and immediately prevents the matter's running out of the vat.

Every-body does, or ſhould know, that indigo is a dye uſed to dye wool, ſilk, cloths, and ſtuffs, blue: the Spaniards call it anilo: the fineſt they make, i. e. in New-Spain, comes from Guatimala; which makes a great many people call it barely guatimala. It is made alſo in the Eaſt-Indies, particularly in the dominions of the great Mogul, the kingdom of Golconda, and other places thereabouts, as Mr. Tavernier relates in his voyages. This ſort is in Europe oftener called India than Indigo or Anil, people taking, for its proper name, the name of the place it was made at.

Indigo is compoſed of the ſalt and ſubſtance of the leaves and rind of a plant of the ſame name; ſo that one may ſay, it is a diſſolution or digeſtion of the plant, cauſed by the fermentation it has excited in the water it was laid to ſteep in. I know ſome writers pretend, that the ſubſtance of the leaves does not produce the indigo, which (as they would have it) is only a viſcous tincture, or colour, which the fermentation of the plant diffuſes in the water; but, before I take their words for it, I deſire they would tell me what becomes of the ſubſtance of the plant; for, when it is taken out of the ſteeper, it is certain, that it has no longer the ſame weight, conſiſtence, nor colour it had before. The leaves which were very plump, and very full of juice, are light, flabby, and withered, and look more like dung than any thing elſe; which makes them frequently give the name of rot to the ſteeper. If then we no longer find in the leaves, and the reſt of the plant, the ſame ſubſtance that was obſervable in it before it was laid in ſteep, is it not moſt natural to believe, that it is the ſame ſubſtance and ſalts, which, being freed from incloſures, and diffuſed in the water, have thickened it, and by their union or coagulation have formed that blue maſs which they call indigo, ſo uſeful in painting and dying.

Method of cultivating the Anil.——This plant requires a good rich level ſoil, not too dry; it greatly robs and impoveriſhes the ground where it grows, and muſt be alone. There cannot be too much care taken to keep it clean, and to hinder herbs of any kind whatever from growing near it. They weed and cleanſe the ground where they intend to plant the indigo ſeed, five times over. I ſhould think they ſhould call it ſowing; but the term of planting is conſecrated in our iſles, and I do not think I ought for the ſake of a word to fall out with our planters, who deſerve our eſteem upon a thouſand accounts, though they have got an habit of murdering the French language. They ſometimes carry their neatneſs to ſuch a pitch, that they ſweep the piece of ground as they do a room. After that, they make the holes or pits, wherein the ſeeds are to be put: for this purpoſe, the ſlaves, or others, who are to work at it, range themſelves in the ſame line, at the top of the piece of ground; and, going backwards, they make little pits of the breadth of their hoe, of the depth of three or four inches, at about a foot diſtance every way, and as much as poſſible in a ſtraight line. When they are come to the end of the ground, each furniſhes himſelf with a little bag of ſeeds, and, returning that way they came, they put eleven or thirteen ſeeds into each of the holes they have made. This work is the moſt toilſome of any in the manufacture of indigo; for thoſe who plant it, muſt be always ſtooping, without riſing up, till the planting of the whole length of the piece of ground is ended; ſo that, when that is large, which almoſt always happens, they are obliged to remain two hours, and often more, in this poſture.

When they come to the top of the piece, they go back again, and cover the holes they have put the ſeeds in, by thruſting in with their feet the earth they had taken out of them; and ſo the ſeed is covered with about two inches of earth.

Though all ſeaſons are good for the planting of indigo, yet care muſt be taken not to put it in the ground in a dry time: it is true, the ſeed may keep a whole month in the ground, without being ſpoiled: but, when it is planted ſo, one runs the riſk of having it eaten up by vermin, or carried away by the wind, or choaked by the weeds which ſpring up with it; ſo that the prudent planters never run the riſk of planting it dry; i. e. at a time, when they do not probably expect rain in two or three days after the planting is ended: they chuſe therefore, uſually, a moiſt ſeaſon, which promiſes rain; and then they are ſure of ſeeing the plant ſpring up in three or four days after its being planted.

Notwithſtanding all the care that has been taken in clearing the ground, where the ſeeds have been planted, the planter muſt not be careleſs when the indigo is got above-ground; becauſe the goodneſs of the ſoil, joined to the moiſture and warmth of the climate, and the plentiful dews that fall every night, makes a prodigious quantity of weeds ſpring up, which would choak and abſolutely ſpoil the indigo, if extreme care was not taken to weed them up as ſoon as they appear, and to keep the plant extraordinary neat; and very often the weeds are partly the cauſe of the breeding of a kind of caterpillars, which devour all the leaves in a trice.

From the time of the plant's riſing above-ground, to its perfect maturity, is but two months, and then it is fit to cut: if one was to ſtay longer, it would bloſſom; its leaves would grow drier and harder, and conſequently they would yield leſs ſubſtance, and the colour would not be near ſo beautiful.

After this firſt cutting, the new branches and leaves, which the plant produces, may be cut about every ſix weeks, provided the ſeaſon be rainy, and that care be taken not to cut it in a time of drought, becauſe we ſhould then infallibly loſe the plant, or, as they call it there, the choupues, and be obliged to plant again; but, all things being rightly managed, the plant may laſt two years; after which, it muſt be plucked up, and new ones planted.

When the plant is ripe, which is known by the leaves, which grow brittler, and leſs ſupple, they cut it ſome inches from the ground. They uſe for the cutting of it great crooked knives made like ſickles. Some planters make it into bundles like double bottles of hay, that a negro may eaſily carry them to the ſteeper: but moſt people put it into large pieces of coarſe cloth, which they tie by the four corners; and this is more convenient, for the plant is leſs handled and ſqueezed, and the ſmall is carried away as ſafely as the great; and, beſides, the work goes on quicker this way, than in making bottles; and as time is precious every-where, and eſpecially in America, there cannot be too much care taken not to loſe any.

Eighteen or twenty packets of plants, each about the ſize of two bottles of hay, are ſufficient to fill a ſteeper of the aforementioned ſize. When it is filled with water, ſo that it covers the plants, they put pieces of wood on the top, that the plants may not riſe above the water (much as they do upon the grapes that are put into the preſs) and let all ferment.

According as the heat is greater or leſs, or the plant more or leſs ripe, the fermentation is raiſed ſooner or later, ſometimes in ſix, eight, or ten hours; and ſometimes one is obliged to wait eighteen or twenty hours, but very ſeldom longer. Then the effect of the fermentation viſibly appears, the water heats, and boils up on all ſides, as the grapes do in the vat: and the water, which at firſt was clear, inſenſibly grows thick, and becomes of a blue, inclining to a violet colour. Then, without meddling at all with the plants, they open the cocks which are at the bottom of the ſteeper, and let all this water, loaded with the ſalts and ſubſtance of the plants, which were freed by the fermentation, run into the battery; and while they throw away, as uſeleſs, and almoſt rotten, the plants that were in the ſteeper, and clean it, that it may be filled with freſh, they beat the water, which they have let out of the ſteeper, into the battery.

They formerly uſed, for this purpoſe, a battle-door wheel, whoſe axle was placed on the middle of the vat, and which they turned by two handles, that were at the end of the ſame axle. Since that, in the room of battle-doors, they have put little bottomleſs boxes, and afterwards others, whoſe bottoms were bored full of holes: at preſent they uſe a kind of pretty large pails, faſtened to ſtrong poles, placed upon chandeliers, by means of which, the negroes violently and continually raiſe, beat, and ſtir the water, till the ſalts and other parts of the ſubſtance of the plants are united, and ſufficiently, as it were, coagulated to incorporate.

The hitting this minute exactly ſhews the skill of him who overſees the making of the indigo: for, if he makes them leave off beating a little too ſoon, the grain, not yet formed, remains diſperſed in the water, without ſinking and gathering together at the bottom of the vat, and is loſt with the water, when they are obliged to let it out; which is a great loſs to the owner: or if, when it is formed, they continue to beat, they diſſolve it, and the ſame inconveniency follows. This minute then muſt be obſerved, and, when it is found, muſt leave off beating, and let the matter reſt.

To find this minute, they make uſe of a little ſilver cup, deſigned for this uſe alone: they fill it with this water, while the negroes beat it; and, according as they obſerve that the fæces ſink to the bottom of the cup, or remain diſperſed in the water, they ceaſe, or continue beating.

When they have left off beating, they let the matter reſt: the fæces ſink to the bottom of the vat, and gather together like a kind of mud; and the water, freed from all the ſalts it was impregnated with, ſwims above it, and grows clear. Then they open the cocks, which are placed in the battery at different diſtances from the bottom, and let this water run away; and, when they come to the ſurface of the fæces, they open the cocks of the bottom, that the fæces may all fall into the deviling or ſettler. There they let it ſettle a little while longer, after which they put it into linnen-bags, fifteen or eighteen inches long, made with a point, where it perfectly purges itſelf of the reſt of the water, which remained among its particles. When that is done, they ſpread it in little boxes, three or four feet long, two feet broad, and about three inches deep, and expoſe it to the air to dry it perfectly. They obſerve not to expoſe it to the ſun, becauſe it would ſtarve the colour in drying it; and they take a great deal of care to keep it from the rain, becauſe that would diſſolve and utterly ſpoil it. It ſometimes happens, that the caterpillars get among the indigo; and, if they are let alone ever ſo little a while, they eat all the leaves, and often the very rind and ends of the branches, and kill the ſtocks; it is but loſt time to endeavour to deſtroy them, or hinder them from ravaging a whole piece, by ſtopping them with a ditch. The ſureſt way is to cut down the indigo with all ſpeed, let its age be what it will, and to throw both plants and caterpillars pell-mell together into the ſteeper; they there burſt, and part with what they had devoured, and the indigo is not the leſs beautiful for it. It is true, when the plant is not come to its full maturity, it yields much leſs: but many experiments have taught us, that the colour it yields is much more beautiful; ſo that what is loſt one way, is gained another. I would not wait for ſo perfect a ripeneſs, before I cut the plant. Perhaps all the ſecret of thoſe, whoſe indigo is ſo much extolled beyond ours, lies only in cutting the plant, when it yields the livelieſt colour. I have experienced, that in leaving ſome cochineal-flies upon ſome Indian figs, which were too ripe, inſtead of being red, they grew of a filemot colour, like the fruit they fed upon. The ſame thing might happen in indigo; and what I here propoſe, is not a groundleſs doubt, ſince it is backed by the experiment juſt now related; which plainly proves, that the ſame plant, cut at different ages, produces colours of different beauty. I would not venture to give this advice to men wedded to their intereſt, who value the quantity rather than the quality of their commodity; but I believe I have nothing to fear from our iſlanders, who are generous and magnificent, ſometimes even beyond their abilities: I adviſe them therefore to make different trials, as to the ſoil, the ſeaſon, the age of the plant, the water they ſteep it in, the point of diſſolution, &c. And I am ſure, that, with a little time, labour, and patience, they will make indigo that will equal, and even excel, the moſt boaſted indigo of foreign countries. The planters of St. Domingo know, that, in 1701, their coarſe ſugar was very bad, and was not made without infinite trouble; and at preſent every-body allows, that by their labour, aſſiduity, and inquiries, it is grown much more eſteemed than that of the windward iſlands: why may not the ſame be hoped for in indigo?

Mr. Pomet, author of the general hiſtory of drugs, ſays in his firſt part, chap. 10, that the Indians of the village of Sarqueſſe, near Amadabat, uſe only the leaves of the indigo, and throw away the plant and branches; and that it is from thence the moſt eſteemed indigo comes. I am pretty much of his opinion; for we ſee, that thoſe who take the pains to ſtrip off the grapes from the branches, before they put them into the vat, and throw away the ſtalks intirely, make much the beſt wine; becauſe the ſtalks always contain an acid, which mixes with the juice of the grape with the treading and preſſing them both together; and, for the ſame reaſon, the indigo plant muſt contain a liquid much leſs perfect in colour than that of the leaves: but one ought to have the leiſure and patience of the Indians to undertake ſuch a work, and have work-men as cheap as they are in that country, ſuppoſing the fact true, as Mr. Pomet delivers it from the relation of Tavernier.

Though I am a great friend to thoſe experiments which may carry our manufactures to a greater perfection, yet I dare not propoſe this, becauſe of the expence they muſt be at, who would try it; and becauſe the profit ariſing from it would not, perhaps, quit coſt: however, I have here given the method of the Indians of Sarqueſſe, that I may have no reaſon to reproach myſelf with having omitted a thing, which may be of ſome uſe to my country.

Good indigo ought to be ſo light, as to ſwim upon water; the more it ſinks, the more it is ſuſpected to be mixed with earth, aſhes, or powdered ſlate. Its colour ought to be a deep blue, inclining to a violet, brilliant, lively, and bright: it ought to be more beautiful within than without, and look ſhining, and as it were ſilvered.

If it is too heavy in proportion to its bulk, it ought to be ſuſpected, and its quality examined into; for, as it often bears a conſiderable price, it is fit that thoſe who buy it, ſhould be acquainted with the frauds that may be committed in it.

The firſt is the beating the plant too much in the ſteeper, that the leaves and rind of it may be intirely conſumed. It is certain, that the quantity of the matter is very conſiderably increaſed by this diſſolution; but the indigo is a great deal the leſs beautiful for it; it is blackiſh, thick, heavy, and fitter to be thrown away than uſed.

The ſecond is the mixing aſhes, earth, or a certain brown ſhining ſand (which is pretty commonly found in the bays by the ſea-ſide) and eſpecially powdered ſlate, with the fæces, as they fall into the deviling, and ſtirring all well together, that it may incorporate, and the fraud not appear; and this fraud is much more eaſily committed in the powdered indigo, than in that which is in cakes; becauſe it is very difficult for thoſe heterogeneous bodies to unite ſo well together, as not to make, in many places, as it were beds of a different matter; and then, breaking the piece of indigo, they are eaſily perceived.

The two following expedients may be made uſe of, in order to know the goodneſs or badneſs of indigo.

The firſt is to diſſolve a bit of it in a glaſs of water. If it is pure, and well made, it will entirely diſſolve; but, if it be adulterated, the foreign matter will ſink to the bottom of the glaſs.

The ſecond is to burn it. The good indigo will burn all away, whereas the aſhes, earth, ſand, and ſlate, remain after the true indigo is conſumed. *Labat's Travels.*

A'NIMA *Saturni*, the ſoul of lead, a name given to a preparation of that metal, uſed by enamellers, for various purpoſes. The method of making it is this:

Put litharge finely powdered into a glazed earthen veſſel, and pour diſtilled vinegar upon it to the height of four fingers; let it ſtand till the vinegar has acquired a white or milky colour: pour off this vinegar, and put on freſh, and continue to do ſo till the vinegar will no longer be coloured by the litharge; then ſet theſe vinegars together in open glazed earthen veſſels, that the white powder may ſubſide, and the vinegar be poured off clear. This white ſubſtance is the Anima ſaturni. Sometimes this white matter will not precipitate without the addition of water; and ſometimes it is neceſſary to evaporate the liquors; but by that means it is always prepared. *Neri's Art of Glaſs.*

A'NIMAL (*Dict.*)— An Animal, reſpect being only had to the body, not the ſoul, may be defined with Boerhaave to be an organical body, conſiſting of veſſels and juices, and taking in the matter of its nutriment, by a part called a mouth; whence it is conveyed into another called the inteſtines, into which it has roots implanted, whereby it draws in its nouriſhment, after the manner of plants.

According to this definition, an Animal is diſtinguiſhed from a foſſile, in that it is an organical body; and from a vegetable by this, that it has its roots within itſelf, and a plant without itſelf.

In effect, the inteſtines of an Animal are, in reality, no more than its earth, or the body it adheres to; into which it ſends forth its roots, that is, the lacteal veſſels, which thence draw the matter of its life and increaſe.

An Animal is better defined from its mouth than its heart, ſince we do not know whether the whole tribe have ſuch a part; for as ſeveral have ſixteen hearts, particularly the ſilk-worm, and ſome even ſixty: ſo it is poſſible others may have none at all.

Nor can any general character of an Animal be taken from the brains, the lungs, or the like, ſince we know of many quite deſtitute thereof.

The genuine characteriſtic, then, of an Animal, is to be free and at large with reſpect to the ſubject it derives its nouriſhment from: for every thing is taken in by the mouth; and the mouth does not adhere to any thing: whereas all plants are connected, in ſome manner or other, to the body which furniſhes them food.

Hence it follows, that a fœtus, while it remains in the mother's womb, is a real plant; as being connected by the funiculus umbilicalis to the placenta, and by the placenta to the uterus, from whence it receives its nutriment.— If it did not derive its food by the ſaid funiculus, but by its mouth, it were an Animal; and, if it drew it by both, a zoophyte, or plant-Animal.

Some have defined Animals from their loco-motion, as being capable of ſhifting from place to place; and plants, from their ſticking faſt to the ſame ſubject: but, on this principle, oiſters, muſſels, cockles, &c. are excluded from the claſs of Animals, inaſmuch as they adhere, or grow to rocks, &c. yet it is certain, that thoſe creatures are real Animals, as they have mouths and ſtomachs to take in their food, and lacteals and meſenteric veins to receive it.— Indeed, muſſels ſeem an exception from the former definition. That anomalous creature breathes, and receives its nouriſhment, not at the mouth, but by the anus: the part which we account its head, though without either eyes, ears, or tongue, or any other apparatus, ſave a hole, which we may call its mouth, is an immoveable part; being faſtened to one of the ſhells, ſo that it cannot ſeek for food, but the food muſt come to ſeek it. This food is water, which, as the ſhells open, enters in at the anus of the muſſel, which opens at the ſame time; and paſſing thence into certain canals between the inner ſurface of the ſhell, and the outer ſurface of the Animal, is conveyed thence into its mouth, by a certain motion, which the Animal can produce at pleaſure.

We chuſe therefore, with Dr. Tyſon, to fix the criterion of an Animal in a ductus alimentalis, i. e. a gula, ſtomach, and inteſtines: all which make but one continued canal.

But there is no difference abſolutely eſſential and general between animals and vegetables; but nature deſcends by certain ſteps and imperceptible gradations, from a more perfect to a leſs perfect Animal, and from thence to a vegetable. Let us ſuppoſe the freſh water polypus to be the laſt of the Animal and firſt of the vegetable creation.

After having examined the difference, if we conſider the ſimilitude between Animals and vegetables, we ſhall find it, at firſt view, very eſſential and general: you will find in both a common power of producing themſelves; ſuch a power implies a greater analogy and ſimilitude in their nature, than appears at firſt ſight; and gives us reaſon to believe that Animals and vegetables are beings nearly of the ſame claſs.

A ſecond ſimilitude between them may be drawn from the unfolding and opening their parts, a property common to both; for vegetables as well as Animals have a power of growing, and, though the manner be different, it is not totally and eſſentially ſo, becauſe there are in Animals many different parts, as bones, hair, hoof, horns, &c. the unfolding of which is a true vegetation, and the fœtus, in its firſt formation, vegetates before it lives.

They have this third reſemblance, that ſome Animals are produced like plants, and by the ſame means, as, for example, the green lice found on trees, which multiply without copulation, is like increaſing plants by ſowing their ſeed; and increaſing the polypus, by cutting him in pieces, reſembles propagating trees by ſlips. We may therefore aſſert on ſtronger terms, that Animals and vegetables are beings of the ſame claſs, and that nature ſeems to have made a tranſition from one to the other, by inſenſible gradations; becauſe it is certain they have many eſſential and general likeneſſes, but no difference that can be looked upon as ſuch.

Now, if we compare Animals and vegetables in other reſpects, as number, magnitude, form, &c. we ſhall draw new inferences from theſe conſiderations.

The number of the ſpecies of Animals is much greater than that of plants; for, in the genus of inſects only, there is perhaps a great number of ſpecies inviſible to the naked eye, than there are plants viſible upon the face of the earth. Animals reſemble each other much leſs than plants, and in the ſimilarity of plants conſiſts the difficulty of ranging and claſſing them properly. This gave birth to the art of botany, a more difficult ſtudy than zoology; becauſe Animals are much more ſenſibly different from one another than plants, and are therefore more eaſy to be diſtinguiſhed, named, and deſcribed. Beſides, here is another advantage we have in diſtinguiſhing the ſpecies of Animals; we ought to look on that as the ſame ſpecies which propagates and preſerves itſelf by the copulation of the male and female of the ſame ſpecies, and conſider that as a different ſpecies, which by the ſame means can produce nothing. So that the fox will be a different ſpecies from the dog, if nothing proceeds from the copulation of a male and female of theſe two ſpecies; and, even though a creature half dog half fox ſhould proceed from this copulation, yet it would not claſs the fox properly in the canine ſpecies; becauſe this production would be a mule, and nature proceed no farther; whereas, to conſtitute a ſpecies, it is neceſſary the production ſhould be continued invariable fit for the propagation of its own ſpecies, in a word, like other Animals.

In plants we have not the ſame advantage, for though ſome pretend to have diſcovered ſexes in plants, and have ſettled diſtinctions of male and female from the parts of fecundation, yet this is neither ſo certain nor apparent in plants as Animals: beſides, the production of plants is effected in many caſes, where the ſex is not concerned, nor the parts of generation neceſſary; and the notion of ſexes in plants is not ſufficiently underſtood, to be a proper method for us, whereby to diſtinguiſh plants into their different ſpecies.

The number of the ſpecies of Animals is therefore greater than that of plants; but it is not the ſame thing with regard to the number of individuals contained in each ſpecies. As, in plants, the number of individuals is much greater in the leſs than larger ſpecies, ſo, in animals, the ſpecies of flies is perhaps a hundred thouſand millions of times more numerous than that of the elephant; in like manner there are more herbs than trees. But if we compare the quantity of individuals in plants and Animals, ſpecies to ſpecies, we ſhall ſee, that each ſpecies of the plant is more fruitful than each ſpecies of the Animal. As for inſtance: quadrupeds produce but a ſmall number of young, and thoſe at conſiderable diſtances of time; trees on the other hand every year produce a great number of their own ſpecies.

M. de Buffon objects againſt the juſtice of this compariſon; and to render it a parallel caſe, he ſays, we muſt firſt be able to compare the quantity of generative particles in the ſemen of an Animal with the number of ſeeds growing on a tree, and then perhaps we ſhould find the generative powers to abound moſt in Animals. But if, ſays he, by way of anſwer, it were poſſible, by carefully gathering all the acorns of an oak, and ſowing them, to raiſe 100,000 trees, the production of one year, which is by no means impracticable, and, though we took care to help a horſe to all the mares he could cover in a ſeaſon, the produce would be vaſtly inferior to that of the vegetable. I do not therefore, ſays M. de Buffon, examine into the quantity of generative particles, firſt, becauſe in Animals we do not know it; ſecondly, becauſe the acorn is not a generative principle, but a production as perfect as the fœtus of an Animal, and wants nothing but a proper nudus to diſplay itſelf.

M. de Buffon mentions the prodigious increaſe of ſome kind of inſects; the female bee produces thirty or forty thouſand; but he declares, that he relates this in general, comparing Animals and vegetables; and that this inſtance of bees, which is the greateſt we know in the Animal world, is yet no proof; for out of this number of thirty or forty thouſand, which the mother bee produces, he obſerves there is but a very ſmall number of females, and about 1500 or 2000 males, the reſt being mules, or of no ſex, being incapable of generation.

It muſt be owned that in inſects, fiſhes, and ſhell fiſh, there are ſpecies which ſeem to be extremely fruitful; oiſters, herrings, lice, &c. are perhaps as numerous as moſſes and other common plants. But, if we conſider and take a view of the whole, we ſhall eaſily diſcover that the greateſt part of the ſpecies of Animals are leſs fruitful of individuals than the ſpecies of plants. Farther we may obſerve, that, by comparing the increaſe of the ſpecies of plants with each other, there is not ſo wide a difference in the number of individuals, as in the ſpecies of Animals; ſome of which produce a great number, others a very ſmall one, inſtead of which, the number of productions in plants is always very great, in every ſpecies.

It follows from what we have ſaid, that the leaſt and loweſt ſpecies are always the moſt fruitful in individuals, both in the Animal and vegetable world. In proportion as the ſpecies of Animals grow more perfect, we ſee them reduced to a leſs number of individuals. Can one imagine it would coſt nature more trouble to conſtruct in bodies of a certain figure, as that of quadrupeds, with certain organs for the perfection of ſenſe, than to produce a living creature, and organize it in a manner that appears ſo difficult to us to conceive? No, it cannot be imagined; to account for this phænomenon we muſt have recourſe to the firſt order of things, and ſuppoſe the production of the larger Animals equal to that of inſects. We ſee, at firſt ſight, that this monſtrous ſpecies would ſoon have ſwallowed up all others, nay, would have devoured even itſelf, would alone have overſpread the face of the whole earth, and that nothing would have been left on the continent but elephants, birds, and inſects; in the ocean nothing but whales, and fiſhes which by the ſmallneſs of their ſize could eſcape being devoured by the former. An order of things not to be compared with that which exiſts at preſent. Thus we ſee, that the works of providence are regulated by the higheſt wiſdom.

Let us now with M. de Buffon proceed to the compariſon of Animals with vegetables, in point of ſituation, magnitude, and form: the earth is the only place where vegetables can ſubſiſt; the greateſt number riſe above the ſurface of the ground, and are held by roots which penetrate into the earth. Some, as truffels, grow intirely under the ſurface, ſome ſmall number grow under water; but all, to preſerve their exiſtence, muſt be placed in a ſtratum of earth. Animals, on the other hand, are more univerſally diffuſed: ſome inhabit the ſurface, others the bowels of the earth; ſome live at the bottom of the ſea, others in its waters; they are found in the air, the internal parts of plants, in the bodies of men and other Animals, in liquors, nay, even in ſtones.

By the help of the microſcope prodigious diſcoveries have been made of Animals of different ſpecies. But it may ſeem ſomething ſingular, that not above one or two ſpecies of plants have been diſcovered by the application of this inſtrument. The little moſs, produced by mouldineſs, is the only microſcopical plant we have heard of. From this we might be induced to think that nature, which is ſo fruitful in producing animalcula, is very ſparing of her productions in plantulæ or little plants; but we may be led into an error by adopting ſuch an opinion too haſtily, and the error might perhaps take its riſe, from the greater ſimilarity there is between plants than Animals, which renders it more difficult to diſtinguiſh their ſpecies; ſo that this mould which we take for an infinitely ſmall moſs, might be a garden or wood, filled with a vaſt number of plants really very different from each other, and yet that difference imperceptible to our eye.

It is true, if we compare the magnitude of Animals with reſpect to each other and plants in the ſame light, there will appear a great diſparity; for there is a much greater diſproportion between the whale and one of theſe pretended microſcopical Animals, than there is between the talleſt oak and the infinitely minute moſs we have mentioned: and, tho' magnitude be only a relative attribute, yet it is proper to conſider the extreme bounds which nature ſeems to have preſcribed to herſelf. The larger ſpecies in Animals and plants have ſome parity, a vaſt oak and a great whale have ſome correſponding proportion in magnitude; but in the leſſer ſpecies there is no analogy, if it be true that a thouſand microſcopical Animals united are not equal to the microſcopical plant in magnitude.

Farther, the moſt ſenſible and general difference between Animals and vegetables is their formation. That of Animals, though it admits of infinite variety, has no ſimilarity with that of plants, and though the polypus which is propagated in the manner of a plant, may be looked upon as making the continual gradation between the Animal and vegetable, yet we may ſay the figure of any Animal whatever is of ſo different an exterior formation from that of a plant, as to leave no difficulty in diſtinguiſhing one from the other. Animals may indeed perform operations which reſemble plants or flowers; but plants will never produce any thing ſimilar to an Animal. If an ill-grounded prejudice had not ranked the coral among the vegetables, thoſe wonderful inſects that work and produce it had never been miſtaken for flowers. Thus it appears, the errors we are liable to fall into by comparing the formation of Animals with that of vegetables, can only be in a ſmall number of ſubjects which make the gradation between both; and a nicer obſervation will convince us that the Creator has fixed no certain bounds between the Animal and vegetable; that theſe two kinds of organized beings have many common properties, no real difference; that the production of an Animal coſt nature no more trouble than the production of a plant, perhaps leſs; that the production of organized beings in general is nothing extraordinary, and that, in ſhort, the living and animated being, inſtead of being ranked in a degree of præternatural entities, is only actuated by the phyſical property of matter.

After having ſettled one very difficult and important point by the help of M. de Buffon's profound knowledge in metaphyſics, let us proceed to the ſecond, which we owe to M. de Aubenton, his illuſtrious partner, in their natural hiſtory.

Animals, ſays M. d'Aubenton, have the firſt place in the general diviſion of natural hiſtory. All the objects comprehended in this ſcience are diſtributed into three claſſes which they call kingdoms; the firſt is the Animal kingdom: we have put this firſt, becauſe Animals have a nearer connection with us than vegetables, which make the ſecond kingdom, and minerals, having ſtill a more diſtant one, make the third kingdom. In ſome works of natural hiſtory, however, the order is inverted, the mineral kingdom placed firſt, and the animal laſt. Theſe authors were of opinion we ought to begin with contemplating the moſt ſimple objects, ſuch as are minerals, and from thence paſſing through the vegetable world, ſhould gradually proceed to the conſideration of the moſt compounded objects, which are Animals.

The ancients divided Animals into two claſſes; the firſt contains ſuch as have blood, the ſecond thoſe which have none; this diſtinction was made in Ariſtotle's time, and perhaps long before that great philoſopher; and this diſtinction has been generally admitted till of late. Several objections have been raiſed againſt this diſtinction, that all Animals have blood, becauſe all Animals have a fluid, the circulation of which all over the body is neceſſary for a continuance of life, that the eſſence of blood does not conſiſt in its being of a red colour, &c. but theſe objections prove nothing againſt the propriety of the diſtinction we are ſpeaking of: for whether we ſuppoſe all Animals to have a blood or a part only, whether the name of blood may properly be aſſigned to the fluid which circulates in the bodies of ſome, is no part of the queſtion; it is ſufficient to make a diſtinct claſs of Animals, that in theſe the circulating fluid is red, in thoſe not ſo. But there is one objection to this method of claſſing Animals, which admits of no reply. Among the Animals ſaid to have no blood, or, at leaſt, no red blood, ſome are found to have blood, and very red blood too; theſe are earth-worms. This is a fact which ſhews a defect in this method of diſtinction, and yet, perhaps, upon the whole it is the better, and leſs liable to objection than many others.

For a general account of Animals, we ſhall here ſubjoin Mr. Ray's ſcheme.

Animals are either

- Sanguineous, that is, ſuch as have blood, which breathe either by
  - Lungs, having either
    - Two ventricles in their heart, and thoſe either
      - Viviparous.
        - Aquatic, as the whale-kind.
        - Terreſtrial, as quadrupeds.
      - Oviparous, as birds.
    - But one ventricle in the heart, as frogs, tortoiſes, and ſerpents.
  - Gills, as all ſanguineous fiſhes, except the whale-kind.
- Exſanguineous, or without blood, which may be divided into
  - Greater, and thoſe either
    - Naked,
      - Terreſtrial, as naked ſnails,
      - Aquatic, as the poulp, cuttle-fiſh, &c.
    - Covered with a tegument, either
      - Cruſtaceous, as lobſters and crab-fiſh.
      - Teſtaceous, either
        - Univalve, as limpets,
        - Bivalve, as oyſters, muſcles, cockles.
        - Turbinate, as periwinkles, ſnails, &c.
  - Leſſer, as inſects of all ſorts.

Viviparous hairy Animals or quadrupeds, are either

- Hooſed, which are either
  - Whole-footed or hoofed, as the horſe and aſs.
  - Cloven-footed, having the hoof divided into
    - Two principal parts, called biſulca, either
      - Such as chew not the cud, as ſwine.
      - Ruminant, or ſuch as chew the cud, divided into
        - Such as have perpetual and hollow horns.
          - Beef-kind.
          - Sheep-kind.
          - Goat-kind.
        - Such as have ſolid, branched, and deciduous horns, as the deer-kind.
    - Four parts, or quadriſulca, as the rhinoceros and hippopotamus.
- Clawed or digitate, having the foot divided into
  - Two parts, or toes, having two nails, as the camel-kind.
  - Many toes or claws; either
    - Undivided, as the elephant.
    - Divided, which have either
      - Broad nails, and an human ſhape, as apes.
      - Narrower, and more pointed nails, which, in reſpect of their teeth, are divided into ſuch as have
        - Many fore-teeth, or cutters in each jaw;
          - The greater, which have
            - A ſhorter ſnout and rounder head, as the cat-kind.
            - A longer ſnout and head, as the dog-kind.
          - The leſſer, the vermin or weazel-kind.
        - Only two large and remarkable fore-teeth, all which are phytivorous, and are called the hare-kind.

Animals make the principal part of heraldry, both as bearings, and as ſupporters, &c.

It is an eſtabliſhed rule among heralds, that, in blazoning, Animals are always to be interpreted in the beſt ſenſe, that is, according to their moſt noble and generous qualities, and ſo as may redound moſt to the honour of the bearers.

Thus the fox being reputed witty, and withal given to filching for his prey; if this be the charge of an eſcutcheon, we are to ſuppoſe the quality repreſented to be his wit and cunning, not his theft.

Guillim adds, that all ſavage beaſts are figured in their fierceſt action, as a lion erected, his mouth wide open, his claws extended, and in this poſture he is to be rampant.——A leopard, or wolf, is to be portrayed going, as it were, pedentemtim; which form of action, ſays Chaſſanæus, fits their natural diſpoſition, and is termed paſſant.

The gentleſt kind are to be ſet forth in their nobleſt and moſt advantageous actions; as a horſe running or vaulting, a greyhound courſing, a deer tripping, a lamb going with a ſmooth and eaſy pace.

Every Animal is to be moving, or looking to the right ſide of the ſhield; and it is a general rule that the right foot be placed foremoſt, becauſe the right ſide is reckoned the beginning of motion: add, that the upper part is nobler than the lower; ſo that things, conſtrained either to look up or down, ought rather to be deſigned looking upwards.

However, notwithſtanding theſe precepts of Guillim, &c. the other maſters of armory, we find by experience, that there are lions paſſant, couchant, and dormant, as well as rampant, and that moſt Animals look down and not up. *Guillim's Heraldry.*

Wheel-ANIMAL, a name given by the writers on microſcopical diſcoveries to a ſpecies of minute animalcule, which appears in a ſort of ſheath or caſe, the end of which it faſtens to the roots of water-plants, or whatever elſe is in its way, *See plate* III. *fig.* 15, 16, 17.

This little creature has two ſeeming wheels, with a great many teeth or notches coming from its head, and turning round, as it were, upon an axis. This little creature, on the leaſt touch, draws in its wheel into its body, and its body into the ſheath; but, as ſoon as all is quiet, it throws them out, and works them again.

In order to find theſe animalcules, chuſe ſuch roots of duck-weed as are long, and proceed from ſtrong old plants, for the young roots ſeldom afford any; they ſhould not be covered with that rough matter which is frequently found about them, nor any way tending to decay, as they will often be.

In the water found remaining in the leaden pipes, or gutters, on the tops of houſes, there are alſo found great numbers of Wheel-Animals. Theſe are of a different ſpecies from the former; and, when the water dries away, they contract their bodies into a globular or oval figure, and are then of a reddiſh colour, and remain mixed with the dirt, growing together into a lump as hard as clay. This, whenever it is put into water, in half an hour's time, diſcovers the Animals living again, and as briſk as ever; and they have been found to be living in this manner, after the matter had been kept dry for twenty months.

It ſhould ſeem from this, that, as the water dries up, their pores become ſhut in the manner of ſuch Animals as remain torpid for the winter, and that, when they find water come on again from rain, they then unfold themſelves, and live and feed as long as it laſts. *Baker on the Microſcope.*

A'NKER, a liquid meaſure, chiefly uſed at Amſterdam. The Anker is the fourth part of the aem, and contains two ſtekans; each ſtekan conſiſts of ſixteen mingles, the mingle being equal to the Paris pint.

ANIMA'LCULA (*Dict.*)— Under this term in a philoſophical ſenſe are comprehended thoſe animals which are not viſible without the help of a microſcope; ſince the invention of this inſtrument many little animals have been perceived, which had before eſcaped our notice: we have ſeen bodies moving in ſeveral different liquors, chiefly in the ſemen of animals, and infuſions of the grains of plants. Hartſoeker and Lewenhoeck were the firſt authors of theſe diſcoveries, and have told us theſe moving bodies were really living creatures; and ſeveral others, who have purſued the ſame ſtudy, have found new moving bodies. All have agreed in this opinion, that theſe bodies were animals; from whence have aroſe different hypotheſes concerning generation, the ſpermatic Animalcula of the male, and the ova of the female, &c. At laſt, M. de Buffon has deſtroyed this falſe opinion; he has demonſtrated by undeniable experiments, in the ſecond volume of his Natural Hiſtory, that the moving bodies, diſcovered by the microſcope, are not really animals, but moleculæ or little maſſes of a certain organization, alive, and proper to compoſe a new body of the ſame organization with that from whence they were extracted. M. de Buffon has found theſe moving bodies in the ſemen of females as well as males: he ſhews that the moving bodies which he has obſerved with the microſcope in infuſions of the ſeeds of plants, as well as in the ſemen of animals, are alſo organized moleculæ of vegetables. M. de Buffon had communicated to Mr. Needham of the Royal Society at London, the obſervations he had made on the ſemen of animals, and infuſions of the ſeeds of plants, with his diſcoveries before the publication of the firſt volume of his Natural Hiſtory. I myſelf, ſays M. d'Aubenton, with Mr. Needham, was preſent at the firſt experiments made in the Royal Gardens, with a microſcope Mr. Needham had brought from London with him. It was after having ſeen the firſt experiments on infuſions of the ſeed of plants, that Mr Needham entertained a deſign of purſuing theſe experiments on vegetables; he communicated this intention to M. de Buffon in my preſence, as to the author of a diſcovery, whoſe hints he deſigned to follow. Mr. Needham, in conſequence of this reſolution, made a number of experiments, and publiſhed a work under the title of New Microſcopical Obſervations 1750, and the author has promiſed to give the public a particular account of all the obſervations he has made on this head; Mr. Needham has communicated ſome to me from which I have received great ſatisfaction.

A number of theſe Animalcula have been diſcovered on various ſubſtances, as, for example, on a grain of ſand preſſed through a ſieve a little Animal has been found, with a great number of feet, and a back covered with ſhells; in the liquor of a puſtule cauſed by the itch Animalcula have been found reſembling tortoiſes. See ITCH in the Dictionary.

You may ſee, in common water ſome time expoſed to the air, a number of little moving bodies of different magnitudes and figures, the generality of which are round or oval. Lewenhoeck ſays that a thouſand millions of thoſe bodies which float in common water, are not ſo big as an ordinary grain of ſand. *Diderot's Encyclop.*

A'NIME (*Dict.*)—The Anime of the ſhops is of the number of thoſe dry reſins which are very improperly called gums, what is called gum Anime being a friable ſubſtance, inflammable, and ſoluble in oil, which are characters of a genuine reſin, and ſuch as no gum can poſſeſs. We are to obſerve alſo, that there is another very frequent error with regard to this drug, which is, that many call it copal, and confound it with another reſin, improperly called alſo a gum, and known by that name. Copal is, indeed, a term uſed by the Indians in a very large ſenſe, and ſometimes, as a generical name for all the ſcented reſins; but with us it is never uſed ſo, nor has any good author uſed it, as a term ſynonymous with Anime: it is the name of a diſtinct reſin to be treated of in its place.

The Spaniards, according to Hernandez, uſed the term copal to diſtinguiſh all the white, or whitiſh ſweet-ſcented reſins; and the term Anime, which they alſo made generical, to expreſs all the brown ones: after this, the name Anime became attributed to a peculiar reſin, of a ſweet ſcent, and of a browniſh yellow colour, brought from the eaſt, or rather from Ethiopia, on the confines of Arabia; and finally, after this, the Portugueſe gave it alſo to certain ſweet reſins which they found in the Braſils, and eſteemed ſomewhat of the ſame nature with the Ethiopian Anime.

On this diſtinction has been founded the name of oriental and that of occidental Anime, long known in the ſhops, and diſtinguiſhing two different reſins at this time found there, though neither very frequently.

The oriental or Ethiopian Anime, called by the Portugueſe animum and aniimum, and in the ſhops gum Anime, is a dry and ſolid reſin, brought to us in large cakes or maſſes, of an irregular figure, and of a very uncertain colour; ſome of them are greeniſh, ſome reddiſh, ſome brown, and ſome of the colour of myrrh; they all agree in this, however, that they are moderately pellucid, of a tolerably compact texture, light and eaſily powdered, of a fragrant ſmell, very inflammable, and of a reſinous and ſomewhat bitter taſte. This which is the genuine and true Anime is now very rare in the ſhops. It is brought, as Garcias informs us, only from Ethiopia, but the occidental kind, or reſin of the courbaril, is what is univerſally received in its place. It has been ſuppoſed by many, that this Ethiopian or true Anime was known to the ancient Greeks. Some have ſuppoſed that Dioſcorides meant this reſin by the name of myrha minia, and many arguments have been advanced in favour of the opinion; but the reſins themſelves are ſo like one another, and the deſcriptions the Greeks have left us of them is ſo ſhort and imperfect, that it is impoſſible to affirm any thing on this head with any tolerable degree of certainty. We are not yet informed what the tree is that produces the Ethiopian Anime. Herman is of opinion, that it is the ſame that yields the occidental kind, only growing in a different climate; but this is no more than a conjecture.

The occidental Anime is a whitiſh, dry, and ſolid reſin, ſomewhat reſembling frankincenſe in colour. It is often of a fine yellowiſh white, between that of frankincenſe and maſtich, and in the pureſt pieces is very clean and tranſparent; in general, however, it is much inferior to the oriental in theſe reſpects. It is moderately heavy, friable, and ſomewhat oleaginous to the touch. It is extremely fragrant, eſpecially when burnt, and is of a reſinous, acrid, and ſomewhat bitteriſh taſte. It is brought to us from many parts of America, particularly from new Spain and the Braſils. The natives call it joticacica and jetaicica. Our people from their name of the tree vulgarly call it reſin of courbaril.

Whatever might be the caſe in regard to the Ethiopian Anime, we may be very well aſſured, that this was not known to the Greeks. The tree which produces it is one of the arbores ſiliquoſæ of Mr. Ray. It is deſcribed by Caſpar Bauhine under the name of arbor ſiliquoſa ex Virginia lobo fuſco ſcabro, and by Plumier, under that of courbaril bifolia flore pyramidato. It grows to a very great height; its wood is ſolid, and of a fine grain, of a reddiſh colour, and very durable, and ſerves them for many of their better works. The leaves are like thoſe of our bay-tree, but thicker, and they grow conſtantly two together on every ſtalk; they are of a ſhining green, and, if held up to the light, ſeem to be perforated with innumerable little holes in the manner of the leaves of St. John's-wort. The flowers ſtand in cluſters or tufts towards the tops of the branches; they are of the papilionaceous kind, like thoſe of our vetches, and of a purpliſh colour: theſe are ſucceeded by a kind of pods ſix inches long, and an inch and a half broad, compreſſed ſideways, and raiſed into two ridges on the back.

This fruit, when ripe, does not open lengthwiſe into two valves, as the generality of pods of this ſhape do; it remains intire, and contains in it, among a multitude of irregular fibres, four or five ſeeds larger than the common pine-kernels, otherwiſe like them. This tree is common in moſt parts of America, and the fruit ripens in May and June, when it falls from the trees, and is picked up by the natives, who are fond of the farinaceous ſubſtance that is among the fibres within it. The trunk of the tree exſudates the reſin here deſcribed in very conſiderable quantities without being wounded for it; the fineſt lumps of it are white or of a pale yellow, and much reſemble amber.

The American Anime, analyſed by diſtillation in a retort, yields firſt a ſmall quantity of a limpid phlegm of a ſubacid taſte, and of a ſmell not diſagreeable, but much reſembling that of oil of Juniper; after this a ſmall quantity alſo of a reddiſh liquor more acid than the former, and then of a brown liquor of an empyreumatic ſmell; after theſe there comes over a moderate portion of a fine yellow pellucid oil, and then a thick and brown one like butter, in ſo large a quantity as nearly that of two thirds of the weight of the whole. The remainder in the retort is but in a very ſmall quantity, and, after lixiviation, yields, with the utmoſt care, only about four grains of a fixed ſalt, and that of the ſal ſalſus, not the alkaline kind, from the pound.

The natives of America uſe this reſin in fumigations for the head-ach, and for diſeaſes of the breaſt and lungs. They are alſo externally diſſolved in oil as a liniment, and in ſpirit of wine as an embrocation for pains in the limbs.

Anime, in heraldry, is where the eyes, &c. of a rapacious creature, are borne of a different colour from the reſt of the creature.

ANNA'LIS *Actio*, in the civil law, ſignifies an action which may be put in practice any time within the year.

Annalis *Clavus*, in antiquity, the nail which the prætor, conſul, or dictator, fixed every year in the wall of Jupiter's temple, upon the ides of September, to ſhew the number of years. But this cuſtom was afterwards changed, and the years were reckoned by the conſuls.

ANNA'TES, a tax levied on Chriſtian clergy, and paid to the Pope: it was a year's revenue, or tax upon the revenue of the firſt year of a vacant benefice, ever ſince the twelfth century. Some biſhops or abbots had, either by cuſtoms, or particular privileges, received Annates, or firſt fruits of the benefices belonging to their patronage or juriſdiction. Thus, in the year 1726, Peter, biſhop of Beauvois, gave the canons of the church of St. Quintin the Annates of all the prebends of this cathedral. The court of Rome, which was always incroaching upon the liberties of the church, ſoon found means to get the Annates into its hands. John XXIII. ſecured the Annates of all vacant benefices (biſhoprics and abbies excepted) for three years. His ſucceſſors improved the advantage, and took in the biſhops and abbots; but the payment of this tax was always grudged, and was warmly conteſted in the council of Conſtance, an. 1414. The council of Baſil, in 1431, forbad the payment of Annates; and the council of Bourges, in 1438, approved the decree of the ſynod of Baſil; to which we may add its being forbidden by ſeveral edicts of the French king's. Matthew Paris, in his Hiſtory of England, for the year 746, relates that the archbiſhop of Canterbury, by virtue of a grant or conceſſion of the Pope, received Annates of all the benefices that became vacant in England. Clement V, predeceſſor of John XXII, was the firſt, according to Matthew of Weſtminſter, who exacted Annates of all the vacant benefices in the kingdom, for the ſpace of two years; or, according to Walſingham, for three. John XXII. introduced the like in France; yet Polydore Virgil, and ſome others, take the Annates to be of much older ſtanding, and to have prevailed long before they were paid to the Pope. It is certain, at leaſt, that, from the 12th century, there were biſhops and abbots, who, by ſome peculiar cuſtom or privilege, took Annates of the benefices depending on their dioceſe or abbey. This burden was laid at firſt only on ſuch benefices as the Pope himſelf collated to; and this he did, ſays Polydore Virgil, before he had ſuch large poſſeſſions. Boniface VIII, in the time of Edward I, firſt ſtarted the doctrine of the Pope's univerſal and abſolute dominion in beneficiary matters; but he was vehemently oppoſed at the reformation. They were taken from the Pope, and veſted in the king, or on the crown of England, where they continue to this day, except what alterations have been made ſince, in relation to ſmall livings.

ANNO'TA. See ANATTA.

ANNU'ITIES. Under this article in the Dictionary, we have ſhewn the method of finding the value of Annuities; and, under the article *Compound* INTEREST, we have given a ſhort table for computing the value of Annuities on lives; we ſhall here give a fuller account of that doctrine, according to the obſervations made by Dr. Halley on the Breſlaw bills of mortality.

Breſlaw is the capital city of the province of Sileſia. It is ſituated on the eaſtern bank of the river Oder, near the confines of Germany and Poland, and very nigh the latitude of London. It is very far from the ſea, and as much a mediterranean place as can be deſired; whence the confluence of ſtrangers is but ſmall, and the manufacture of linen employs chiefly the poor people of the place, as well as of the country round about; whence comes that ſort of linen we uſually call Sileſia linen, which is the chief, if not the only, merchandize of the place. For theſe reaſons the degrees of mortality in the city ſeem moſt proper for a ſtandard, and the rather, for that the births do a ſmall matter exceed the funerals: the only thing wanting is the number of the whole people, which in ſome meaſure I have endeavoured to ſupply, ſays the doctor, by compariſon of the mortality of the people of all ages; which is traced out from the curious tables of the births and funerals drawn up monthly by Dr. Newman of that city.

Dr. Halley's Table of obſervations, exhibiting the probabilities of life.

Age cur.	Perſons.	Age cur.	Perſons.	Age cur.	Perſons.	Age cur.	Perſons.	Age cur.	Perſons.	Age cur.	Perſons.	Age	Perſons
1	1000	8	680	15	628	22	586	29	539	36	481	7	5547
2	855	9	670	16	622	23	579	30	531	37	472	14	4584
3	798	10	661	17	616	24	573	31	523	38	463	21	4270
4	760	11	653	18	610	25	567	32	515	39	454	28	3964
5	732	12	646	19	604	26	560	33	507	40	445	35	3604
6	710	13	640	20	598	27	553	34	499	41	436	42	3178
7	692	14	634	21	592	28	546	35	490	42	427	49	2709
Age cur.	Perſons.	Age cur.	Perſons.	Age cur.	Perſons.	Age cur.	Perſons.	Age cur.	Perſons.	Age cur.	Perſons.	56	2194
43	417	50	346	57	272	64	202	71	131	78	58	63	1694
44	407	51	335	58	262	65	192	72	120	79	49	70	1204
45	397	52	324	59	252	66	182	73	109	80	41	77	692
46	387	53	313	60	242	67	172	74	98	81	34	84	253
47	377	54	302	61	232	68	162	75	88	82	28	100	107
48	367	55	292	62	222	69	152	76	78	83	23	Sum total	34000
49	357	56	282	63	212	70	142	77	68	84	20		

M. de Moivre has largely explained the uſe of the foregoing table, in the following manner:

Suppoſe that by this table we would know what the probabilities are for a man of 30 to live 1, 2, 3, 4, 5, &c. years. Look for the number 30 in one of the columns of age, and under it you will find 31, 32, 33, &c. and oppoſite the number 30, in the next adjoining column on the right hand, you find 531, under which are written 523, 515, 507, &c. correſponding in order to the numbers in the column of ages; the meaning whereof, is that, out of 531 perſons living of 30 years old, there remain but 523, 515, 507, 499, &c. that attain the reſpective ages of 31, 32, 33, &c. and who, conſequently, from that term of 30, do live 1, 2, 3, 4, &c. years reſpectively.

In order to compute the value of an Annuity upon a life of a given age, let the quantities A, B, C, D, E, F, &c. repreſent reſpectively the perſon living at the age given, and the ſubſequent years.

Now it is obvious, that there being A, perſons of the age given, and one year after B, perſons remaining, the probability which the perſon of the given age has to continue in life, for one year at leaſt, is repreſented by the fraction $\frac{B}{A}$, and that the probability which it has to continue in life, for two years at leaſt, is repreſented by the fraction $\frac{C}{A}$, &c. and that therefore, if money bore no intereſt, it would be only neceſſary to multiply thoſe probabilities by the ſum to be received annually, which is ſuppoſed here to be $=1$, and the ſum of the product would expreſs the preſent value of the Annuity. But, as money bears intereſt, let r repreſent the amount of 1 l. with its intereſt at the year's end, and then the preſent values of the ſums to be received would be reſpectively $\frac{1}{r}$, $\frac{1}{rr}$, $\frac{1}{r^3}$, $\frac{1}{r^4}$, &c. and therefore, multiplying theſe ſums by the probabilities of obtaining them, we ſhall have the value of the Annuity expreſſed by the ſeries $\frac{A}{r}+\frac{B}{rr}+\frac{C}{r^3}$ $\frac{D}{r^4}+\frac{E}{r^5}+\frac{F}{r^6}+\frac{G}{r^7}+\frac{H}{r^8}$, &c. which muſt be continued to the end of the tables.

But let us ſuppoſe, that, inſtead of an Annuity upon a life whoſe age is given, there ſhould be the expectation of a ſum, which we will call (1) payable once for all, whenever it happens, that the life ceaſes within a limited time. It is plain that the probability of the life's ceaſing after one year is $\frac{A-B}{A}$, and that the probability of its continuing one year, and dropping the next, will be $\frac{B}{A}\times\frac{B-C}{B}$, or barely $\frac{B-C}{A}$, and that, again, the probability of its continuing two years, and dropping the third, will be $\frac{C-D}{A}$, and ſo on; and that therefore the value of the expectation founded on the contingency of the life's falling within a limited time would be $\frac{A-B}{Ar}+\frac{B-C}{Arr}+\frac{C-D}{Ar^3}+\frac{D-E}{Ar^4}+\frac{E-F}{Ar^5}+\frac{F-G}{Ar^6}$, &c.

Let it now be ſuppoſed, for inſtance, that the party on whoſe life this expectation depends is 10 years of age, and that the age limited, as a condition of obtaining the ſum (1) is 21; hence it is plain, that, the difference between 21 and 10 being 11, we ought to limit ourſelves to 11 terms of the foregoing ſeries, and then, conſulting Dr. Halley's table, we ſhall find the numbers A, B, C, D, E, &c. to be reſpectively 661, 653, 646, 640, 634, 628, &c. and that, therefore A — B, B — C, C — D, D — E, E — F, &c. will reſpectively be 8, 7, 6, 6, 6, &c. and that, conſequently the preſent value of the expectation will be $\frac{8}{661r}+\frac{7}{661rr}+\frac{6}{661r^3}+\frac{6}{661r^4}+\frac{6}{661r^5}+\frac{6}{661r^6}+\frac{6}{661r^7}+\frac{6}{661r^8}+\frac{6}{661r^9}+\frac{6}{661r^{10}}+\frac{6}{661r^{11}}$.

Let it be further ſuppoſed, that this expectation is not given, but ſold to a purchaſer who intends to make 5 per cent of his money, then r ſtands for 1,05, and therefore the ſum, which purchaſers ought in juſtice to pay for their expectations, is the ſum of the numbers here annexed, which is about $\frac{2}{25}$; and therefore if the ſum, called (1) before, ſtands for an eſtate whoſe preſent real value is 20 years purchaſe, the adventurer ought to pay no more for the conſideration of his chance than $1\frac{3}{5}$ years purchaſe.

0.0115260 ——	1
0.0096054 ——	2
0.0078412 ——	3
0.0074678 ——	4
0.0071122 ——	5
0.0067735 ——	6
0.0064510 ——	7
0.0061438 ——	8
0.0058512 ——	9
0.0055726 ——	10
0.0053072 ——	11
0.0796599	

It is not intended here to calculate other intervening chances which might defeat this expectation, ſuch as that of an heir-male, which might live to the age of twenty-one; for, there being not any tables * of obſervations concerning a man's marrying and getting an heir-male between ſixteen and twenty-one, what could be added on that ſubject, would be barely conjectural, which would not be of a-piece with what has been ſaid; however, it is eaſy to conceive, that this muſt conſiderably diminiſh the value of the expectation.

Problem II.

Suppoſing the probabilities of life to decreaſe in arithmetic progreſſion, when conſidered from a term given, to find the value of an Annuity on a life of a given age.

Solution.

Let P repreſent the value of an Annuity certain of 1 l. for as many years as are intercepted between the age given, and the extremity of old age, ſuppoſed at 86, and let that interval of life be called n, then the value of an Annuity upon ſuch a life would be expreſſed by $\dfrac{1-\frac{r}{n}P}{r-1}$, ſuppoſing, as before, that r ſtands for the amount of the principal and intereſt of 1 l. in one year.

Thus, ſuppoſing an age of 50, and that intereſt of money be eſtimated at 4 per cent. then n will repreſent 36, and r for 1.04, for which reaſons looking into the tables of 4 per cent. which ſhew the worth of an Annuity certain for 36 years, being 17.9083, this being multiplied by r, that is, by 1,04, the product will be 18.624632; and this being divided by n, that is, by 36, the quotient will be .0.517351. Then this being ſubtracted from unity, and the remainder 0.482649 being divided by $r-1$, that is, by 0.04, the quotient will be found 12.0661, which is very little more than 12 years purchaſe for the value of an Annuity on a life of 50.

But, for the ſake of thoſe who are not ſo well verſed in decimal fractions, it may be proper to expreſs the rule as follows: multiply the Annuity certain as found in the tables by the amount of 100 l. joined with its intereſt for one year, that is, in this caſe, by 104, and let the product be divided by 100; then let the quotient be ſubtracted from 25, which ſhews how many years purchaſe a perpetuity of 100 l. is worth, and the remainder will ſhew how many years purchaſe the Annuity upon the age given is worth in ready money.

Problem III.

Suppoſing a fictitious life, whoſe number of chances to continue yearly are conſtantly equal to a, and the number of chances to fail conſtantly equal to b, ſo that the odds of its continuing, during the ſpace of any one year, be to its failing in that ſame interval of time conſtantly as a to b, to find the value of an Annuity upon ſuch a life.

Solution.

Let 1 be the Annuity, r the amount of 1 l. joined to its intereſt in one year, make $a+b=s$.

It is plain from what has been ſaid already, that the preſent value of the 1ſt year's rent is $\frac{a}{sr}$, of the 2d $\frac{aa}{ss\,rr}$, of the 3d $\frac{a^3}{s^3\,r^3}$, &c. which terms conſtituting a geometrical progreſſion, the ſum of them all will be $\frac{a}{rs-a}$; thus, if a repreſented 21, and b 1, then s would repreſent 22; ſuppoſing alſo that $r=1.05$, then the denominator $rs-a$ would be 23.1—21 or 2.1, and, dividing the numerator 21 by the denominator 2.1, the quotient will be 10, which ſhews that the life would be worth 10 years purchaſe.

Corollary I.

An Annuity upon a fictitious life being given, the probability of its continuing one year is alſo given; for let the value of it be — M, then $\frac{a}{rs-a}=M$, therefore $\frac{a}{s}=\frac{Mr}{M+1}$.

Corollary II.

If a life whoſe value, as reduced from the tables of obſervation, or from the preceding problem, be worth 10 years purchaſe, then ſuch a life is equivalent to a fictitious life, whoſe chances for continuing one year are to the chances of its failing in that year as 21 to 1.

Corollary III.

Wherefore, having calculated a life from the tables of obſervations, or from the ſecond problem, we may transfer the value of that life to that of a fictitious life, and find the number of chances it would have to continue or to fail yearly.

Corollary IV.

And the combination of two or more real lives will be very near the ſame as the combination of ſo many correſponding fictitious lives; and, therefore, an Annuity granted upon ſo many correſponding fictitious lives, and the values of the reverſions granted upon the real lives, will be very near the ſame, as thoſe granted upon the fictitious lives.

Problem IV.

The values of two ſingle fictitious lives being given, to find the value of an Annuity granted for the time of their joint continuance.

Solution.

Let the values be reſpectively M and P, r the rate of intereſt; then the value of an Annuity upon the two joint lives will be expreſſed by $\frac{MPr}{\overline{M+1}\times\overline{P+1}-MPr}$.

Demonſtration.

Let x and y repreſent the reſpective probabilities of the lives continuing one year together, then xy will expreſs the probability of their joint continuance for that year; and x^2y^2 the probability of their joint continuance for two years; and x^3y^3 the probability of their joint continuance for three years, &c. wherefore the value of an Annuity, for all the time, will be expreſſible by the following geometric progreſſion, viz. $\frac{xy}{r}+\frac{x^2y^2}{rr}+\frac{x^3y^3}{r^3}+\frac{x^4y^4}{r^4}$, &c. where the ſum is $\frac{xy}{r-xy}$; but, by the firſt corollary of problem the third, $x=\frac{Mr}{M+1}$; and, for the ſame reaſon, $y=\frac{Pr}{P+1}$, and, therefore, the value of the two joint lives, is $\frac{MPr}{\overline{M+1}\times\overline{P+1}-MPr}$.

Problem V.

The values of two ſingle lives being given, to find the value of an Annuity upon the longeſt of them; that is, to continue ſo long as either of them is in being.

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* If any tables of that kind ſhould be calculated, there cannot, perhaps, be a better foundation to proceed on than that of Dr. Arbuthnot, concerning the regularity in the births of both ſexes, publiſhed in the *Philoſophical Tranſactions*, No. 328.

Solution.

From the ſum of the values of the ſingle lives, ſubtract the value of the two joint lives found by the foregoing problem, and the remainder will be the value of the Annuity required.

Demonſtration.

It will be ſufficient to ſhew what will be the value of the firſt year, ſince the values of all the ſubſequent years are found in the ſame manner.

Let, therefore, x and y be the reſpective probabilities of the lives continuing one year together, then $1-x$ and $1-y$ are the reſpective probabilities of their dropping in that year, and, conſequently, the product of $1-x$ by $1-y$, viz. $1-x-y+xy$ is the probability of their both dropping in that year; and, this being ſubtracted from unity, the remainder $x+y-xy$ will expreſs the probability that either one or the other, or both, out-live the year; which is ſufficient for the purchaſer of the Annuity to eſtabliſh his right of receiving the firſt year's rent, whoſe preſent value is, therefore, $\frac{x}{y}+\frac{y}{r}-\frac{xy}{r}$.

And, therefore, one may ſee at ſight, that, the expectation of the other years being founded on the ſame principle, the value of an Annuity upon the longeſt of two lives will be the ſum of the values of the ſingle lives, wanting the value of the joint lives.

Problem VI.

The value of the three ſingle lives being given, to find the value of an Annuity upon their joint lives.

Solution.

Let x, y, z, reſpectively, repreſent the probabilities of the lives continuing one year, then the probabilities of their continuing all three together for one year will be xyz, and the probability of their continuing together for two years is $xxyyzz$, &c. and, therefore, the value of an Annuity upon the three joint lives will be $\frac{xyz}{r}+\frac{x^2y^2z^2}{r^2}+\frac{x^3y^3z^3}{r^3}+\frac{x^4y^4z^4}{r^4}$, &c. which conſtitutes a geometric progreſſion, whoſe ſum is $\frac{xyz}{r-xyz}$: now in the room of x, y, z, writing their reſpective values $\frac{M+1}{r}$, $\frac{P+1}{r}$, $\frac{Q+1}{r}$, the ſum of the 3 joint lives will be expreſſed by $\frac{MrPQrr}{\overline{M+1}\times\overline{P+1}\times\overline{Q+1}-MPQrr}$, ſuppoſing, as we have done in the preceding problem, that M, P, Q, repreſent reſpectively the values of Annuities upon each ſingle life.

Problem VII.

The value of three ſingle lives being given, to find the value of an Annuity upon the longeſt of them.

Let x, y, z, repreſent the reſpective probabilities of the life's continuing one year; then the product of $1-x$ by $1-y$, and of that again by $1-z$, that is, $1-x+xy-y+xz-z+yz-xyz$, will expreſs the probability of their all failing the firſt year; and, this being ſubtracted from unity, the remainder will expreſs the probability that either they will all ſubſiſt one year, or, at leaſt, that they will not all fail in the year: which being the foundation of receiving the firſt year's rent, and the other years following the ſame law, we may draw this concluſion, that, if from the ſum of the values of the ſingle lives we ſubtract the ſum of the values of the joint lives taken two and two, and to the remainder add the value of the three joint lives, we ſhall have the value of the Annuity upon the longeſt of the three joint lives.

Problem VIII.

To find the value of one life after another.

By the value of one life after another, is meant what a man muſt pay in preſent money to purchaſe the expectation of an Annuity for his life, after the failing of another, with this reſtriction, that, if the expectant dies before the preſent poſſeſſor, no conſideration is to be given to the heirs of the ſaid expectant.

Solution.

Since the expectation of the purchaſer is grounded on the failing of the life in poſſeſſion, and of the continuation of his own life, it follows, that, if we ſuppoſe x and y to be the reſpective probabilities of the lives continuing one year, then $1-x\times y$ or $y-xy$ will expreſs the probability of the firſt life's dropping in the year, and of the ſecond's out-living the year; from whence we may draw this conſequence, that, if from the preſent value of the expectant's life be ſubtracted the value of the two joint lives, there will remain the value of the expectation.

This may be made plain another way; for, ſuppoſe I were the purchaſer, I might begin to pay the proprietor of the Annuity the full value of my life, but then I would expect back the value of the two joint lives of the preſent poſſeſſor and myſelf, ſince I am to receive nothing, whilſt we are both living. To this may be added, that, ſuppoſing that the proprietor is to be paid for the longeſt of the two lives of the preſent poſſeſſor and myſelf, my ſhare of the purchaſe ought to be only that part of it which would remain if the life of the preſent poſſeſſor was deducted out of it, which will give the ſame concluſion as before.

But, if the expectant were to have the reverſion abſolute for himſelf and his heirs after the deceaſe of the preſent poſſeſſor, it is plain, that there being nothing interpoſed between his preſent circumſtances and the poſſeſſion of the eſtate, but the life of the preſent poſſeſſor, then, from the value of the perpetuity, ought barely to be ſubtracted the life of the poſſeſſor, and the remainder will be the value of the expectation.

Problem IX.

To find the value of one life after two.

Solution.

From the value of the longeſt of the three lives, ſubtract the value of the longeſt of the two firſt lives, and there will remain the value of the expectation of the third life.

But, if the expectation be above the abſolute reverſion, then from the perpetuity ſubtract the value of the longeſt of the two firſt lives, and there will remain the value of the third.

And the ſame rule may be extended to as many lives as may be aſſigned. Though theſe queſtions may, at firſt ſight, ſeem to have a great degree of difficulty, yet there is reaſon to believe that the ſteps taken, to come at their ſolution, will eaſily be followed by thoſe who have a competant ſkill in algebra, and that the chief method of proceeding therein will be underſtood by thoſe who are barely acquainted with the elements of that art.

For thoſe, however, who may not be acquainted with this method of reaſoning, I ſhall ſubjoin what may be more generally intelligible, and, therefore, more generally acceptable. The common method of purchaſing Annuities is at a certain number of years purchaſe; for which reaſon, the following tables may be uſeful to ſhew how long the annuitant muſt live, to be reimburſed his principal money, with intereſt, at any given rate.

The table is very plain, as appears by this example: Suppoſe 11 years purchaſe is given for an Annuity.

	years	days			
Then, if the Annuitant lives	12	200	he will be reimburſed his principal, with intereſt, at the rate of	2	per cent per ann.
	13	9		2½	
	13	200		3	
	14	48		3½	
	14	286		4	
	15	190		4½	
	16	134		5	
	18	188		6	
	21	264		7	
	27	201		8	
	53	160		9	

The fractions of the year are made in days, for the greater exactneſs, though it is common for Annuities to be paid either half-yearly or quarterly.

A table to calculate the value of Annuities upon lives, at 4 l. and 5 l. per cent. Continuance of the lives to reimburſe the annuitants their purchaſe money.

years purchaſe given for a life.	At 4 per cent.		At 5 per cent.	
	years.	days.	years.	days.
1	1	15	1	19
2	2	46	2	58
3	3	95	3	121
4	4	163	4	209
5	5	252	5	327
6	6	364	7	113
7	8	137	8	303
8	9	304	10	172
9	11	138	12	92
10	13	9	14	75
11	14	286	16	134
12	16	246	18	285
13	18	261	21	189
14	20	340	24	247
15	23	132	28	151
16	26	18	32	360
17	29	19	38	322
18	32	167	47	71

The ingenious Mr. Dodſon has defended the above hypotheſis of Dr. Halley, in the Philoſophical Tranſactions, Vol. 47. Pag. 333. And alſo laid down a method for improving the bills of mortality.

ANNUNCIATION, *(Dict.)*— We celebrate the memory of this myſtery on the 25th of March; and St. Auguſtin ſays, that the church, upon the authority of ſome old tradition, believed that the Saviour of the world was conceived upon this day. Not only the Greek and Latin churches have choſen the 25th of March, to celebrate this myſtery; but likewiſe the Syrians, Chaldeans and Coptics, do the ſame. This opinion ſeems to be founded principally, upon the ſuppoſition of Chriſt's being born upon the 25th of December: as a conſequence of this opinion, it was believed that he was conceived upon the 25th of March, becauſe, generally, there are nine months between the birth and conception of children. In the place where the virgin was ſaluted by the angel, there was a church built. It is certain, this feſtival was obſerved before the time of the council of Trullo, in which there is a canon forbiding the celebration of all feſtivals in Lent, excepting the Lord's day, and the feaſt of the Annunciation, ſo that we may date its original from the 7th century. However, among the ſermons of St. Auguſtine, who died in 430, there are two on the Annunciation, viz. the ſeventeenth and the eighteenth de Sanctis: and in the Greek church we find ſtill earlier teſtimonies of it. Thus Baſil of Seleucia, who died 455, and Proclus, who died 446, and John Chyſoſtom, in 407, and Gregory Thaumaturgus, in 395, have all of them diſcourſes on the Annunciation; ſome writers indeed queſtion the authenticity of theſe ſermons.

ANO'MALOUS (*Dict.*)—There are Anomalous verbs, or irregular inflexions of words, in all languages.—In the Engliſh, all the irregularity in our Anomalous verbs lies in the formation of the preter tenſe and paſſive participle; though this only holds of the native Teutonic or Saxon words, and not of the foreign words, borrowed from the Latin, Welch, French, &c.

The principal irregularity ariſes from the quickneſs of our pronunciation, whereby we change the conſonant *d* into *t*, cutting off the regular ending *ed*.

Thus for mixed, we write mixt or mix'd, for dwelled, dwelt or dwell'd; for ſnatched, ſnatcht, &c.— But this is rather of the nature of a contraction than an irregularity; and is complained of by ſome of our politer writers, as an abuſe much to the diſadvantage of our language, tending to disfigure it, and turn a tenth part of our ſmootheſt words into cluſters of conſonants: which is the more inexcuſable, in that our want of vowels has been the general complaint of the beſt writers.

Another irregularity relates to the preter tenſe and paſſive participle. – Thus give, if it were regular, or formed according to the rule, would make gived in the preter tenſe and the paſſive participle; whereas it makes gave in the preter tenſe, and given in the paſſive participle.

ANO'MALY, in grammar, denotes an irregularity in the accidents of a word, whereby it deviates from the common rules or paradigms, whereby other words of the like kind are governed.

ANAMORHOMBOI'DIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is formed from the Greek ἀνώμαλὴς, irregular, and ῥομβοιδὴς, a rhomboidal figure.

The bodies of this genus are pellucid cryſtalline ſpars, of no determinate or regular external form, but all breaking into regular rhomboidal maſſes; eaſily fiſſile, and compoſed of plates running both horizontally and perpendicularly through the maſſes, but cleaving more readily and evenly in a horizontal, than in a perpendicular direction: the plates being ever compoſed of irregular arrangements of rhomboidal concretions.

There are five known ſpecies of this genus, all which have, in ſome degree, the double refraction of the iſland cryſtal. *Hill's Hiſtory of Foſſils.*

ANO'NA, in botany, the name of a genus of plants, ſome ſpecies of which Plumier has deſcribed under the name guanabanus. The characters of this genus are as follows:

The flower conſiſts of ſix heart-ſhaped petals, the inner three of which are ſmaller than the others; there are ſcarce any filaments to ſerve by way of ſtamina, but the antheræ are very numerous, and ſeem to adhere to the ſides of the germen. The germen is roundiſh, and ſtands upon the cup; there are no ſtyles, but ſeveral obtuſe ſtigmata. The fruit is an extremely large berry of an oval and rounded figure, containing one cell, and covered with a ſcaly punctated bark; the ſeeds are numerous, hard, of an oblong oval figure, and placed circularly. *Linnæi Gen. Plant.*

ANO'REXY (*Dict.*)—If an Anorexy, or want of appetite, be conſtant, it is reputed dangerous, in proportion to its increaſe, rather than its continuance. When it proceeds from viſcid humours lodged in the ſtomach, it is not reputed ſo dangerous as when from hard drinking, which often ends in an incurable icterus, dropſy, or conſumption. If it happen on account of the ſummer heat, it is not thought dangerous; but, coming upon the palſy, bad. Corpulent bodies are thought better able to bear it, than ſuch as are lean or emaciated. When, from a relaxation of the fibres of the ſtomach, it is not eſteemed dangerous, if taken in time; but, when it proceeds from other diſtempers, is to be judged of from them. If it continues after thoſe are gone off, it may be looked upon as original. Reliſhing ſauces are here allowable, if not overdoſed with unctuous ingredients. All acids are here accounted good. The night-meal ſhould be very eaſy of digeſtion, and made an hour or two before bed-time. Riding is thought excellent: the ſleep ſhould be moderate, and the air clear. If the patient be plethoric, or the diſorders proceed from a ſtoppage of evacuations, bleeding is good; and in caſe of ſour eructations, pain in the head, ſickneſs at the ſtomach, dulneſs, heavineſs, or if crapula's, or the uſe of narcotics, have preceded, an emetic, and afterwards a paregoric, are proper. In the next place, purging, eſpecially if the menſes are ſuppreſſed, and that with calomel. The tinctura ſacra is alſo good, being taken in the quantity of an ounce at a time. When the indiſpoſition proceeds from any paſſion, bliſtering, emetics, the cold-bath, a free air, and diverſions are of ſervice, together with proper ſtomachics. If it comes from a ſuppreſſion of any evacuations, promote them, and uſe ſtomachics. Proceed in the ſame manner, when this caſe is a ſymptom in other diſtempers. If it was cauſed by too liberal a uſe of tea, it ſhould be left off by degrees, and a glaſs of red wine be drank in its ſtead, or an infuſion of cortex in red wine. And, laſtly, let the cold-bath be tried. The chewing of rhubarb is good in moſt of theſe caſes, eſpecially if they are attended with great coſtiveneſs. *Shaw's New Practice of Phyſic.*

ANT, *formica*, in natural hiſtory, an inſect famous in natural hiſtory, of which we have five ſpecies common in England. 1, A ſmall blackiſh Ant. 2, A ſmall reddiſh brown Ant. 3, A middle-ſized black Ant. 4, A middle-ſized reddiſh Ant; and, 5, The common great hippomyrex, or horſe-Ant.

The Ant, examined by the microſcope, appears to be a creature of a very ſingular ſtructure. The head is large, adorned with two pretty horns, each having twelve joints. Its eyes are protuberant and pearled; it has jaws ſaw-like or indented, with ſeven little teeth that exactly tally, opening ſide-ways, and able to gape very wide aſunder; by the help whereof it is often ſeen graſping and tranſporting bodies of three or four times its own bulk and weight. It is naturally divided into the head, the breaſt, and the belly or tail: each of theſe parts joining to the other by a very ſlender ligament. From the breaſt-part, three legs come forth on either ſide. The tail is armed with a ſting, which the animal uſes only, when provoked: but then a poiſonous liquor is conveyed by it into the wound, occaſioning pain and ſwelling. The whole body is caſed over with a ſort of armour, ſo hard, as not to be penetrated by a lancet, and thick ſet with ſhining whitiſh briſtles. The legs, &c. are alſo covered with hairs, but much ſmaller and of a darker colour. *Baker's Microſcope made eaſy.*

The ſight of Ants is really very inſtructive. They are a little people united, like the bees, in a republic governed by its own laws and politics. They have a kind of oblong city, divided into various ſtreets, that terminate at different magazines. Some of the Ants conſolidate the earth, and prevent its falling in, by a ſurface of glue with which they incruſt it. Thoſe which we commonly ſee, amaſs ſeveral ſplinters of wood, which they draw over the tops of their ſtreets, and uſe them as rafters to ſuſtain the roof; and acroſs theſe they lay another rank of ſplinters, and cover them with a heap of dry ruſhes, graſs, and ſtraw, which they raiſe with a double ſlope, to turn the current of the water from their magazines; ſome of which are appropriated to receive their proviſions, and in the others they depoſit their eggs, and the worms that proceed from them.

As to their proviſions, they take up with every thing eatable, and are indefatigable in bringing home their ſupplies. You may ſee one loaded with the kernel of ſome fruit, another bends under the weight of a dead gnat. Sometimes ſeveral of them are at work on the carcaſe of a May-fly, or ſome other inſect. What cannot be removed they eat on the ſpot, and carry home all that is capable of being preſerved. The whole ſociety is not permitted to make excurſions at random: ſome are detached, as ſcouts, to get intelligence; and, according to the tidings they bring, all the community are upon the march, either to attack a ripe pear, a cake of ſugar, or a jar of ſweet-meats; and in order to come to this jar, they leave the garden, and aſcend the houſe; there they find this mine of ſugar, this rich Peru of ſweets, that opens all its treaſures to their view. But their march to it, as well as their return from it, is under ſome regulation: the whole band is ordered to aſſemble, and move in the ſame track; but the injunction is not executed with much ſeverity, and they have liberty to expatiate, when they have an opportunity to ſpring any game in the country. The green vermin that make an infinite waſte among flowers, and cockle the leaves of the peach and pear trees, are ſurrounded with a glue, or kind of honey, which is ſought for by the Ants with great avidity; but they are not ſollicitous either for the fleſh of theſe creatures, or for any part of the plant. Theſe are the vermin who are the authors of all that deſtruction to our trees, which is falſly imputed to the Ants, and draws upon them a very unjuſt and cruel perſecution.

Their next prevailing paſſion is, to amaſs a ſtore of corn, or other grain that will keep; and, leſt the humidity of the cells ſhould make the corn ſhoot up, we are told, for a certainty, that they gnaw off the buds which grow at the point of the grain.

I have ſeen Ants carry, and ſometimes puſh before them, grains of barley and wheat, much larger than themſelves; but I never could find out their granary. All the ancients mention it, and Aldrovandus aſſures us he had ſeen it. Their labours, as well as their inclinations, may vary according to their ſpecies. It is likewiſe probable that their aurelia's, which are ſometimes yellow, have been taken for grains of corn without buds, and ſwelled by moiſture.

The Ants, after they have paſſed the ſummer in a conſtant employment and fatigue, ſhut themſelves up in the winter, and enjoy the fruits of their labour in peace; however, it is very probable, they eat but little in that ſeaſon, and are either benumbed, or buried in ſleep, like a multitude of other inſects. And therefore, their induſtry in ſtoring up proviſions is not ſo much intended to guard againſt the winter, as to provide, during the harveſt, a neceſſary ſuſtenance for their young. They nouriſh them, as ſoon as they leave the egg, with an aſſiduity that employs the whole nation; and the care of their little progeny is eſteemed a matter of importance to all the ſtate.

When the young quit the egg, they are little worms, no longer than common grains of ſand, and after they have for ſome time received their aliment, which is brought to them in common, and diſtributed in equal proportions, they ſpin a thread, and wrap themſelves up in a white web, and ſometimes in one that is yellow; at which period they ceaſe to eat, and become aurelia's. In this ſtate, ſome people fancy they are the eggs of Ants, when, in reality, they are the nymphs, out of whoſe ruins the new piſmires are to riſe. Though the young diſcontinue their eating, their nurture ſtill proves very fatiguing to their parents. Theſe have generally ſeveral apartments, and remove their young, from the nurſery, to ſome other manſion they intend to people. They either raiſe the aurelia's toward the ſurface of the earth, or ſink them to a diſtance from it, in proportion as the ſeaſon is either warm or cold, rainy or dry. They raiſe them when the weather proves ſerene, or when a long drought is ſucceeded by gentle dews; but, at the approach of night and cold, or the appearance of ſhowers, they claſp their beloved charge in their arms, and deſcend with them to ſuch a depth, that one muſt then dig above a foot into the earth, before thoſe aurelia's can be diſcovered.

We might enlarge on many other particulars of their conduct, ſuch as their diſperſing themſelves over the country, their cuſtom of removing the dead from their habitations, their promptitude in aſſiſting each other to carry their burdens, or invade their enemies. A long deſcription might likewiſe be given of the ſmall ſting they carry in the extremity of their bodies, with a bag of corroding water that cauſes little tumors. Much might be alſo ſaid of their wings, that are acquired by the males at a certain age, to facilitate their acquiſition of food, and which are refuſed to the females, that they may be more ſedentary, and better devoted to domeſtic cares. *Spectacle de la Nature.*

In the memoirs of the Royal Academy, there is a curious account of Ants; the writer tells us, that he found a neſt of Ants in a box of earth, ſtanding out from a window two ſtories high; whence they made excurſions both upwards, to the top of the houſe, where ſome corn lay in a garret, and downwards, into a garden, which the window overlooked. The ſituation of this neſt obliged them to go up or down a great way before they could poſſibly meet with any thing; but he found, notwithſtanding, that none of them ever returned empty, but every one brought a grain of wheat, rye, or oats, a ſmall ſeed, or even a particle of dry earth, if nothing elſe could be got. Some travelled to the farther end of the garden, and, with prodigious labour, brought heavy loads from thence. It required four hours, as he learned by frequent obſervation, to carry a pretty large grain or ſeed from the middle of the garden to the neſt: and he computed therefrom, that an Ant works as hard as a man who ſhould carry a heavy load twelve miles a day.

The pains theſe Ants took, to carry grains of corn up a wall to the ſecond ſtory, climbing all the way with their heads downward, muſt be exceeding great. Their wearineſs was ſhewn, by their frequent ſtops at the moſt convenient places; and ſome appeared ſo fatigued and ſpent they could not reach their journey's end: in which caſe it was common to ſee the ſtrongeſt Ants, which had carried home their load, come down again and help them. Sometimes they were ſo unfortunate as to fall down with their burdens, when juſt in ſight of home: but, when this happened, they ſeldom loſt their corn, but carried it up again.— He ſaw one, he ſays, of the ſmalleſt Ants carrying a large grain of wheat with incredible pains. When ſhe came to the box where the neſt was, ſhe and her load together tumbled back to the ground. Going down to look for her, he found ſhe had recovered the grain, and was ready to climb up again. The ſame misfortune befel her three times; but ſhe never let go her hold, nor was diſcouraged; till at laſt, her ſtrength failing, ſhe was forced to ſtop, and another Ant aſſiſted her to carry home her load to the public ſtock.

How wonderful is the ſagacity of theſe inſects! How commendable their care, diligence, and labour! How generous their aſſiſtance of one another, for the ſervice of the community! How noble their public virtue, which is never neglected for the ſake of private intereſt! In all theſe things they deſerve our notice and imitation.— A contemplative mind will naturally turn its thoughts from the condition and government of Ant-hills to that of nations; and reflect, that ſuperior beings may poſſibly conſider human kind and all their ſollicitudes and toils, pride, vanity, and ambition, with no more regard than we do the concerns of theſe little creatures.

ANT-HILLS, are little hillocks of earth, which the Ants throw up for their habitation and the breeding of their young. They are a very great miſchief to dry paſtures, not only by waſting ſo much land as they cover, but by hindering the ſcythe in mowing the graſs, and yielding a poor hungry food pernicious to cattle.

The manner of deſtroying them is to cut them into four parts from the top, and then dig into them ſo deep as to take out the core below, ſo deep that, when the turf is laid down again, it may lie ſomewhat lower than the level of the reſt of the land, and this will prevent the Ants from returning to the ſame place, which, otherwiſe, they would certainly do. The earth that is taken out muſt be ſcattered to as great a diſtance as may be, otherwiſe they will collect it together and make another hill juſt by.

The proper time for doing this is winter, and, if the places be left open, the froſt and rains of that time of the year will deſtroy the reſt; but in this caſe care muſt be taken, that they are covered up early enough in the ſpring, otherwiſe they will be leſs fertile in graſs than the other places.

In Hertfordſhire they uſe a particular kind of ſpade, to this purpoſe. It is very ſharp, and formed at the top into the ſhape of a creſcent, ſo that the whole edge makes up more than three fourths of a circle; this cuts in every part, and does the buſineſs very quickly and effectually; others uſe the ſame inſtruments that they do for mole-hills.

Human dung is a better remedy than all theſe, as is proved by experiment, for it will kill great numbers of them, and drive all the reſt away, if only a ſmall quantity of it be put into their hills.

Some put honey mixed with powder of rats-bane into little boxes pierced full of holes, ſuch as will juſt admit this creature, and this never fails to deſtroy them in great numbers; care is to be taken, however, that theſe holes are not too large, for, if they would admit a bee, thoſe creatures would as ſurely come in as the Ants, and would not only be deſtroyed themſelves, but might chance to carry this poiſoned honey to the hive, and depoſit it in the combs among the reſt, before they died by it, which would render the whole ſtock of honey poiſonous. A bottle filled half up with any ſweet liquor, and hung upon the trees, will deſtroy great numbers by their getting in, and being drowned in it; but, if they are troubleſome to the walks and allies in the pleaſure-gardens, the watering theſe at times will ſend them away. *Mortimer's Huſbandry.*

ANTAPO'CA, in the civil law, implies one's acknowledgment in money paid, by way of rent, intereſt, or ſuch-like incumbrance. Such an inſtrument, or Antapocha, the debtor gives upon making payment to the creditor, to ſerve as a proof of the charge or incumbrance for futurity, and exclude any claim of preſcription againſt the payment of it.

ANTECE'DENT (*Dict.*)—

ANTECEDENT *will*, or *deſire*, is that which precedes ſome other will or deſire, or ſome knowledge or proviſion.— Thus we ſay, God by a ſincere, but Antecedent deſire, wills all men to be ſaved: that is, this ſincere deſire of God precedes, and does not ſuppoſe, the knowledge of their faith and repentance.

By the way it muſt be noted, that the term Antecedent is only applied to God in reſpect of the order of nature, not of an order of ſucceſſion; for that God, by reaſon of his infinite perfections, ſees and foreſees at the ſame time: after the ſame manner he alſo wills, and not ſucceſſively, one thing after another.— Yet does not this hinder, but that God may will one thing on occaſion of another, or have ſuch a deſire on occaſion of ſuch a proviſion; which divines call the order of nature, in contradiſtinction to that of time.

ANTECE'SSORS, in the art of war, is an appellation given to a party of horſe, diſpatched before the agmen or body of an army, partly by way of intelligence, and partly to chuſe a proper place for encamping on, as well as the moſt convenient roads for the ſoldiery to travel in. *Aquin. Lex. Milit.*

ANTECESSO'RES, in the antient military art, parties ſent before to mark out a camp, procure proviſion, or even reconnoitre the enemy. *Aquin. Lex. Milit.*

ANTEJUSTINIA'NEAN, an appellation ſometimes given to the antient Roman law, as it ſtood before the time of the emperor Juſtinian.

A'NTEDATE, a falſified date, a date ſet down before the true one. Antedates are of a very dangerous conſequence in matters of trade.

To ANTEDATE, in commerce, is to ſet down a falſe date, to date, from a day prior to that on which the buſineſs is tranſacted, the note, or bill, drawn, or letters written, &c.

In France it was formerly the ill cuſtom to leave blank orders on the back of bills of exchange; that is to ſay, to endorſe them by writing only one's name, ſo that they could eaſily be Antedated, which might occaſion very great abuſes, eſpecially from thoſe who happened to break: for they who fell under that misfortune, and had bills of exchange drawn at two uſances, or payable in the payment of Lyons, which were to order, in blank, might Antedate the order, and make them thus be received under borrowed names, or give them in payment to ſuch of their creditors as they wanted to favour, to the prejudice of others; by which means thoſe bills could not be demanded to be added to the bankrupt's effects, becauſe, the date of their order ſeeming to be prior to the time of the failure, it could not be urged that they were negotiated within the time wherein the perſon became a bankrupt.

The regulation for commerce in France, made in the year 1673, has provided, that it is not now ſo eaſy to Antedate orders on the back of bills of exchange: for, in the 22d article of Tit. V, it is ordered, that the ſignature, or name ſigned, on the back of bills of exchange, ſhall ſerve only as an endorſement, and not as an order, unleſs it be dated, and contain the name of the perſon who ſhould have paid the value in money, merchandize, or otherwiſe: and, by the 26th article of the ſame title, it is ordered, that whoever Antedates orders, ſhall be puniſhed as guilty of forgery.

ANTEDILU'VIAN *Philoſophy*, or the ſtate of philoſophy before the flood. Some who have traced philoſophy back, to its origin, do not ſtop at the firſt man, who was formed in the image and likeneſs of God; but, as if the earth were unworthy to give birth to ſuch a ſcience, ſoar to the ſkies, and ſeek it among angels, where they ſhew it us brilliant in a glare of brightneſs. This opinion ſeems founded on what the ſcripture ſays of the nature and wiſdom of angels. It is natural to think, that, being of a nature very much ſuperior to our's, they muſt conſequently have a better knowledge of things, and be better philoſophers than men. Some learned men have carried things farther yet; in order to prove that angels excelled in natural knowledge, they have aſſerted that God made uſe of their ſervice in the creation of the world, and in the formation of the different animals that inhabit it. This opinion it is eaſy to ſee flows from the doctrines of the Pythagorean and Platonic philoſophy. Pythagoras and Plato, puzzled at the infinite ſpace between God and man, thought proper to fill up the interval with genii or angels, but, as M. Fontenelle judiciouſly obſerves in his Hiſt. des Oracles, with what ſhall we fill the infinite ſpace between God and theſe genii or angels; for the diſtance between God and any creature whatever is infinite? Now, if the action of God muſt traverſe an infinite vacuum, if I may be permitted the expreſſion, to deſcend to angels, it might have deſcended to men as they are removed only ſome degrees lower, which bears no proportion to the diſtance of angels from the firſt cauſe. When God ſpeaks to man by the means of an angel, it is not becauſe, as Plato has aſſerted, angels are neceſſary for ſuch a communication; no, God employs them for reaſons that philoſophy never will find out, and can be perfectly known only by himſelf.

Plato imagined ſpirits to form a ſcale of beings, ſo that, by aſcending from a leſs perfect to a more perfect Being, we might at laſt arrive at a creature inferior to the Deity, only by ſome degrees of perfection: but, as it is certain, all beings are infinitely imperfect, compared to him, becauſe they are infinitely removed from him, the different degrees of perfection which are between them, diſappear, when we compare them with God; what raiſes them one above another, does by no means bring them near to him. Thus, without any higher aid than human reaſon ſupplies, it is plain, there is no occaſion for ſpirits, or any intermediate beings between God and us, to render our approaches towards the divine Being more proportional.

But if good angels, miniſters of the will of God, and his meſſengers to men, are excellent in the philoſophical ſciences, why ſhould we refuſe this power and capacity to the fallen angels? Their fall did not change the excellency of their nature, nor perfection of their knowledge. One may ſee a proof of this in aſtrology and augury. The devil who tempted our firſt parents, owed his victory over them to artful and ſubtle reaſonings. None have been ſo weak as to advance, that the fallen angels have revealed to men whom they had commerce with, and had inchanted, ſeveral ſecrets, as the nature of metals, the virtues of herbs, magic, and the art of reading men's deſtinies in the ſkies, except ſome fathers of the church, whoſe heads were infatuated with the dreams of the Platonic philoſophy.

It will be needleſs to ſhew the weakneſs and abſurdity of their arguments, who aſſert that angels or dæmons are philoſophers, and great philoſophers too: let us leave this philoſophy to theſe inviſible philoſophers, and come to that which is more ſuitable to the nature of man, and within our own ſphere.

Was Adam, the firſt man, a philoſopher? This ſeveral make no doubt of. Hornius, in ſhort, tells us, that, in in his opinion, Adam, before his fall, was not only perfect in all knowledge, but alſo retained ſome veſtigia or traces of this perfection after his fall. The remembrance of what he had loſt, being always in his mind, kindled in his heart a paſſionate deſire of recovering the knowledge ſin had robbed him of, and diſſipating the darkneſs which had thrown a veil over it. To ſatisfy this thirſt of knowledge, he dedicated his whole life to the contemplation of nature, and, carrying ſcience to the higheſt pitch, left moſt of his diſcoveries to his children; becauſe he lived long enough to communicate them. Such are the reaſonings of Dr. Hornius, to which we might add what the Jewiſh rabbins have wrote, if their fables merited our attention. But Hornius offers ſome farther arguments, to prove Adam a philoſopher, and even of the firſt rank. Had he not been a naturaliſt, ſays Hornius, could he have given the animals names ſo expreſſive of their nature? Euſebius has brought a proof of Adam's logic. As to the mathematics, he muſt have certainly underſtood them, or he could never have made cloaths out of the ſkins of wild beaſts, have built him an houſe, obſerved the motions of the ſtars, and regulated the year by the courſe of the ſun. But the higheſt of all theſe convincing arguments, brought in favour of Adam's philoſophy, is this, that he wrote books, that theſe books contained all the ſublime ſciences which he had made himſelf maſter of with incredible labour. It is true, indeed, theſe books are apocryphal, or loſt; but that ſignifies nothing; becauſe tradition has preſerved the titles of the authentic books whereof he was the real author.

Nothing is more eaſy than to refute all theſe arguments; firſt, if we ſpeak of Adam's wiſdom before the fall, it has no relation to philoſophy in the ſenſe we accept it; for that wiſdom conſiſted in the knowledge of God and himſelf, but, particularly, in that practical knowledge which might lead him to the happineſs for which he was created. It is true, Adam poſſeſſed this kind of wiſdom, but what connection has this with a philoſophy which admiration and curioſity, the daughters of ignorance, produce, which is not acquired without the toil of reflection, nor brought to perfection without the conflict of different opinions? The wiſdom with which Adam was created, was that divine wiſdom which is the fruit of grace, which God pours forth even on the weakeſt minds. This is, no doubt, a true philoſophy, but it is very different from that philoſophy which the rational mind firſt conceived, and all ages have concurred to produce and carry to its preſent maturity. If Adam, in his ſtate of innocence, had no philoſophy, what will become of that they attribute to him after his fall, which was but a faint glimmering of what he had before? Would they perſuade us that Adam, whoſe ſin continually followed him, and who could think on nothing but the means of reconciling himſelf to God, and reſiſting the evils that ſurrounded him, had a mind ſufficiently at eaſe to apply himſelf to the barren ſpeculations of vain philoſophy? He gave names to animals; but does this prove him well acquainted with their nature and properties? He reaſoned with Eve, our common mother, and his children; from thence ſhall we conclude he underſtood the art of logic? By ſuch reaſoning as this we may make every man a logician. He built himſelf a poor cottage, governed his family prudently, inſtructed them in their duty, taught them religious worſhip; but are theſe ſufficient reaſons to prove Adam an architect, a politician, and divine? How can any one maintain Adam to have been the firſt inventor of letters, when it is evident, that, mankind, long after the flood, made uſe of hieroglyphics, the moſt imperfect of all kinds of writing, to convey their ideas to each other; and that this was the firſt attempt made of the kind. The wonders of nature are expoſed to our view in the moſt glaring light, a long time before we have reaſon, opportunity, or penetration enough to enquire into them. If we came into the world with the ſame degree of reaſon with which we go to a playhouſe the firſt time, ſtruck, on the ſudden drawing of the curtain, with the magnificence of the ſcenes and decorations of the play, we could not poſſibly forbear admiring its beauty, and examining its ſtructure; but who is ſurprized at what he has ſeen for a courſe of fifty years? Among men, the wants of ſome take up all their time to ſupply their neceſſities, they have none to apply themſelves to metaphyſical ſpeculations; the riſing ſun calls them to their labour, and the fineſt night that ever ſhone on the beſpangled ſky, ſpeaks no language to them, or only ſays this, 'Go, weary labourer, " to reſt." Many, of more leiſure, either have not had opportunity to interrogate nature, or wanted capacity to underſtand her anſwers. The philoſophical genius, whoſe ſagacity, ſhaking off the yoke of cuſtom, firſt gazed with admiration on the prodigies of nature which ſurrounded him, deſcended into himſelf, asked himſelf queſtions, and gave himſelf anſwers concerning all the objects which he ſaw, muſt have been a long time in ſuſpence, might even have died without having credited his own opinions, ſays the author of the eſſay on Merit and Virtue, page 92.

If Adam had no philoſophy, there can be no inconſiſtence in denying it to his children Abel and Cain: no body but Hornius has diſcovered that Cain was the founder of a ſet of philoſophers. A man would ſcarce think Cain had ſown the firſt ſeeds of the Epicurean doctrine, and been an atheiſt. The reaſon Hornius brings to prove this is very ſingular: Cain, ſays he, was a philoſopher, but a wicked and atheiſtical philoſopher; becauſe he loved pleaſures and diverſion, and his children have but too well followed the leſſons he gave them of voluptuouſneſs. If every man muſt neceſſarily be an Epicurean philoſopher who liſtens to the blandiſhments of pleaſure, and takes refuge in atheiſm for impunity of the crimes he commits, the garden of Epicurus would not be large enough to contain ſo great a number of philoſophers. As to what he ſays about the city Cain built, and the tools he made uſe of in tilling the earth, theſe by no means prove him a philoſopher; for what neceſſity and experience made men diſcover, in this early age of the creation, required no precepts of philoſophy; neceſſity and experience only taught them. Beſides, it may be ſuppoſed God taught the firſt man agriculture, and other arts, and he inſtructed his children in them.

Jealous Cain having murthered his brother Abel, God revived Abel in the perſon of Seth. The ſacred traditions which concerned religion, were, therefore, preſerved in this family. The eſpouſers of the Antediluvian philoſophy, not contented with aſſerting Seth was a great philoſopher, would perſuade us he was alſo a great Aſtronomer. Joſephus, ſpeaking mightily in praiſe of the learning which the Children of Seth had acquired before the deluge, relates, that they erected two columns, one of brick, the other of ſtone; that they ſpared no pains nor coſt to build them in the ſtrongeſt manner, in order to reſiſt the conflagration and the flood, the world was threatened with; and on theſe they inſcribed their learning, and all the diſcoveries they had made. Joſephus adds, that the column built of brick remained even to his time. I know not whether we ought to lay any great ſtreſs on this paſſage. Hyperboles and exaggerations coſt Joſephus little, when the point is to aggrandize his own nation. The main ſcope of this hiſtorian is to ſhew the ſuperiority of the Jews over the Gentiles in arts and ſciences; this probably may have given birth to the fiction of two columns being built by the children of Seth. What probability is there that ſuch a column could have reſiſted the devaſtations of the deluge? Beſides, can it be imagined that Moſes, who has mentioned the arts invented by the children of Cain, as muſic, metallurgy, the art of working in iron and braſs, &c. ſhould be ſilent about the great knowledge Seth had acquired in aſtronomy, in writing of which they pretend him the inventor, that nothing ſhould have been ſaid in his writings concerning the names he gave to the conſtellations, and the diviſion he made of the year into months and weeks?

We are not to imagine Jubal and Tubal-Cain were great philoſophers, one for having invented muſic, the other for having poſſeſſed the ſecret of working in iron and braſs: theſe two men, perhaps, only carried to a greater perfection what others had found out before them. But, ſuppoſing them to have been the inventors of theſe arts, does it follow as a neceſſary concluſion they muſt have been philoſophers? Every one knows that many of the arts moſt uſeful to ſociety owe their invention to chance; it is the part of philoſophy to reaſon on the genius ſhe diſcovers in them after they are found out. It is a bleſſing chance has prevented our wants, and left philoſophy almoſt nothing to do. Thus you ſee there is no philoſophy either in the branch of Cain or Seth. We find honeſt laborious men, before the flood, who applied themſelves to agriculture, preſerved their primitive traditions, tended their flocks, and retained a true knowledge of God, but were no philoſophers; wherefore it is in vain to ſeek the origin and riſe of philoſophy in the time preceding the flood.

Antediluvian *World.*—Dr. Burnet and Dr. Woodward differ very widely about the Antediluvian world; the former imagines its face and appearance to have been ſmooth, equable, and in all reſpects different from what we now find it to be.

The latter, on the contrary, endeavours to prove, that the face of the terraqueous globe, before the deluge, was the ſame as it is now, viz. unequal, diſtinguiſhed into mountains and dales, and having, likewiſe, a ſea, lakes, and rivers; that this ſea was ſalt as ours is; was ſubject to tides, and poſſeſſed nearly the ſame ſpace and extent that it now does, and that the Antediluvian world was ſtocked with animals, vegetables, metals, minerals, &c. that it had the ſame poſition, in reſpect of the ſun, which ours now hath, its axis not being parallel, but inclined, as at preſent, to the place of the ecliptic; conſequently, that there were then the ſame ſucceſſion of weather, and the ſame viciſſitudes of ſeaſons, as now.

A'NTELOPE, *gazella*, in zoology, the name of an animal of the goat kind, of which there are three known ſpecies.

1. The gazella Africana ſtrepſicheros Plinii. This is the ſpecies we uſually ſee under the name of the Antelope; it is called the addace in Africa, and is the dorcas Lybica of Ælian. Its horns are ſlender and erect; they are black, tranſverſly radiated, and twiſted into the appearance of ſpiral lines; though theſe are, in reality, ſo many annular circles, they are towards the middle bent a little outwards, and thence they turn in again, ſo that they, in ſome meaſure, repreſent the antient lyre.

2. The gazella Indica, or Indian Antelope, with very long ſtraight horns, which are annulated only in that part near the head. The horns of this creature are ſometimes three feet long, and are perfectly ſmooth and gloſſy, except near the head and back. The creature is of the ſize of our common deer, and is of a greyiſh colour; its tail is a foot long, and has longer hairs on it than thoſe of the reſt of the body. The horns of this ſpecies are very common in the muſæum's of the curious. This creature ſeems to be the animal which produces the bezoar ſtone ſo much valued in medicine.

3. The African kind, which has flat horns annulated to the very top, and crooked near the middle; this has been ſeen alive, ſometimes, in England. It was much ſmaller than our deer, and of a ſandy colour; its belly white, and its ſides, where the white and ſand-colour meet, of a duſky appearance. Its horns grow out of the middle of the forehead near the eyes, and are very long, ſharpening at the ends, and all the way marked with tranſverſe ſtriæ or furrows, and a little bent upwards. Its ears are large, and its legs very ſlender.

ANTEPENU'LTIMA, in grammar, is either taken ſubſtantively or adjectively, to agree with a ſyllable underſtood. Words of many ſyllables have the two laſt thus diſtinguiſhed, the ultima or laſt, the penultima or laſt but one; which is a contraction of pene almoſt, and ultima the laſt. The ſyllable preceding the penultima is called the Antepenultima, Ante, before, being added to penultima: thus, in the word amaveram, ram is the ultima, or laſt ſyllable, ve, the penultima, and ma the Antepenultima.

In Greek, the acute-accent is placed over the laſt ſyllable, as Θεός, God; over the penultima, as λόγος, diſcourſe; over the Antepenultima, as ἄνθρωπος, man; but it is never carried farther back.

In Latin, if accents be made to direct the reader in his pronunciation, if the penultima be ſhort, the accent muſt be placed over the Antepenultima, though that be ſhort alſo, as *dóminus*, a lord.

ANTEPREDI'CAMENTS, *anteprædicamenta*, in logic, certain previous matters, requiſite to a more eaſy and clear apprehenſion of the doctrine of predicaments or categories.

Such are definitions of common terms, as equivocals, univocals, &c.

They are thus called, becauſe treated by Ariſtotle, before the predicaments, that the thread of the diſcourſe might not afterwards be interrupted.

ANTHESTE'RIA *, in antiquity, was a feſtival celebrated by the Athenians in honour of Bacchus.

* Some think it takes its name from the month Antheſterion, on which it was celebrated: others, as Apollodorus, quoted by Ariſtophanes, imagine, it was not the name of any particular feaſt, but that all the feaſts of Bacchus were called Antheſteria; but the moſt natural derivation of the word Antheſteria is from ἄνθος, a flower, becauſe they then offered garlands of flowers to Bacchus.

The Antheſteria laſted three days, the eleventh, twelfth, and thirteenth days of the month, each of which days had a name ſuited to its proper office. The firſt day of the feaſt, or eleventh of the month, was called πιθοίγια, that is, opening of the veſſels, in regard on this day they opened the veſſels and taſted the wine.—The ſecond day of the feaſt, or twelfth of the month, they called χόος, congius, the name of a meaſure, containing the weight of about ten pounds: on this day they drank the wine prepared the evening before. The third day of the feaſt, or thirteenth day of the month, they called χύτροι, kettles: on this day they boiled all ſorts of pulſe in kettles, which, however, they were not allowed to touch, becauſe they were offered to the god Mercury. At theſe feſtivals the ſervants had the ſame liberty as at the Roman feriata. *Meurſii Græca Saturnalia.*

ANTHOLO'GIA, in polite literature, ſignifies a collection of Greek epigrams.

Meleager, a native of Gadara, a city of Syria, who lived in the reign of Seleucus, the laſt king of that realm, made the firſt collection of Greek epigrams, which he called Anthologia, becauſe, as he had the brigheſt and moſt florid epigrams of forty-ſix antient poets, he conſidered his collection as a noſegay, and denominated each of thoſe poets after ſome flower, Anytus the lilly, Sappho the roſe, &c. After him Philip of Theſſalonica made a ſecond collection, in the time of the emperor Auguſtus, out of only fourteen poets. Agathias made a third, about five hundred years after, in the reign of the emperor Juſtinian. Planudes, a monk of Conſtantinople, who lived in the year 1380, made the fourth and laſt, which he divided into ſeven books, in each of which the epigrams are diſpoſed, in an alphabetical order, according to their ſubjects. This is the Anthologia that have reached our hands. He retrenched abundance of obſcene epigrams, for which ſome of the learned are not a little angry with him.

There are a great many epigrams in this collection, that abound with wit and ſenſe, but more of a different character. *Rollin.*

ANTHO'CEROS, in botany, the name of a genus of moſſes. The name was given by Micheli, and the generical character eſtabliſhed, in that it has a monopetalous flower, which is corniculated and divided into two carinated parts, the diviſion running to the center, where there ſtands a duſty ſtamen or filament; this, he ſays, is barren, and ariſes from the tubular cup of the flower; the fruits being, ſometimes, on the ſame plants with theſe flowers, and ſometimes on others, and being of a radiated form, each of the ſeveral rays containing two, three, or four ſeeds.

Dillenius, however, obſerves, that what this author calls the monopetalous flower of the Anthoceros, is properly the capſule, containing a fine duſt, which is like that of the capſules of all other moſſes, and is, by him, ſuppoſed to be the farina or male part of the fructification; the filament in the middle of this capſule is ſurrounded with yellow duſt, and the whole capſule, viewed by the microſcope, appears of the nature of the common unicapſular and bivalve ſeed-veſſels of the larger plants, as the pods of muſtard, and the like. And this author further obſerves, that he could not accurately perceive the ſeed-veſſels deſcribed by Micheli.

There are only five known ſpecies of this genus.

1. The common Anthoceros, with ſmaller and more divided leaves; this grows moſt frequently in damp ſhady places.

2. The Anthoceros, with larger and leſs divided leaves, the heads, in this kind, ſtanding on very ſhort pedicles; it is found in many parts of Germany. 3. The narrow-leaved Anthoceros with a ſhort flower; this is found in Italy by wayſides. 4. The five-cut leaved Anthoceros; the leaves of this are of a purple green; it grows on clayey ground. 5. The muſhroom-headed moſs, or ſmall leafleſs moſs, with thick bivalve heads; this is frequent in Muſcovy. *Dillen. Hiſt. Muſc.*

A'NTHRAX, in the natural hiſtory of the antients, was a word uſed by the moſt early writers, for the ſubſtance we now call pit-coal and lithanthrax. Theophraſtus plainly tells us, that the ſubſtance ſtrictly and properly called Anthrax (for they alſo knew a gem by the ſame name uſed in a metaphorical ſenſe) was an earthy foſſil ſubſtance, which was broken in pieces to be uſed, and kindled well, and burnt almoſt like wood-coals, and was uſed by the ſmiths.

ANTHROME'TRICA *Machina*, a name given by Sanctorius to his weighing chair, contrived for meaſuring the quantity of inſenſible perſpiration.

ANTHROPOGRA'PHIA *, a deſcription of man; more particularly, of the ſtructure of his body, and the parts thereof.

* The word is formed from the Greek ἄνθρωπος, a man, and γράφω, to deſcribe.

ANTHROPO'LOGY, is particularly uſed in theology for a way of ſpeaking of God, after the manner of men; but by attributing human parts to him, as eyes, hands, ears, anger, joy, &c.

We have frequent inſtances of Anthropology in holy ſcripture, by which we are only to underſtand the effect, or the thing which God does, as if he had hands, &c.

ANTHROPO'PATHY, a figure, expreſſion or diſcourſe, whereby ſome paſſion is attributed to God, which properly belongs only to man.

Anthropopathy is frequently uſed promiſcuouſly with anthropology; yet, in ſtrictneſs, they ought to be diſtinguiſhed as the genus from the ſpecies.— Anthropology may be underſtood of any thing human attributed to God: but Anthropopathy, only of human affections, paſſions, ſenſations, &c.

ANTHROPOPHA'GIA, the act of eating human fleſh. Some authors trace the original of this barbarous cuſtom as high as the deluge, attributing it to the giants. It is pretended that the land of Canaan itſelf was inhabited by giants, who were naturally ſo fierce and cruel, that they ordinarily fed on human fleſh. Some hiſtorians, particularly Pliny. lib. 4. cap. 12, ſay, the Scythians and Sauromatans practiſed this horrid cuſtom: the ſame author alſo ſays, there were Anthropophagi in Ethiopia: and Juvenal mentions the barbarity of certain people of Egypt, who, after the manner of tygers, devoured human bodies. Titus Livy ſays, that Hannibal obliged his ſoldiers to eat human fleſh, to make them more fierce and intrepid in battle. In the ſouthern parts of Africa, and in ſome parts of America, this horrid practice ſtill obtains. Veſputius relates, that he has ſeen the men and women naked eat indifferently each other's fleſh; the children fed greedily upon their father's dead body, and gloried in having eat a great number of men.

ANTHOSPE'RMUM, in botany, the amber-tree. The characters of this genus are:

It is male and female in different plants, and ſome are hermaphrodite: the empalement is divided into four parts; the flower is of one leaf; there are two pointals, which are accompanied by four ſtamina: the flower ſits upon the ovarium.

We have but one ſort of this plant in the Engliſh gardens at preſent, viz.

Anthoſpermum mas. Lin. The male Anthoſpermum.

It has been long known, in the curious gardens, under the title of frutex Africanus, ambram ſpirans, or amber-tree; by ſome ambergreaſe, from the ſcent of this plant being ſuppoſed to be like that of ambergreaſe.

This is preſerved in moſt curious gardens, which have collections of tender plants. It is eaſily propagated by planting cuttings, during any of the ſummer months, in a border of light earth; which will take root in ſix weeks time, provided they are watered and ſhaded, as the ſeaſon may require; or, if theſe cuttings are planted in pots, and plunged into a very moderate hot-bed, they will take root ſooner, and there will be a great certainty of their growing: then they ſhould be taken up, with a ball of earth to their roots, and planted into pots filled with light ſandy earth, and may be expoſed to the open air until October; at which time they ſhould be removed into the conſervatory, where they ſhould be placed as far as poſſible from being over-hung with other plants: and, during the winter-ſeaſon, they muſt be refreſhed with water, but ſhould not have too much given them each time. You may let them have as much air as the weather will permit; for, if they are kept too cloſe, they will be ſubject to grow mouldy, and generally decay ſoon after; ſo that, if the green-houſe is damp, it will be difficult to preſerve theſe plants through the winter. *Miller's Gardener's Dict.*

ANTICA'RDIUM, in anatomy, &c. that hollow part under the breaſt, juſt againſt the heart, commonly called the pit of the ſtomach: called alſo ſcrobiculus cordis.

ANTICHRE'SIS, in the civil law, a covenant or convention, whereby a perſon, borrowing money of another, engages or makes over his lands or goods to the creditor, with the uſe and occupation thereof, for the intereſt of the money lent. This covenant was allowed of by the Romans, among whom uſury was prohibited: it was afterwards called mortgage, to diſtinguiſh it from a ſimple engagement, where the fruits of the ground were not alienated, which was called vif gage.

ANTICHTHO'NES, is uſed, in antient writers, to denote the inhabitants of contrary hemiſpheres.

In which ſenſe Antichthones differ from antœci and antipodes. The ancients conſidered the earth, as divided by the equator into two hemiſpheres, the northern and ſouthern; and all thoſe who inhabited one of theſe hemiſpheres were reputed Antichthones to thoſe of the other.

A'NTI-CHRIST (*Dict.*)— As to the time when Anti-Chriſt will make his appearance, it is far from being agreed on. We know, in general, that he will precede the ſecond coming of Chriſt. But all thoſe who have attempted to fix the year of his appearance have only diſcovered their ignorance and raſhneſs. There have been impoſtors ever ſince St. Paul's time, who have terrified believers, by perſuading them that the day of the Lord was at hand. St. Paul warns the Theſſalonians againſt any deceit of this kind. The heretics of that time were true ſigns of Anti-Chriſt, but this ſtill ſhews that the Chriſtians of that time expected the coming of the Meſſiah.

The ſame opinions and diſpoſitions are obſervable in the generality of the fathers of the firſt ages. The churches of Vienna and Lyons in Gaul, ſeeing the violence of the perſecution, which was ſet a-foot by Marcus Aurelius, believed they then beheld the preludes to the perſecution of Anti-Chriſt. Judas Syrus, in the reign of the emperor Severus, aſſerted that Anti-Chriſt would ſoon appear, becauſe the perſecution was then carrying on with great heat againſt the church. Tertullian, who lived about the ſame time, and St. Cyprian, who flouriſhed ſoon after, believed the coming of Anti-Chriſt was very near. St. Hilary was of opinion, that the progreſs of Arianiſm was a forerunner of Anti-Chriſt. St. Baſil the great, St. Ambroſe, St. Jerom, St. Martin, St. Cryſoſtom, and Gregory the great were of opinion, that the end of the world was at hand, and that the coming of Anti-Chriſt would not be far off.

After the tenth age, which concluded the ſixth millenary, according to their opinion, who reckoned the birth of Jeſus Chriſt to have happened in the year of the world 4500; people began to get the better of that apprehenſion, they had been under, of the appearance of Anti-Chriſt, and concluſion of the world, which was to be, according to the tradition of the ancients, after the duration of 6000 years. They then began to build larger churches and edifices. St. Jerom's tranſlation of the ſcriptures, which allowed the world to have exiſted not above 4000 years before Jeſus Chriſt, contributed likewiſe to perſuade men that the laſt period of the world, and the coming of Anti-Chriſt, were not ſo near. Notwithſtanding this, it did not hinder ſome from attempting once more to fix the year of Anti-Chriſt's appearance. The council of Florence, aſſembled in 1105, condemned Fluentius, biſhop of that city, for maintaining that Anti-Chriſt was then already born; Abbot Joachim, who lived in the twelfth age, pretended that Anti-Chriſt was to appear in the 60th year of his time. Arnaud de Villeneuve ſaid, he would come, in 1326: Peter Daille, in 1789: Cardinal de Cuſa, in 1730: John Picus, of Mirandola, in 1994: Jerom Cardan, in 1800: and Vincent Ferrier, who lived in the 15th century, wrote to Pope Benedict XIII, that Anti-Chriſt would appear in a very ſhort time; and that an holy hermit had informed him, nine years before, that this enemy of God was born. The event has already confuted the generality of theſe predictions; and we may ſafely venture to affirm, that the reſt are no better grounded, nor at all more certain, than the preceding ones.

Our Saviour, in his goſpel, deſcribes the times that ſhall precede his coming, as times of war, famine, and rebellion; and ſays, that all this is but the beginning of ſorrows. Then the juſt ſhall be given up into the hands of the wicked, and put to death by them; many good men ſhall be offended, and the abomination of deſolation ſhall be ſeen in the holy places. The calamities which will then happen, will be alſo ſo extreme, that, if they were not to be ſhortened, no one would be ſaved: but, for the elect's ſake, they will be ſhortened. Then ſhall ariſe falſe Chriſts, and falſe prophets, and ſhall ſhew great ſigns and wonders, inſomuch that (if it were poſſible) they would deceive the very elect. After all this, the ſon of man ſhall appear in the brightneſs of his majeſty.

There is likewiſe a difference among authors, as to the manner of the birth of Anti-Chriſt. Some ſay, he will be begot by a devil upon ſome very corrupt woman: others tell us, that Anti-Chriſt will be a devil incarnate, and not a man; that, as Jeſus Chriſt was born of a pure virgin, Anti-Chriſt will pretend to the ſame: but, whereas the ſon of God aſſumed real fleſh, Anti-Chriſt will take only the phantom and appearance of fleſh. But St. Cryſoſtom, Theodoret, Theophylact, and ſome others, with more reaſon, imagine that Anti-Chriſt will be a real man, and an agent of the devil in exerciſing all his cruelty and malice againſt the faithful. There was a tradition received among the ancients, that he ſhould be born of a Jewiſh family, and proceed from the tribe of Dan. In which ſenſe theſe words of Jeremiah are explained, the ſnorting of his horſes are heard from Dan: The whole land trembled at the ſound of the neighing of his ſtrong ones; for they are come, and have drowned the land and all that is in it. The moſt ancient commentators upon the Revelations, ſuch as Aretas, Bede, Primaſius, Rupert, Hiacino, and many others, are of opinion, that St. John's omiſſion of the name of Dan, in his enumeration of the tribes of Iſrael, proceeds from the knowledge he had, that Anti-Chriſt ſhould be born of this tribe.

As to the dominion, or kingdom of Anti-Chriſt, as it is ſuppoſed that he will be born in Babylonia, it is ſaid that he will there lay the foundation of his empire, and that the Jews will be the firſt to declare for him, acknowledge his dominion, and enjoy the principal employments in his government. He will begin with attacking the Roman empire, which will then be divided among ten kings, according to the prophecy of Daniel. After he has ſubdued Egypt, Ethiopia, and Lybia, he will conquer Jeruſalem, and there fix the ſeat of his empire. Then, finding himſelf maſter of the eaſtern and weſtern empires, he will apply himſelf to the deſtruction of Chriſt's kingdom. Some of the ancients believe he will be ſeated in the churches of Chriſtians, and there receive the adoration of great numbers of apoſtates from the Chriſtian faith.

The ſcripture does not particularly tell us what the duration of Anti-Chriſt's kingdom will be; but, in ſeveral places, it ſeems to allow three years and an half for the continuance of his perſecutions; at leaſt three years and an half for the perſecutions of thoſe who were looked upon as figures of Anti-Chriſt.

The righteous, under the perſecution of Anti-Chriſt, will retire to the mount of Olives, where they will ſoon be attacked by this enemy of God. Then will they cry unto the Lord, and he will ſend Jeſus Chriſt to deliver them. He will deſcend from heaven, attended by his angels, and preceded by by a flame, which nothing will be able to extinguiſh. The angels will make ſuch a ſlaughter of the Anti-Chriſt, that their blood ſhall flow like a torrent in the valley. Anti-Chriſt himſelf will come to the top of mount Olivet, where he will be put to death in his own tent, and upon his own throne, without receiving the leaſt aſſiſtance from any one.

The Muſſulmen, as well as the Jews and Chriſtians, expect an Anti-Chriſt. The Muſſulmen call him Daggial, or Deggial, from a name which ſignifies properly an impoſtor, or a lyar; and they hold that their prophet Mahomet taught one of his diſciples, whoſe name was Tamini al Dari, every thing relating to Anti-Chriſt; and upon the faith of this man they tell us, that Anti-Chriſt muſt come at the end of the world, that he will make his entry into Jeruſalem like Jeſus Chriſt, who, as they will have it, is not yet dead, but will come, at his ſecond advent, to encounter him, and that, after having conquered him, he will then die.

A'NTIC, in ſculpture and painting, denotes a fantaſtical compoſure of figures of different natures, ſexes, &c. as men, beaſts, birds, flowers, fiſhes, and even things merely imaginary, or which have no exiſtence in the nature of things. *Build. Dict.*

ANTIHE'CTICUM *Poterii (Dict.)*— This medicine is prepared in the following manner:

Take equal quantities of tin and martial regulus of antimony, melt them in a large crucible; then put to them, by little and little, three times the quantity of nitre; after the detonation and noiſe is over, waſh the whole with warm water, till no ſaltneſs remain.

This is accounted a forcing penetrating medicine, inſomuch as to make way through the minuteſt paſſages, and ſearch even the nervous cells; whence, in all diſorders of that original, it is reckoned very effectual. In thoſe heavineſſes of the head, giddineſs, and dimneſs of ſight, whence proceed apoplexies and epilepſies, it does great ſervice. And, in all affections and foulneſſes of the viſcera of the lower belly, it is reckoned inferior to nothing in cleanſing away and diſcharging their impurities. Thus it obtains in the jaundice, dropſies, and all kinds of cachexies. It is likewiſe eſteemed of great ſervice, even in obſtinate venereal caſes, in clearing the blood from all impreſſions of contagion, and cleanſing the glands from thoſe corroſive recrements, which ſuch diſtempers frequently lodge upon them, and occaſion blotches and ulcerous deformities. In ſhort, there is hardly a preparation, in the chymical pharmacy, of greater efficacy in moſt chronic diſtempers; but it is not often met with in preſcription, although conſtantly kept in the ſhops. The doſe is from ſix grains to a ſcruple in grown perſons; for it is ſeldom given to children, their tender veſſels not well bearing the force of ſuch medicines. *Quincy's Diſpenſatory.*

ANTIME'RIA, in grammar, a figure whereby one part of ſpeech is uſed for another. e. gr. velle ſuum cuique eſt, for voluntas ſua cuique eſt; alſo, populus late rex, for populus late regnans.

Antimerica, in a more reſtrained ſenſe, is a figure whereby the noun is repeated inſtead of the pronoun. *Ludovic. Hebraiſm.*

The Antimeria is frequent in the Hebrew, and is ſometimes retained in our verſion of the Old Teſtament accordingly. Thus in *Gen.* cap. iv. Hear my voice, ye wives of Lamech, for my wives. *Gen.* c. iv. 23.

ANTIMETA'BOLE *, ἀντιμεταβολὴ, in rhetoric, a figure which ſet two things in oppoſition to each other.

* The word is Greek, compounded of ἀντὶ, againſt, and μεταβολὴ, from, μεταβάλλω, to ſhift or transfer.

This figure is twice exemplified in an apophthegm of Muſonius; which, on account of its excellence, is called aureum monitum, the golden maxim or precept. This apophthegm, tranſlated into Engliſh, is as follows:

Allowing the performance of an honourable action to be attended with labour, the labour, is ſoon over, but the honour immortal; whereas, ſhould even pleaſure wait on the commiſſion of what is diſhonourable, the pleaſure is ſoon gone, but the diſhonour eternal.

A'NTIMONY, *antimonium (Dict.)*—A conſiderable heavy ſemi-metal, naturally running into maſſes compoſed of an infinite number of ſtriæ or filaments. It is ſofter than any other of the bodies of this claſs; it breaks eaſily with a ſmall blow, and is very readily reducible to powder, by only rubbing it in a mortar. It has not the leaſt degree of ductility, but it is naturally very bright and gloſſy, and not much ſuſceptible of ruſt. It is not at all ſonorous in itſelf, yet, like tin, which has not that quality in itſelf, it is capable of heightening it in other metallic bodies that are poſſeſſed of it. It is eaſily fuſed by fire; a ſmall degree of heat anſwers this purpoſe: it flows the thinneſt of all the known mineral bodies, and, when urged by a violent fire, proves totally volatile. It bubbles up in the manner of lead, when the degree of fire is a little greater than what is barely neceſſary to melt it. It is not only volatile in itſelf, but it renders all other ſubſtances volatile by mixture, gold alone excepted. It leaves this metal infuſion clearer and purer than it can be made by any other means, but carries off every thing elſe in vapour with it. Antimony very eaſily runs into a glaſs, like that of lead, which is of the ſame uſe with the glaſs of lead in the vitrifying earth and ſtones; but is even preferable to it, as it attenuates them more, and in a ſtrong fire carries them off with it in vapour. It would therefore be very uſeful in the fuſion of ores, by the vitrifying and ſeparating the ſtony matter, but that it carries the metal itſelf alſo, except that be gold, away with it. This glaſs is very eaſily prepared by only fuſing Antimony with a mineral ſubſtance, commonly known by the name of calk, and very frequent in our lead-mines: a lump of this, the bigneſs of a walnut, thrown into a pound of Antimony in fuſion, vitrifies it almoſt inſtantly, and receives no viſible change itſelf in the operation.

The glaſs, produced by this proceſs, is of a duſky browniſh red, and ſemi-pellucid; wherever calk is to be had, there is no way ſo ready as, by this means, to make the glaſs of Antimony: where it is not at hand, it is eaſily vitrified alone, by calcining it in coarſe powder to a grey maſs, ſtirring it that it may not run into lumps, and then putting this calx into a crucible in a ſtrong fire: the Antimony is thus converted into a glaſs, like that of the former proceſs, but of a clearer red.

Where bodies very difficult of vitrification are mixed among the matters to be putrified by Antimony, as is the caſe in the more refractory ores of many kinds, the Antimony is apt to evaporate away before it has done its office: this however is eaſily prevented by only throwing a little piece of ſuet or tallow into the matter, which keeps it from flying off a long time. The regulus of Antimony mixes very readily with the ſeveral metals; moſt freely of all with iron, and, next to that, with copper. It conſiſts of a large quantity of a true foſſil ſulphur, and a matter very much reſembling the nature of the metals, and which, if art could arrive at any method of rendering it ductile under the hammer, would be a true metal. Mr. Boyle tells us, he knew a ſecret proceſs, by which a true fluid mercury might be obtained from it; and others, ſince his time, have pretended the ſame thing, but we have never ſeen any of them do it. It would therefore have been a great ſatisfaction if Mr. Boyle had given us the proceſs. It renders all metals brittle with which it is mixed; and, upon the whole, there ſeems great reaſon, from its effects on theſe bodies compared with theſe of arſenic, to believe that it is very nearly allied to that poiſonous mineral, though it do not exert the ſame fatal power in the body. The whole difference between the two ſubſtances ſeems to be, that the arſenic is fixed in Antimony by a vitrifying earth.

The ores of Antimony are very numerous and very various in their form, colour, and figure. It is pretended by many, that Antimony is often found pure, in its perfect ſtate in the earth; and the cabinets of collectors hold ſo many ſubſtances under the name of native Antimony, that it ſhould ſeem almoſt abſurd to deny the exiſtence of ſuch a foſſil. I can only obſerve, that, of all the ſpecimens I have ſeen preſerved as native Antimony, I never met with one that would bear the teſt, and prove truly ſuch: and, to ſilence the clamour that ſuch a harſh aſſertion may raiſe among the gentlemen who are robbed by it of ſome of the greateſt glories of their cabinets, I may add, that many of the very fineſt of theſe ſubſtances preſerved under this pompous name, and reſembling the wrought Antimony in their grey colour and ſtriated texture, are ſpecimens of manganeſe.

Antimony is found reduced to the ſtate of ore by ſulphur and other extraneous matter, and, as theſe are blended with it in greater or leſſer quantities, it has more or leſs of the external appearance of wrought Antimony, and is from this external appearance arranged by collectors in the claſs of native Antimony, or of Antimony-ores.

The moſt uſual ore of Antimony is a hard and ponderous ſubſtance of a bluiſh grey colour, not ſtriated as common Antimony, but compoſed of a number of ſmall irregular granules, which appear very bright and ſparkling, wherever the maſs is freſh broken. This ore has much the appearance of a bright piece of caſt iron, where freſh broken.

Other ores of Antimony, in which there is leſs extraneous matter, are formed of broader and flatter granules; theſe more nearly reſemble wrought Antimony, but are more brittle: theſe are very bright, of a paler grey than the granules of the laſt mentioned kind, and the ores compoſed of them are more beautiful and more valued.

When there is yet leſs of the extraneous matter, and that is almoſt pure ſulphur, the ores approach infinitely more than either of theſe to the appearance of wrought Antimony. They are compoſed of multitudes of fine and ſlender filaments, of a bright and glittering ſteel colour; theſe are laid more or leſs cloſely together in the ſeveral ſpecimens, and are much broader and coarſer in ſome than in others. Theſe are properly enough called ſtriated Antimony-ores; but, the generality of people who collect minerals loving founding names, they are generally found in the cabinets, under the title of native Antimony.

Theſe are the forms, in which Antimony appears in thoſe ores in which it is moſt pure; but, beſides theſe, there are others very frequently met with, in which this ſemi-metal is mixed with ſilver, and with iron; theſe give it a very different appearance. In England we alſo have Antimony mixed with lead in the ſame ore, a thing ſcarce known in any other part of the world; and ſome of our Corniſh Antimony-ore contains alſo a ſmall portion of tin. The German ores of Antimony, are frequently found of a fine ſilvery white, or a fine gold-like yellow: theſe colours are owing to the admixture of the white or yellow marcaſites with them, and, though very ſplendid as to the appearance, they are far from being the moſt valuable of Antimony-ores for working.

Antimony-ore is very frequently blended with cryſtalline or ſparry matter; ſometimes it is perfectly covered with a fine yellow ſulphur, and ſometimes with a mixture of theſe and other ſubſtances together.

Antimony-ore is found in great abundance in many parts of the world. The German mines abound with it. There is a great deal of it in France and Italy. In Hungary, particularly about Preſburg, there is a great deal of very rich ore found. The firſt Antimony of France is that of Poictou; and in England, where we have no ſmall quantity, that of Endellion in Cornwall is the beſt; but this muſt be well purified from the lead the ore alſo contains before it is fit for uſe.

The Hungarian Antimony-ore is much of it of the naturally ſtriated kind; this was called the male Antimony by the Romans. The broad-grained, or that formed of large and ſhining granules, which the Romans called the female, is frequent in Saxony. Some of the ſtriated Hungarian Antimony-ores are variegated with yellowiſh or orange-coloured ſpots. Theſe pieces are frequently found in the gold mines, and ſuppoſed to contain ſulphur of gold. The chymiſts call this kind antimonium ſolare, and are very full of an opinion, that vaſt matters may be done with it in the great work of the tranſmutation of metals.

The Antimony-ore is never brought into the ſhops, or at leaſt it never ought to be. What we ſee there has been all melted from its ſtate of ore, and is in cakes of the figure of the veſſels it has been caſt in, all throughout compoſed of the ſame ſort of ſtriæ or filaments as the finer ores, reſembling ſo many bright needles, diſpoſed in faſciæ or bubbles throughout the maſs.

It ſhould be choſen very bright, tender, and friable; compoſed of long and broad ſtriæ of the paleſt colour, and the moſt glittering that can be found; and the tops of the cakes, which are of an irregular or ſpongy texture, and blacker colour, ought to be thrown away. The ſulphur that Antimony contains is not ſeparated in that fuſion in which it paſſes in the reducing it from its ore. We have the moſt evident inſtances of it in the calcination of it afterwards, in which operation we are offended with a ſmell, wholly like that of common brimſtone; and, if it be performed in a dark place, we even ſee it burn away in thin blue flames.

Antimony, thrown into a crucible with nitre, deflagrates in the very ſame manner that common ſulphur does under the ſame circumſtances; and, if crude Antimony be diſtilled with corroſive ſublimate, a cinnabar is prepared, called cinnabar of Antimony. This owes it origin ſolely to the mercury in the ſublimate united with the ſulphur in the Antimony. In fine, the ſulphur may be ſeparated from Antimony, in its proper form, by boiling crude Antimony in common water, after it has been run with a mixture of quicklime or pot-aſh, and then adding vinegar or ſome other acid to the ſolution made of the ſulphur of it, by the water and alkaline ſalts; for a plain ſulphur is precipitated from it in this manner.

The glaſs of Antimony only loſes its ſemi-metalline form by the ſulphur's having been driven off from the Antimony in calcination; and if it be fuſed in the fire, and any ſulphureous and inflammable matter be added to it, it inſtantly becomes Antimony again. Nay, this ſulphur abounds ſo much in the common melted Antimony, that an acid, plainly of the kind of that of common ſulphur or vitriol, for they are the ſame, may be produced from it.

The proper ſolvent of Antimony, in its reguline ſtate, is aqua regia.

Antimony is more eaſily ſeparated out of its ores than almoſt any others of the metalline ſubſtance. It needs no flux-powders, and the utmoſt caution neceſſary is to keep off in a great meaſure the communication with the external air, and to keep the fire moderate, that part of it does not burn away or go off in vapour. The method of ſeparating it is no more than this: bore three or four holes in the bottom of a crucible, and, filling it half full of broken Antimony-ore, ſet it in another crucible, and cover it with a tile; lute all the junctures with ſome Windſor loam or any common lute, and ſet theſe veſſels, thus joined, on the hearth. Place ſome ſtones or bricks round them at ſix inches diſtance every way, and fill up the intermediate ſpace with aſhes up to the rim of the lower crucible; then put burning charcoal about the upper crucible, and blow it till it be red-hot; keep it ſo a quarter of an hour, and then let all cool. The melted Antimony will be found in a ſtriated maſs in the lower veſſel.

Antimony has had various names among the writers of the ſeveral ages, and chymiſts have added to theſe a number of fantaſtical ones, expreſſive either plainly or metaphorically of its qualities. We generally call it antimonium or ſtibium. The Greeks called it ſtimmi, and ſometimes alabaſtrum. And, in the writings of Hippocrates in particular, it ſeems to ſtand under the name of tetragonon. Pliny calls it lapis ſpumæ candidæ nitentiſque non tamen tranſlucentis, and the Arabians antimad or atemed. The chymiſts, from its power of deſtroying other metals, call it lupus vorax, the voracious wolf, and ſaturnus, from the name of the god who was ſaid to eat his own children. They have alſo called it plumbum ſapientum, the lead of the wiſe men, from its performing the office of lead only more perfectly in the purifying of gold; and ſome of them magneſia ſaturnina. They alſo call it lavacrum ſolis.

The character they denote it by is this ♁, a circle, denoting the body to be gold, to which a croſs is added, to ſhew it very corroſive at top.

Antimony is not only given in ſubſtance, but a great many preparations of it are in common uſe in medicine; they are either emetic, cathartic, diaphoretic, or ſudorific. Crude Antimony, in powder, is found of great benefit in diſſolving viſcidities in the fluids; it gives relief in cutaneous diſeaſes, and, as ſome very confidently aſſert, in convulſions and epilepſies. Externally, in ointments, it is much commended for drying up ulcers, and for curing the itch, and other diſeaſes of the ſkin, and in plaiſters for reſolving of tumors. With the antients it was in frequent uſe among the coſmetics, being the moſt eſteemed ſubſtance for tinging the eye-brows black. This practice is even as old as the Old Teſtament, for we find Jezebel, and others of the Iſraelitiſh women, cenſured for this uſe of it: the Greeks gave it two new names on this account, calling it gyraicon and platyophthalmon, from its making the eye-brows appear broader than they naturally are.

Dioſcorides, and the older Greeks, ſeem to have been but imperfectly acquainted with its virtues internally; they tell us it was aſtringent and cooling, but that it was apt to obſtruct the paſſages. They uſed it frequently in collyriums for the eyes, when they meant to dry up redundant humours, and alſo in old ulcers. They calcined it, in order to prepare it for uſe, and made it into paſtils with the milk of a woman's breaſt; theſe were uſually of a ſquare form, and hence the name of tetragonon ſeems to have been given it by Hippocrates. The Greeks do not ſeem to have known any thing of it in any other intentions than theſe.

Its virtues, as a purge, became known in the twelfth century, at which time Baſil Valentine publiſhed his book, entitled Currus Antimonii Triumphalis, in which he extols it as a remedy for almoſt all diſeaſes. In the fifteenth century, Paracelſus brought it yet more into uſe. It was even after this, however, a diſputed point a long time among the phyſicians, whether Antimony were a ſalutary or a poiſonous medicine. At preſent we are, however, very well ſatisfied of its ſalutary effects, and know of two very different qualities in it, according to the different form it is given in, a purge and a diaphoretic. All the preparations of Antimony operate either by ſtool or vomit, or by inſenſible perſpiration or ſweat. There appears no reaſon in the world for people's ever having been afraid of giving the crude Antimony internally; we daily ſee it taken in large doſes, a drachm or more at a time, and that for a long continuance, without any bad ſymptom, or even the leaſt nauſea, unleſs, by accident, the acid of the ſtomach ſhould be ſtrong enough to prove a menſtruum to it. *Hill's Hiſt. Mat. Med.*

Golden ſulphur of ANTIMONY, *ſulphur auratum antimonii*—Boil the ſcoriæ of Antimony, till they are all diſſolved; into the inodorous liquor drop vinegar, and there will inſtantly ariſe a moſt noiſome, ſtercoraceous ſmell, and the liquor, which before was thin, will become very thick. Drop in more vinegar, ſtir the mixture about, and proceed in this manner, till nothing more will precipitate. Let the veſſel ſtand quiet, and a precipitate will gradually ſubſide to the bottom, which will be reduced to a much leſs compaſs than one would expect. Pour off the liquor that ſwims at top; waſh the precipitate with water, till it is abſolutely inſipid; dry it gently, and keep it under the title of ſulphur auratum antimonii.

Remarks.

The ſulphur of Antimony, mixed with an alcali, makes the ſcoriæ of Antimony. Theſe, boiled in water, make a ſulphureous lixivium; and from this, by the acid, the ſulphur is precipitated. This has a mild emetic quality. If this is rubbed upon ſilver, it makes it of the colour of gold, and hence it is called auratum. *Boerhaave.*

Glaſs of ANTIMONY, *vitrum antimonii.*—Take of powdered Antimony one pound, calcine it with a gentle fire in an unglazed earthen veſſel, continually ſtirring it with an iron ſpatula till the fumes ceaſe, and the Antimony is reduced to a grey powder; melt this powder with an intenſe fire, and pour the fuſed matter on a heated plate of copper.

Diaphoretic ANTIMONY, *antimonium diaphoreticum*, called, alſo, *ſweet Antimony.*—Take any quantity of calcined Antimony. Reduce it to a fine powder, pour hot water upon it, and ſtir them about with a ſtick, by which means the fixing nitre, that adheres to it, will be diſſolved. Let the white calx ſubſide, pour off the ſaline liquor, put on more water, and thus render the calx perfectly ſweet, ſo that there ſhall be no nitre ſenſibly adhering to it; and then dry it, and it will be white, inſipid, and heavy, and is the thing you want.

Remarks.

This is called diaphoretic, but it is an inert, noxious calx, without any thing active in it, as far as one can judge by its effects, and wants every thing valuable it had before. It acts only in a ſenſible manner, when it is mixed with half as much of a purgative; for then it truly quickens its operation, as appears by undoubted experiments in the pulvis Cornachini: But, otherwiſe, I diſſuade the uſe of it. How ſurpriſingly are the colours changed in the Antimony, by ſimply varying the proportion of the nitre in the calcination? And what a ſurpriſing alteration do we find in the ſtrength? *Boerhaave's Chem.*

Kermes mineral, or *pulvis Carthuſianorum.*— Take of Antimony four pounds, rain-water three pounds, and boil them for two hours. Then the boiling decoction is to be paſſed through cap-paper, and ſet in a quiet place for twenty-four hours, till a yellowiſh or ſaffron-coloured powder ſinks to the bottom of the veſſel, the liquor remaining clear. This liquor being poured off by inclination, the powder is to be firſt waſhed by the frequent affuſions of warm water, till it is deprived of all its ſalts; and then about four ounces of ſpirit of wine burnt upon it, and afterwards dried, and kept for uſe.

This powder is looked upon as a kind of panacea, or univerſal remedy. It ſometimes excites vomiting, eſpecially when it meets with an acid in the ſtomach, and is ſometimes cathartic, diaphoretic, and ſudorific, according as it is determined, by the diſpoſition of the patient, to act upon any one humour more than other. It is given from one to four grains, or, ſometimes, when it is deſigned only to attenuate and divide any viſcidities in the fluids, in the quantity of half a grain, repeated every three, four, or ſix hours. In acute fevers, where there is a great crudity and ſpiſſitude of the humour, it is given in ſmall doſes with ſucceſs. It changes the crude and ſerous evacuations by ſtool, into a more bilious conſiſtence, by attenuating the viſcid bile, and ſo diſpoſing it to paſs off by ſtool. It is often given with ſucceſs in the beginning of the ſmall-pox and meaſles, when they are apprehended to be of a bad kind, in ſmall doſes mixed with bezoartic powders, or abſorbents, ſuch as crabs-eyes, red coral, pearl, egg-ſhells, crabs-claws, and the like; for thus it excites a ſpitting and diaphoreſis, removes anxieties, corrects the lympha and coagulated ſerum, and raiſes ſuch an effervеſcence in the blood as tends to purify it. Glauber confirms theſe virtues by the examples of ſeven children in the ſmall-pox. Frederic Hoffman commends the uſe of this powder in ſtubborn autumnal agues, becauſe it powerfully opens obſtructions, particularly of the liver, by which theſe fevers are produced, eſpecially when taken in the quantity of a grain, mixed with detergent anti-febrile ſalts; ſuch as the ſalt of wormwood, the febrifugous ſalt of Sylvius, vitriolated tartar, and the like.

It is, however, to be carefully obſerved, that this powder is not to be given till the quantity of blood has been leſſened, and all the fluids ſufficiently diluted and attenuated; for, as by the uſe of it the blood is ſuddenly rarefied, and put into a kind of effervеſcence; if the veſſels are before full, they muſt be ſtill more diſtended, by the increaſed heat and motion of the blood and other fluids, and hurtful congeſtions may be formed in the viſcera. It ought, therefore, never to be given, till the dangers from a plethora are taken off, and till the humours have been rendered fluid by great quantities of diluents often repeated.

The lixivium in which Antimony has been boiled, paſſed through cap-paper, is recommended by ſome in ſcabs, and other diſeaſes of the ſkin. *Geoffroy.*

Vitrum ANTIMONII *ceratum.*—Take a glaſs of Antimony in powder, one ounce; bees-wax, one drachm: melt the wax in an iron ladle; then add the powder; ſet them on a ſlow fire without flame, for the ſpace of half an hour, continually ſtirring them with a ſpatula; then take it from the fire, pour it upon a piece of clean white paper, powder it, and keep it for uſe.

After it has been about twenty minutes in the fire, it begins to change the colour; and, in ten more, comes pretty near the colour of ſnuff: by that colour I know it is ſufficiently prepared, without attending to the degree of heat, or ſpace of time.

Of all the preparations of glaſs of Antimony this, which is given by Dr. Pringle in the Edinburgh medical eſſays, is doubtleſs the moſt perfect; for it is infinitely ſuperior to the chyliſta of Hartman. This chyliſta is nothing more than a glaſs of Antimony well pounded, and opened by acids, and then digeſted in ſpirit of wine impregnated with maſtic; which never can cover the particles of this glaſs with coats of equal impenetrability with thoſe formed by wax bituminized by burning.

This medicine ſucceeds equally in bloody-fluxes, diarrhœa's, ſimple looſneſſes, quartan agues, even the moſt obſtinate, and in certain caſes of the fluor albus.

It muſt be given with caution, beginning with a very ſmall doſe, as one, two, or three grains, eſpecially when it has been levigated again after its calcination: and thus it may be ſafely given to children, and even to pregnant women.

In giving it to robuſt perſons, I always began by a ſmall doſe, as four or five grains, which I gradually increaſed to eighteen, according to the effects produced by leſs conſiderable doſes. By gradually increaſing the doſe of this medicine, I have given as far as twenty-four grains at a time, which had no other effect, but to procure two or three moderate ſtools the next day: but in this caſe it would be imprudent to continue its uſe, without interruption; becauſe, as it paſſes ſlowly, the doſe may poſſibly unite with the firſt, at the time that it begins to operate; and theſe two doſes thus joined might cauſe a ſuperpurgation, which is always to be dreaded.

I ſhould never have ventured to give this medicine to pregnant women, if chance had not convinced me, that it is not more dangerous for them than for others, when given with caution. For, among ſeveral women whom I have cured of bloody-fluxes with this medicine, there were ſome that were actually with child, and did not know it themſelves, at the time of their taking it. They were all cured, and no accident happened to any of them.

When the patient has been purged too violently by one of the firſt doſes of this medicine, which are always ſmall, it is a proof of the weakneſs of the patient; and then I give it to him but every ſecond or third day. The diſtance of time obſerved between the doſes of this medicine makes it operate leſs briſkly, and more equally.

When the vitrum Antimonii ceratum vomits, the patient is to drink warm water at every motion.

When the dyſenteric flux is attended with ſharp pains in the abdomen, with heat and tenſion, the vitrum Antimonii is not to be given, till the pains are removed by emollient clyſters, and other proper remedies.

I have not obſerved any difference in the effects of this medicine, whether the patient had, or had not, been bled or purged; whether the diſeaſe were recent, or of long ſtanding; whether in fine it were attended with a fever, or not. They were all cured equally well, agreeable to what is ſaid in the Edinburgh obſervation.

The vitrum Antimonii ceratum is a good febrifuge. Three or four days uſe of this medicine generally ſuffices for removing the fever accompanying diarrhœa's, looſeneſſes, &c. But, in order to its having this effect, it muſt either purge or vomit the patient; otherwiſe it cures the looſeneſs, but the fever continues, and requires a very long uſe of the medicine to cure it. When it operates in a ſenſible manner, it generally gives the patient an appetite, when he is near being cured: but the weakneſs of his ſtomach does not allow his giving way to it, without running great riſks.

When this remedy operates a cure without producing any viſible effects, it would be dangerous to increaſe the doſe till it cauſes evacuations; for, unleſs the patient be of a ſtrong conſtitution, you endanger the bringing on a hypercatharſis. Moreover I have obſerved, that the fineneſs of the powder has a great influence on the manner of its operation. That, which is very fine, is much more active, than that which is ſomewhat leſs ſo: for example, a grain of the vitrum Antimonii ceratum reduced to a very fine powder will have more force and action, than two grains of the ſame glaſs reduced to a powder ſomewhat leſs fine. Wherefore I always preferred the firſt ſort, as productive of more certain effects, and leſs incommoding the ſtomach.

The vegetable acids develope and increaſe the emetic quality of this medicine to ſuch a degree, that you would always put the patient's life, who takes it, in great danger, if you did not abſolutely forbid him the uſe of acid fruits, and aliments that are liable to turn ſour, as milk, wine, &c.

In obſtinate quartan intermittents, which had reſiſted the moſt powerful febrifuges, I have given this medicine on the two days of intermiſſion, omitting it the day of the paroxyſm; and continuing it thus, and increaſing the doſe very gradually, the paroxyſms grew conſiderably weaker; and generally the fourth did not return. The patients, whom I cured in this manner near a year ago, have never had the leaſt return of the fever.

Excepting in the caſes of fevers, all the patients, who uſed the vitrum Antimonii ceratum, drank habitually of a ptiſan made with rice, oatmeal or hartſhorn. Theſe ptiſans prevent the pains of the ſtomach, which this medicine ſometimes occaſions. *Geoffroy.* See *Philoſ. Tranſact.* Vol. 47. p. 273.

ANTIO'CHIAN *Epocha*, a method of computing time from the proclamation of liberty granted the city of Antioch about the time of the battle of Pharſalia. *Strauch. Brev. Chronol.* l. 4. c. 34.

It is diſputed among chronologers, whether the Antiochian epocha commences in the ſpring or the autumn before the battle of Pharſalia. The chronicle of Alexandria fixes it to the former; Scaliger and Calviſius to the latter. In the firſt year of the epocha began the firſt indiction; ſo that the Antiochian years being divided by fifteen, the remainder ſhews the true character of the cycle of indiction.

ANTI'PATHY is uſed, in painting, for an oppoſition between the qualities of colours. *Du Piles Converſat. ſur la Connoiſ. de la Paint.*

This Antipathy is chiefly obſerved between colours, which endeavour, as it were, to predominate over each other, and which, by their mixture, deſtroy each other, e. gr. ultramarine and vermilion. This does not obtain the clair obſcure; for though there be nothing more oppoſite to each other than black and white, as the one repreſents light, and the other darkneſs; yet they each preſerve themſelves in the mixture, and form together a grey, which partakes of both.

ANTIPERISTA'LTIC *(Dict.)*—The cauſe of the Antiperiſtaltic motion is uſually aſſigned to be a ſtoppage of ſome of the inteſtines, but chiefly of the ilium.

The mechaniſm whereby it is effected, differs in nothing from that which produces the periſtaltic motion, except in the determination of the motion, which in iliac caſes prevents the fæces from proceeding on to the anus; ſo that the motion is periſtaltic from the ſtomach to the place of obſtruction; but when the fecal matters are arrived there, they give riſe to an Antiperiſtaltic motion, by occaſioning a great influx of ſpirits into the fleſhy fibres adjoining; theſe, being contracted, of courſe will compreſs, and propel the contents and chylous matters towards that ſide where there is the leaſt reſiſtance, which will be upwards, ſince an inſurmountable obſtacle is ſuppoſed downwards: conſequently they muſt riſe to the fibres next above, which, being contracted in their turn, will raiſe them a ſtep further, till, by degrees, they have reached the pylorus, whoſe valve, being forced, admits them into the cavity of the ſtomach, from whence they continue their aſcent to the mouth.

Some late ingenious authors have overturned the whole Antiperiſtaltic ſyſtem, and ſhewn this motion imaginary, as well as unneceſſary, for accounting for theſe diſorders. Meſſ. Chirac and Du Verny have endeavoured to prove this, in reſpect to vomiting; and M. Haguenot, and after him M. St. Andre, in the iliac paſſion.

ANTIPERI'STASIS *(Dict.)* — Antiperiſtaſis is uſually defined "the oppoſition of a contrary quality, whereby the "quality it oppoſes becomes heightened, or intended: or "the action whereby a body, attacked by another, collects "itſelf, and becomes ſtronger by ſuch oppoſition: or an in- "tention of the activity of one quality, cauſed by the oppo- "ſition of another."

Thus cold, ſay the ſchool-philoſophers, on many occaſions, exalts the degree of heat, as dryneſs that of moiſture.

Thus it is, that quick-lime is ſet on fire by the affuſion of cold water: ſo water becomes warmer in winter than ſummer, by Antiperiſtaſis: and to the ſame cauſe it is owing, that thunder and lightning are excited in the middle region of the air, which is continually cold.

This Antiperiſtaſis is a principle of great uſe and extent in the Peripatetic philoſophy. "It is neceſſary," according to the authors of that claſs, "that cold and heat be both of them "endued with a ſelf-invigorating power, which each may "exert, when ſurrounded by its contrary; and thereby pre- "vent their mutual deſtruction. Thus it is ſuppoſed, that, "in ſummer, the cold, expelled from the earth and water by "by the ſun's ſcorching beams, retires to the middle region "of the air, and there defends itſelf againſt the heat of the "ſuperior and inferior air. And thus, alſo, in ſummer, "when the air about us is ſultry hot, we find that cellars and "vaults have the oppoſite quality: ſo in winter, when the "external air freezes the lakes and rivers, the internal air, in "the ſame vaults and cellars, becomes the ſanctuary of heat; "and water, freſh drawn out of deep wells and ſprings, in a "cold ſeaſon, not only feels warm, but manifeſtly ſmokes."

Mr. Boyle has canvaſſed this doctrine thoroughly, in his hiſtory of cold.—It is certain, that a priori, or conſidering the reaſon of the thing, abſtracted from the experiments alledged to prove an Antiperiſtaſis, it appears highly abſurd; ſince, according to the courſe of nature, one contrary ought to deſtroy, not to ſtrengthen another: beſides, that it is an axiom, that natural cauſes act as much as they can; which, as to inanimate creatures, muſt be allowed phyſically demonſtrative, in regard theſe act not by choice, but by a neceſſary impulſe.

It is commonly, indeed, alledged, as a proof of a power nature has given bodies of flying their contraries, that drops of water, falling on a table, collect into little globules, to avoid the contrary quality of the table, and keep themſelves from being ſwallowed up by the dry wood: but this we can account for on more intelligible principles, viz. the power of attraction and repulſion. As to the Antiperiſtaſis of cold and heat, the Peripatetics talk of thoſe qualities being ſurrounded by their oppoſites, as if each of them had an underſtanding and foreſight, that in caſe it did not gather up its ſpirits, and guard againſt its antagoniſts, it muſt infallibly periſh; which is to transform phyſical agents into moral ones.

In effect, not only reaſon, but experiment alſo, concludes againſt the notion of an Antiperiſtaſis; the leading argument, urged in the behalf of it, is, the heating of quick-lime in cold water; now, who can ſufficiently admire at the lazineſs and credulity of mankind, who have ſo long and ſo generally acquieſced in what they might ſo eaſily have found to be falſe? For if, inſtead of cold water, the lime be quenched with hot water, the ebullition will, oftentimes, be far greater than if the liquor were cold.

Again, in freezing a baſon to a joint-ſtool, with a mixture of ſnow and ſalt, by the fire-ſide, it is pretended, that the fire ſo intends the cold, as to enable it to congeal the water that ſtagnated upon the ſurface of the ſtool, betwixt that and the bottom of the veſſel. But how little need there is of an Antiperiſtaſis in this experiment appears from hence, that Mr. Boyle has purpoſely made it with good ſucceſs, in a place where there neither was, nor ever probably had been a fire.

The patrons of an Antiperiſtaſis uſually plead that aphoriſtical ſaying of Hippocrates, "the viſcera are hotteſt in winter," in behalf of their own opinion: but the only proof of ſuch greater heat is, that men then have a greater appetite; ſo that the aphoriſm ſuppoſes digeſtion to be made in the ſtomach by heat, which is eaſily refuted.

Another argument, urged in favour of an Antiperiſtaſis, is borrowed from the production of hail, which is preſumed to be generated in ſummer only, not in winter; and, according to the ſchools, is made in the loweſt region of the air, by the cold of the falling drops of rain being ſo highly intended by the warmth they meet with in the air near the earth, as to congeal into a ſolid form.

As to refreſhing coldneſs which ſubterraneous places afford in ſummer, it may be denied that they are then really colder than in winter; though, if the contrary were allowed, it would not neceſſarily infer an Antiperiſtaſis.---It is certain, the ſmoking of waters, drawn from deep places in froſty weather, do not neceſſarily infer ſuch water to be warmer than at other times when it does not ſmoke; ſince that effect may proceed, not from the greater warmth of the water, but from the greater coldneſs of the air. For a man's breath in ſummer, or in mild winter weather, becomes very viſible;

ſible; the cold ambient air ſuddenly condenſing the fuliginous ſteams diſcharged by the lungs, which, in warm weather, are readily diffuſed, in imperceptible particles, through the air.

ANTI'PHRASIS.—Sanctius defines Antiphraſis to be a form of irony, whereby we ſay a thing, by denying what we ought rather to affirm it to be; Antiphraſis eſt ironiæ quædam forma, cum dicimus negando id quod debuit affirmari.—As when we ſay, it did not diſpleaſe me, or, he is no fool; meaning, I was pleaſed with it, or, he is a man of ſenſe.—On this principle, the Antiphraſis ought to be ranked among the figures of ſentences, and not among thoſe of words.

It is a common error to make Antiphraſis conſiſt in ſingle words; as when we ſay, that the parcæ are thus called by Antiphraſis, becauſe they ſpare nobody, parcæ, quia nemini parcunt.—St. Jerom, in his epiſtle to Riparius againſt Vigilantius, ſays he ought rather to be called Dormitantius per Antiphraſin, than Vigilantius, becauſe he oppoſed the Chriſtians holding wakes at the tombs of the martyrs.

Sanctius holds it improper to call theſe Antiphraſes; by reaſon, phraſis is not applicable to a ſingle word, but ſignifies orationem, aut loquendi modum.

ANTIPHTHI'SICA *, in pharmacy, a remedy againſt a conſumption.

* The word is formed from the Greek ἀντὶ, againſt, and φθίσις a phthiſis, or conſumption.

Tinctura ANTIPHTHISICA, a tincture againſt a conſumption; which is prepared as follows:

Take of ſaccharum ſaturni, and vitriol of iron, each an ounce; French brandy, a pint; and, without heat, draw a tincture. *Edinburgh Diſp.*

Quincy, in his Engliſh Diſpenſatory, gives it thus:

Take ſalt of ſteel, and ſaccharum ſaturni, each four ounces; put them into a matraſs with two pints of good French brandy. Twenty hours digeſtion will make a beautiful tincture.

This is by ſome accounted a ſpecific in hectic fevers: and it is not an unlikely medicine in ſuch caſes, becauſe it will aſtringe and draw up the fibres, whereby their tone will be rendered more rigid, and the pores and ſecretory paſſages ſtreightened, ſo that the juices and nouriſhment itſelf will not ſo ſoon run off by thoſe ways. It will alſo procure a firmer texture to the blood itſelf, which, in thoſe diſeaſes, is almoſt fuſed and broken. This is alſo good in many hyſterical affections.

ANTO'FLE *of cloves*; thus they call cloves which remain by chance upon the clove-trees, after the cloves are gathered. The fruit, thus left upon the tree, continues to grow, and becomes an inch thick. The Dutch call them the matrix, or womb, of cloves, or mother-cloves. They are pretty much uſed in phyſic, but the apothecaries often put common cloves inſtead of them, though the virtues and ſmell of both are very different.

ANTI'PODES (*Dict.*)—The Antipodes have nearly the ſame degree of heat and cold, days and nights of equal length, but in oppoſite ſeaſons. It is noon to one, when midnight to the other; and the longeſt day with the one, when ſhorteſt with the other.

We have ſaid the Antipodes have nearly the ſame degree of heat and cold, not abſolutely the ſame of neceſſity. Becauſe, firſt, there are many accidents to modify the action of the ſolar heat, ſo that people, ſituated in the ſame climate, have not the ſame temperature of air. This may in general be accounted for by the interpoſition of mountains, the nearneſs or diſtance of the ſea, the winds, &c. Secondly, the ſun is not throughout the whole year at the ſame diſtance from the earth; it is ſenſibly at a greater diſtance in the month of June, than in January; from whence it follows, that, conſideratis conſiderandis, our ſummer in England is not ſo hot as that of our Antipodes, and our winter leſs cold. Nay, ice is found, in the ſeas of the ſouthern hemiſphere, at a much leſs diſtance from the equator, than in thoſe of the northern hemiſphere.

The horizon of the one place being 90 degrees diſtant from the zenith of the other, it follows, that the Antipodes have the ſame horizon; it follows alſo, that, when the ſun riſes to the one, he ſets to the other.

Plato is eſteemed the firſt who thought it poſſible that the Antipodes ſubſiſted, and is looked upon as the inventor of the word. As this philoſopher apprehended the earth to be ſpherical, he had only one ſtep to make, to conclude the exiſtence of the Antipodes.

The ancients, in general, treated this opinion with the higheſt contempt; never being able to conceive how men and trees could ſubſiſt ſuſpended in air with their feet upwards; for ſo they apprehended they muſt be in the other hemiſphere.

They never reflected that theſe terms, upwards, downwards, are merely relative, and ſignify only nearer to, or farther from the center of the earth, the common center to which all heavy bodies gravitate; and that, therefore, our Antipodes have not their feet upwards and heads downwards any more than ourſelves; becauſe they, like us, have their feet nearer the center of the earth, and their heads farther from it. To have the head downwards, and feet upwards, is to place the body in a direction of gravity, tending from the feet to the head; but this cannot be ſuppoſed with regard to the Antipodes; for they, like us, tend towards the center of the earth, in a direction from head to foot.

If credit may be given to Aventinus, Boniface, archbiſhop of Mentz and legate of pope Zachary, in the eighth century, declared one Virgil, a biſhop in that age, a heretic, for having dared to maintain there were Antipodes.

As ſome people make uſe of this tranſaction, to turn the infallibility of the church into contempt, an anonymous author has called in queſtion the truth of the fact in the memoirs de Trevoux.

The only authority, ſays this anonymous author, on which the truth of this fact can be ſupported, as tradition has tranſmitted it to us, is a letter of pope Zachary to archbiſhop Boniface: "If it be proved, ſays pope Zachary, in this letter, that Virgil maintains there is another world and other men under the earth, another ſun, and another moon; call a council, condemn him, excommunicate him, after having degraded him from the prieſthood, &c." This author aſſerts, that this order of pope Zachary was never carried into execution, and that Bonifice and Virgil lived afterwards in a very good underſtanding with each other; and that Virgil was even canonized by this very pope.

But the anonymous author goes yet farther: Admitting, ſays he, this ſtory for a matter of fact, the pope cannot be accuſed of having acted contrary to truth and juſtice. For, ſays he, the notions they entertained of the Antipodes, were very different from our's. "Mathematical demonſtrations gave riſe to philoſophical conjectures. Philoſophical conjectures ſuppoſed the ſea formed two great circles round the earth, which divided it into four parts; that the vaſt extent of the ocean and exceſſive heat of the torrid zone cut off all communication between thoſe parts; ſo that it was impoſſible the inhabitants ſhould be of the ſame ſpecies, or proceed from the ſame origin as ourſelves. Thus much only, ſays this author, was underſtood, at that time, about the Antipodes. In this manner the anonymous author endeavours to juſtify pope Zachary; but the arguments he urges ſeem by no means concluſive. For pope Zachary's letter contains theſe words: "If Virgil maintains that there is another world and other men under this earth, condemn him." The pope therefore admitted of no Antipodes, and looked upon it as an hereſy to aſſert any ſuch thing. It is true, he adds theſe words, another ſun, another moon. But, 1ſt, whoever aſſerts the exiſtence of Antipodes, may very well advance they have another ſun: What is more common than this expreſſion, 'the ſun in Ethiopia and England is not the ſame? Does this import any thing more, than that the action of the ſun is different? That the moon of March and September are different, &c. ſo theſe words, another ſun, another moon, might, both according to Virgil and the pope's letter, have a very ſimple, true, and obvious meaning. Theſe words, "another ſun under our earth," no more ſignify two ſuns than theſe words "Another world under our earth," ſignify another earth under our's.

It is indeed more than probable all Virgil meant was, that there were Antipodes; becauſe, by allowing the earth a ſpherical form, and admitting the exiſtence of the Antipodes, it is a neceſſary conſequence they ſhould have the ſame ſun as we, to give them day, while it is night with us.

The anonymous author, in the following part of his diſſertation, ſuppreſſes theſe words "under our earth," and pretends that pope Zachary did not deny the Antipodes, but only that there were other men, another ſun, another moon. 2dly, on a ſuppoſition Virgil had maintained the real exiſtence of another ſun and moon for the Antipodes, in this he had only committed a groſs error in natural philoſophy, but ſeems not in my opinion to fall juſtly under the cenſure of hereſy; and, in caſe the pope had a mind to condemn it as ſuch, he ought to have diſtinguiſhed between the pretended hereſy, and the truth which Virgil aſſerted with regard to the exiſtence of Antipodes, and not have jumbled together, in the ſame phraſe, theſe words "other men under our earth, another ſun and another moon."

What are we therefore to infer from what the anonymous apologiſt for pope Zachary advances, with regard to the general opinion concerning the exiſtence of Antipodes, but that the pope fell into and followed a vulgar error, and on that ſcore condemned poor Virgil as an heretic, for having maintained a truth in oppoſition to a received opinion? In fact, the good underſtanding, whether true or pretended, in which Boniface and Virgil lived afterwards, does not prove that pope Zachary was infallible, in condemning Virgil for an heretic, about the Antipodes; and, if Virgil recanted, ſo much the worſe for him.

In the whole courſe of this argument we admit every thing for fact which the anonymous author relates; but at the ſame time are ſenſible it is the more generally received opinion, that the pope actually condemned Virgil for maintaining the exiſtence of Antipodes; and perhaps this is the truth; but the queſtion is of too little importance to be enquired into, whether it be a matter of fact or no.

It is ſurprizing, that the anonymous author of the apology did not hit on a ſhorter and wiſer method, by paſſing over this whole affair, and ſhewing, that this miſtake of pope Zachary's in natural philoſophy is no argument againſt it. We maintain the earth's motion; the holy writings in general ſeem to attribute this motion to the ſun; becauſe, in matters where points of faith are not concerned, the ſcripture conforms to the common methods of expreſſion. So that, though the pope might be deceived in a queſtion of coſmology or natural philoſophy, we can by no means conclude from thence, that the church and general councils that repreſent it, were guilty of errors in matters of faith; this reply is very ſufficient, and we wonder how it eſcaped the anonymous author.

As to the ſentiments of the primitive Chriſtians, with regard to Antipodes; ſome, rather than admit the concluſions of the philoſophers, abſolutely denied the whole, even the demonſtrations of the geometricians relating to the ſphericity of the earth: which is Lactantius's way, Inſtit. lib. 3. c. 24. Others only called in queſtion the conjectures of the philoſophers: which is St. Auguſtine's method, de Civit. Dei, lib. 14. c. 9. After putting the queſtion, whether there ever were nations of Cyclops, or Pigmies, or of people whoſe feet ſtood outward, &c. he comes to the point of Antipodes, and aſks, "whether the lower part of our earth be inhabited by Antipodes?" He made no doubt of the earth's being round, nor of there being a part diametrically oppoſite to our's; but only diſputes its being really inhabited. And the conſiderations he ſuggeſts for that purpoſe are juſt enough: as, that they who aſſerted Antipodes, had no hiſtory for it; that the lower part of the earth may be covered with water; and that to place Antipodes there, of a different origin from us (as muſt have been the opinion of the ancients, ſince they thought it impoſſible to go from our world to their's;) is to contradict ſcripture, which teaches, that the whole race deſcended from one man. Such are the ſentiments of that father.

It may be added, that the Chriſtian fathers were not the only perſons who diſputed the truth of Antipodes. Lucretius had done it before them, at the end of his firſt book, v. 10. 63, &c. See alſo Plutarch, lib. de facie in orbe lunæ; and Pliny, who refutes the opinion, *lib.* 2. c. 65.

We have conſidered the Antipodes here, as being placed diametrically oppoſite on the terreſtrial globe, ſo that a perpendicular or vertical line being drawn through any place whatever, and which, conſequently, paſſes through the zenith of that place, the oppoſite part on the ſurface of the globe, which this vertical line continued would cut, is the ſituation of the Antipodes to that place; this depends on a ſuppoſition of the earth's being a perfect ſphere; for if the earth be not a perfect ſphere, but is an oblate or prolate ſpheroid, there are no reciprocal Antipodes. That is, for inſtance, if a line be drawn through the zenith of London, and center of that city which is in the northern hemiſphere, this line would cut the ſouthern hemiſphere in a point which will be diametrically oppoſite to London, but London then will not be the Antipodes to this place: thus the reciprocal equality of ſituation, latitude, day and night, in the oppoſite hemiſpheres at ſix months diſtance, and all that we are uſed to include in the idea of Antipodes, as inſeparable from it, is no longer ſo; and muſt alter, in proportion as the figure of the earth deviates from a true ſphere. A little attention will convince us of this.

What we have advanced is founded on this poſition, that the ſphere, or, to render the theory more ſimple, the circle, is the only regular figure, which all diametrical lines drawn through the center cut at right-angles. Therefore, in every figure terminated by another kind of curve, to inſtance in the ellipſis, the perpendicular drawn to one of its foci or to its tangent, except the two axes which correſpond to the polar line, or a diameter drawn at the equator, will not paſs through the center, nor cut the oppoſite part of the ellipſis at right-angles; therefore the nadir of Paris or London is not the zenith of their reſpective Antipodes. So if, in the center of London or Paris, a perpendicular column were erected, and another in their reſpective Antipodes, it would not make the ſame right-line, but would form an angle more or leſs acute, in proportion as the ellipſis departed more or leſs from a circle; and, conſequently, the latitude, days, nights, ſeaſons, &c. would alter in the ſame proportion. Places ſituated under either pole, or on the equator, are excepted for the reaſon we have before ſuggeſted; becauſe, in the former caſe, it is one of the axes of the ellipſis that joins both foci, and in the latter it is always a circle, the other axis of which is the diameter of the ellipſis: the ſpheroid, however oblate or prolate, being always ſuppoſed to reſult from the revolution of the elliptical meridian round the axis of the world. See *Hiſt. Acad.* 1741.

ANTI´PTOSIS *, a figure in grammar, by which, as it is commonly ſaid, one caſe is put for another.

Examples, produced of this kind of figure by the grammarians, are numerous; from Virgil, Æneid. V. verſe 451. It clamor cœlo, inſtead of ad cœlum. Terence, in the prologue to the Andria, ſays, Populo ut placerent quas feciſſet fabulas, inſtead of fabulæ, &c. But Sanctius, Voſſius, Perizonius, and other grammarians, who have attended to the rationale of grammar, though it muſt be owned the number is ſmall, have branded this figure in rhetoric with the name of an abſurdity, and juſtly too; becauſe admitting it into uſe would overturn ſyntax, and render the regimen of verbs unworthy attention; a ſcholar might juſtify his error, in this point, to a maſter, by an Antiptoſis, ſays Sanctius, lib. 4. cap. 13. "Figura hæc Latinos canones excedere videtur, nihil imperitius, quod figmentum ſi eſſet verum, fruſtra quæreremus quem caſum verba regerent." "This figure ſeems to leap over all grammar rules, for, if this be admitted, the government of verbs needs not be attended to." Under the word CONSTRUCTION we ſhall endeavour to ſhew what figures ought to be admitted.

The ſame thought may be expreſſed in a different manner, but we muſt always have regard to propriety of language; thus we meet with urbs Roma, the city Rome, by appoſition, on account of the identity, where urbs is uſed adjectively, and muſt be explained urbs quæ eſt Roma, the city which is Rome. In Cicero we find this paſſage, urbs Romæ in oppido Antiochiæ; in Virgil, Butroti aſcendimus urbem; in both theſe paſſages urbs repreſents the ſpecies, the names Roma and Butrotum the particular city.

In theſe different methods of expreſſion, if we meet with any thing which the grammarians ſolve by an Antiptoſis, we ought firſt to enquire whether the copyiſt has not committed ſome blunder in the text, and afterwards, without having recourſe to ſo irrational a figure, ſee if the expreſſion be of ſufficient authority, and whether we can reconcile it to propriety of language, and always give the preference to that which is uſed by the beſt authors.

But to explain this, and ſhew the abſurdity of the figure Antiptoſis in the examples already quoted, which will account for all others of the ſame kind. With regard to it clamor cœlo, the verb is put acquiſitively; and, therefore, cœlo in the dative caſe, inſtead of ad cœlum, which is an elegant and natural ſyntax. In the paſſage cited from the prologue to Terence's Andria, "Populo ut placerent quas feciſſet fabulas," we muſt conſider the relative qui, quæ, quod, to have ſome antecedent, and baniſhing ſo abſurd a figure as the Antiptoſis, ſolve it by the ellipſis to be ſupplied in this manner, ut fabulæ, quas fabulas feciſſet, placerent populo.

ANTI´QUE, a term moſt in uſe among architects, ſculptors, and painters: they make uſe of it to expreſs pieces of architecture, ſculpture, or painting, executed, in the ages when thoſe arts were carried to the higheſt perfection, by men of the fineſt genius in Greece and Rome; that is, from the age of Alexander the Great to the reign of the emperor Phocas, about, the year of our Lord 600, when Italy was over-run by the Goths and Vandals.

Antique in this ſenſe is oppos'd to modern; thus we ſay an Antique edifice, buſto, baſſo relievo, or manner; an Antique model; and of a ſtatue, that it is in an Antique taſte.

We have ſeveral Antique pieces of ſculpture left, as the Laocoon and Venus in poſſeſſion of the family of Medicis, the Apollo and Hercules of the houſe of Farneſe, &c.

Antique paintings are more ſcarce; we have only the wedding of Aldobrandinus, ſome little figures of the pyramid of Ceſtius, a Venus which is the palladium of Rome, and ſome ſmall pieces in freſco, preſerved out of the ruins of the baths of Titus and Heraclius.

Some ſculptors have counterfeited Antiques ſo nicely as to impoſe on the judgment of the public; witneſs the famous ſtory of Michael Angelo's Cupid, which we have related in the preface to the Dictionary.

Antique is ſometimes diſtinguiſhed from ancient, which means a leſs degree of antiquity, a time when the art was not in its higheſt perfection. Some writers uſe a compound word antiquo-modern in ſpeaking of old Gothic churches and other buildings, which they would not confound with thoſe of the Greeks and Romans.

ANTI´QUITY, *antiquitas*; we make uſe of this term to denote paſt ages.

In this ſenſe we ſay, the heroes of Antiquity, traces or veſtigia of Antiquity, monuments of Antiquity.

We make uſe of the ſame word, to expreſs what is left us of the ruins, monuments, remains, &c. of the ancients.

In this ſenſe we ſay a maſter-piece of Antiquity; a fine piece of Antiquity; Italy, France, and England are full of Antiquities.

Antiquity is taken alſo for the ancientneſs of any thing, or the time it has ſubſiſted.

In this ſenſe we ſay, the Antiquity of a kingdom, a cuſtom, or any thing of the like nature. Moſt nations pretend to a greater Antiquity than they can prove. We may ſay, that the preſent time is the age of the world, and that, in thoſe times which we call ancient, the world was only in its infancy.

We read in Plato, that Solon learned from an Egyptian, that the Antiquity of the Athenians was 9000 years, of the Saides 8000. Pomponius goes farther back ſtill, following the traces of Herodotus; reckons 330 kings before Amaſis, and ſo concludes the world to be above 13000 years old. Diodorus Siculus reckons an interval of 23000 years, between the firſt king of Egypt and the expedition of Alexander the Great. Diogenes Laertius leaves all other writers behind him in the Antiquity of his chronology, and doubles this number of 23000 years. When Alexander went into Egypt, the prieſts pretended to prove to him by their ſacred hiſtories (in which mention was made of the Perſian empire which he had juſt conquered, and the Macedonian empire, which was his birth-right) that they were both 8000 years old. Yet it is demonſtrable from the beſt authors, hiſtorians, and chronologiſts, that the Perſian empire, at that time, was of no more Antiquity than 300, nor the Macedonian of more than 500 years.

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* The word is derived from ἀντὶ, for, inſtead of, and πτώσις, caſe.

We need not be ſurprized that the Egyptians and Aſſyrians fell into ſuch ridiculous errors in point of chronology, for the Egyptians compute the reigns of their firſt kings at 4000 years, the Aſſyrians at 1200 only.

The Chaldeans aſſerted, in the time of Alexander the Great, that they had made obſervations of the celeſtial motions 470000 years, and taken the horoſcopes of children born in this prodigious interval of time. But Calliſthenes, having been appointed by Ariſtotle to enquire into theſe obſervations they pretended to produce, found they could actually go backwards no farther than 1900 years before Alexander. This is a fact acknowledged by Porphyry, who certainly had never any intention to give authority to the books of Moſes.

The ſtudy of Antiquity is to a certain degree abſolutely neceſſary, ſince there are in all authors a great many expreſſions, alluſions, and compariſons, which cannot be underſtood without it; and it is ſcarce poſſible, without it, to make one ſingle ſtep in the peruſal of hiſtory, without being puzzled with difficulties, which a very ſlight knowledge of Antiquity would frequently reſolve. Let any one but lightly run over the firſt book of Livy, which, with the origin of the Roman people, contains that of the greateſt part of their laws and cuſtoms, and he will ſoon be ſenſible how uſeful and ſerviceable this ſtudy is.

This ſcience, however, like all others, if carried too far, has its rocks and dangers. There is a kind of obſcure and ill-managed learning, which is employed only upon queſtions equally vain and frivolous, which ſeeks only what is moſt abſtruſe and uncommon in every ſubject, being almoſt wholly confined to the diſcovery of ſuch things as are abſolutely ſuperfluous, and which it is often better to be ignorant of, than acquainted with. Seneca often complains of this bad taſte, which taking riſe among the Greeks, was got among the Romans, and began to ſeize upon that nation. He obſerves, that there is, in point of ſtudy, as in every thing elſe, a vicious exceſs and intemperance; that it is no leſs blameable to collect, at a large expence, an heap of uſeleſs knowledge, than of ſuperfluous furniture; that this ſort of learning is calculated to make men impertinent, fooliſhly poſſeſſed with a notion of their own merit, and at the bottom really ignorant. In applying one's-ſelf to hiſtory or Antiquities, we ſhould not carry our enquiries too far, but be guided in this point by prudence and diſcretion: with this precaution, the ſtudy of Antiquity cannot be recommended too much, as it makes a part of learning which is not only ſuitable to their character, but abſolutely neceſſary for all ſuch perſons as are deſigned by their ſtation to ſtudy and teach the belles lettres.

Thus, though Antiquities, and, conſequently, the ſtudy and reading of antient authors, are things much recommended, yet muſt we by no means put ſuch an implicit faith in whatever they deliver, if repugnant to reaſon, or even common-ſenſe or obſervations, as never to ſcruple giving up our belief of them, ſtrenuouſly adhering to all they aſſert, never contradicting, examining, or refuting their doctrines, &c. Yet has this prevailing humour of extolling every thing that is antique, and paſſing ſlightly over the merit of our contemporaries, ever been a grievance, that men of a free and unprejudiced thought have complained of through all ages.

The immoderate reſpect and adherence to Antiquity is, ſays Dr. Brown, a general cauſe of error, and a mortal enemy to knowledge. That which has done the greateſt execution upon truth, has been a peremptory adheſion to authority and Antiquity, more eſpecially, the eſtabliſhing of our belief upon the dictates of it. For moſt men of the preſent age ſo ſuperſtitiouſly look on ages paſt, that the authorities of the one exceed the reaſons of the other; whoſe perſons, indeed, being far removed from our times, their works, which ſeldom, with us, paſs uncontrouled, either by contemporaries, or immediate ſucceſſors, are now out of the diſtance of envy; and, the farther removed from preſent times, are conceived to approach the nearer unto truth itſelf. But hereby we manifeſtly delude ourſelves, and widely walk out of the track of truth. For men, by theſe means, impoſe a thraldom on their times, which the ingenuity of no age ſhall endure, or, indeed, the preſumption of any did ever yet enjoin. Thus Hippocrates, about 2000 years ago, conceived it no injuſtice, either to examine or refute the doctrines of his predeceſſors; Galen the like, and Ariſtotle moſt of any: yet did not any of theſe conceive themſelves infallible, nor give their opinions as poſitive verities; but when they either delivered their own inventions, or rejected other men's opinions, they proceeded with judgment and ingenuity; eſtabliſhing their judgments not only with great ſolidity, but ſubmitting them alſo to the correction of future diſcoveries.

In criticiſm many pretenders inſinuate, that all that is good is borrowed from Antiquity. This is very common in the mouths of pedants, and, perhaps, in their hearts too; but is often urged by men of no great learning, for reaſons very obvious. Now, nature being ſtill the ſame, it is impoſſible for any in modern life to paint her otherwiſe than the antients have done; if, for example, one was to deſcribe the general's horſe at the battle of Blenheim, as fancy repreſented ſuch a noble beaſt, and that deſcription ſhould reſemble what Virgil hath drawn from the horſe of his hero, it would be almoſt as ill-natured to urge the deſcription from Virgil, as to reproach the duke of Marlborough for fighting only like Æneas. All that the moſt exquiſite judgment can perform, is, out of the great variety of circumſtances wherein natural objects may be conſidered, to ſelect the moſt beautiful, and to place images in ſuch views and lights, as will affect the fancy after the moſt delightful manner. But, over and above a juſt painting of nature, a learned reader will find a new beauty ſuperadded in an happy imitation of ſome famous antient, as it revives in his mind the pleaſures he took in his firſt reading ſuch an author. Such copyings as theſe give that kind of a double delight, when we look upon children of a beautiful couple; where the eye is not more charmed with the ſymmetry of the parts, than the mind by obſerving the reſemblance tranſmitted from parents to their offspring, and the mingled features of the father and mother. The phraſes of holy writ, and alluſions to ſeveral paſſages in the inſpired writings, though not produced as proofs of doctrines, add majeſty and authority to the nobleſt diſcourſes of the pulpit. In like manner an imitation of the air of Homer and Virgil raiſes the dignity of modern poetry, and makes it appear ſtately and venerable. However, if the antients excel the moderns in any thing, it is only in acuteneſs of wit and elegance of language, in their poetry and oratory. As for painting and ſculpture, muſic and architecture, ſome of the moderns certainly equal, if not excel, the beſt of them, not in theory only, but, alſo, the practice of thoſe arts: neither do we give place to them in politics or morality; but, in natural hiſtory and experimental philoſophy, we far excel them. In the purely mathematical ſciences abſtracted from matter, as geometry and arithmetic, we may certainly vie with them: but, in aſtronomy, geography, and chronology, we excel them much. No wonder they ſhould out-ſtrip us in thoſe arts which are converſant in poliſhing and adorning their language, becauſe they beſtowed all their time and pains in cultivating them, and had but one, and that their native tongue, to mind. But thoſe arts are by wiſe men cenſured as far inferior to the ſtudy of things; and to be wholly occupied about them is to fall in love with a picture, and neglect life: and oratory, which is the beſt of theſe arts, is but a kind of voluptuary one, like cookery, which ſophiſticates meat, and cheats the palate, ſpoiling wholeſome viands, and helping unwholeſome.—— *Brown's Vulgar Errors. Rollin's Belles Lettres. Ray's Letters.*

ANTI'RRHINUM (ἀντίῤῥινον, of ἀντὶ, againſt, and ῥὶν, the noſtrils, as though it repreſented a noſe: it is alſo called cynocephalus, of κυνὸς, a dog, and κεφαλὴ, an head; becauſe its fruit reſembles the head of a dog) *ſnap-dragon*, or *calf's ſnout*, a genus of plants whoſe characters are:

It is a plant with an anomalous flower, conſiſting of one leaf, which is divided, as it were, into two lips; the upper of which is cut into two parts, and the under into three parts: out of the flower-cup ariſes the pointal, faſtened like a nail in the hinder part of the flower; which afterwards turns to a fruit reſembling a calf's-head, which is divided in the middle by a partition into two cells, in which are contained many ſmall ſeeds. Botaniſts enumerate twelve ſpecies of this plant.

All the ſorts of ſnap-dragon are pretty ornaments in a garden, and, requiring a very little culture, are rendered more acceptable. They are all hardy plants, and will reſiſt the cold of our winters extremely well, eſpecially if they are planted on a dry, gravelly, or ſandy ſoil; for, when they are planted in a rich moiſt ſoil, they will grow very luxuriant for a while, but are very ſubject to rot in autumn or winter, and are much more ſuſceptible of cold, than when they are in a dry, hungry, rocky ſoil: they will grow in the joints of old walls, where they may be placed ſo as to make ſome abject part of the garden agreeable; for they will continue in flower for ſeveral months; and, if the ſeeds are permitted to ſhed, there will be a continual ſupply of young plants, without any trouble.

Where-ever thoſe plants are deſigned to grow upon walls, or on a rocky barren ſoil, the ſeeds ſhould be ſown the beginning of March, where they are deſigned to remain (for if the plants are firſt raiſed in a better ſoil, and afterwards tranſplanted into thoſe places, they ſeldom ſucceed well). When the plants are come up, they will require no other culture but to keep them clear from weeds; and, where they come up too thick, to pull ſome of them out, ſo as to give them room to grow. In July theſe ſorts will begin to flower, and will continue flowering till the froſt prevents them.

Theſe plants which grow on walls, will be ſtrong, and have woody ſtems, which will continue two or three years or more. *Miller's Gard. Dict.*

ANTISI'GMA, among the ancient grammarians, ſignifies one of the notes or ſentences affixed to thoſe verſes whoſe order was to be changed.

ANTI'STROPHE, in the ancient drama, implied the ſtanza repeated by the chorus to the audience on the left-hand; the word being derived from ἀντὶ, againſt, and ϛρέφω, to turn. Thus the ſtrophe ſignifies that ſtanza or thoſe verſes which the chorus ſing, turning themſelves towards the ſpectators on the right hand; the Antiſtrophe means the ſame ſtanza ſung by the chorus turning themſelves towards the audience on the left. In rhetoric, the Antiſtrophe or epiſtrophe ſignify repartee, as, for example, if, after having ſaid the man of ſuch a maſter, we add, and the maſter of ſuch a man, this laſt phraſe is an Antiſtrophe, or expreſſion in reply to the firſt; a famous paſſage in St. Paul is expreſſed in this figure of rhetoric. Hebræi ſunt, et ego; Iſraelitæ ſunt, et ego; ſemen Abrahæ ſunt, et ego; 2. Cor. chap. xi. verſe 22.

This is alſo a term uſed in antient lyric poetry among the Greeks; the Antiſtrophe made one of the three parts of their ode, the other two were called the ſtrophe and epode. The ſtrophe and Antiſtrophe always contained an equal number of verſes, and thoſe too of the ſame meaſure, which could conſequently be ſung to the ſame muſic: but the epode was compoſed in verſes of a different meaſure, either longer or ſhorter. The Antiſtrophe was a kind of anſwer or relative echo both to the ſtrophe and the epode; the Greeks called theſe three united a περιῶδη, and is the ſame thing that we ſhould call a ſong of three ſtanza's.

ANTITHETA'RIUS, in law, ſignifies a man who endeavours to diſcharge himſelf of the fact of which he is accuſed, by recriminating and charging the accuſer with the ſame fact. This word is mentioned in the title of a chapter in the laws of Canutus, cap. 47. *Jacob's Law. Dict.*

A'NTITYPE, a Greek word, properly ſignifying a type or figure. In this ſenſe St. Paul uſes the word, Heb. ix. ver. 24, where he ſays, that Jeſus is not entered into the holy of holies made with hands, which was the type of the true: inſtead of the word type, we read, in the Greek of St. Paul, Antitype, which Meſſieurs Port-Royal and Amelot have tranſlated type or figure. Thus, according to the true import of the word, it ſignifies a type, which anſwers to another type, or rather that which is in the place of a type.

Tower of ANTO'NIA, in antiquity, the moſt magnificent monument which Herod the Great ever built; he gave it that name in memory of Anthony his friend: it was built on the hill of Jeruſalem, formerly called Barri. The front of it was built entirely of white marble, and defended by a wall of three cubits high; the diſtance from this wall to the tower was forty cubits; within it were contrived halls, apartments, and baths. At equal diſtances were four other towers, three of which were fifty cubits high; and the fourth, which took up the ſouthern and eaſtern angles, was of ſeventy cubits. Theſe towers had galleries communicating with the temple-ſtairs, from whence the Roman ſoldiers uſed to obſerve the people on feſtival days, to ſee that they did not form any dangerous enterprize.

ANTONIA'NA *Aqua*, in the materia medica, the name of a medicinal water of Germany, remarkably pleaſant to the taſte, and of ſervice in many caſes as a medicine.

This water, if mixed with any acid liquor, raiſes a conſiderable effervеſcence, and when mixed with Rheniſh wine and ſugar, which is a common way of drinking it, it makes a great hiſſing and bubbling, and becomes turbid and milky. If powder of galls be added to it, it ſuffers no change but remains limpid and colourleſs, whence it is plain that it contains no iron, nor vitriol; ſyrup of vitriol mixed with it turns the whole green, whence it is plain that it contains an alkali; and, if oil of tartar be added to it, it becomes turbid and milky, and precipitates a white ſediment, whence it appears that there is either common ſalt or a calcarious earth in it. If it be expoſed ſome time in the air in an open veſſel, it, like all the other mineral waters, loſes its pungent taſte and pellucidity, becoming turbid and vapid. A quart of it evaporated with a very gentle heat leaves two ſcruples of a dry ſediment, which, being ſeparated by another ſolution, is found to be one half an alkaline ſalt, and the other a calcarious earth. Oil of vitriol mixed with the ſalt produces a great effervеſcence, and a penetrating ſcent ariſes, like that produced by the mixture of oil of vitriol and common ſalt. Hence it appears that theſe waters contain a ſmall portion of an alkaline ſalt, a larger portion of ſea ſalt, and a yet larger of a calcarious earth, and with theſe a very conſiderable quantity of a ſubtile and penetrating mineral ſpirit.

It is a very temperate water, not too ſtrongly operating either by ſtool or urine; and hence it is a very proper drink for perſons in chronic and many acute diſeaſes, either alone, or mixed with wine, to ſupply the place of malt liquor, which is proper but in very few illneſſes. A long uſe of it alone may alſo prove of conſiderable ſervice in hypochondriac caſes. *Hoffman's Oper.*

ANU'BIS, a God of the antient Egyptians, repreſented by a ſtatue having a dog's head, and in one hand a caduceus, and in the other a lyre. Moreri has given us various conjectures with regard to the origin and odd figure of this deity. Cynopolis was built in honour of him, where they kept a number of dogs which they ſtiled ſacred.

Both Chriſtians and heathens have made themſelves merry at the expence of poor Anubis. Apuleius and Jamblichus have ſpoken very indecently about the conſanguinity of Iſis and Anubis. Euſebius calls him the Egyptian Mercury, and with very good reaſon; for there is very great probability that the Grecian Mercury and Egyptian Anubis were the ſame god.

The Romans who were extremely polite in admitting the gods of nations they conquered, permitted him prieſts, but theſe prieſts came to a terrible end; they ſuffered themſelves to be bribed by a young nobleman of Rome called Mundus, who had conceived a paſſion for Paulina; this lady unhappily frequented the temple of Anubis, and the prieſts corrupted by Mundus perſuaded her, the God Anubis had fallen in love with her. This flattering Paulina's vanity, ſhe came to the temple at night, and found ſomething more agreeable than a god with a dog's head. Mundus could not keep the ſecret, but ſpoke of the adventure of the temple, in ſuch a manner as made it eaſy to gueſs Mundus had played the part of Anubis. She complained to her huſband, and to the emperor Tiberius, who reſented it very highly. The prieſts were crucified, the ſtatue of the lady and Anubis thrown into the Tiber, and the temple demoliſhed. The great men of Rome diverted themſelves a long time with this metamorphoſis into the god Anubis, and Voluſius a Roman ſenator, eſcaped the proſcription of the triumvirate under this diſguiſe.

A'NVIL (*Dict.*)— The face or uppermoſt ſurface of the Anvil muſt be very flat and ſmooth, without flaws; and ſo hard that a file will not touch it. At one end is ſometimes a pike, bickern or beak-iron, for the rounding of hollow work. The whole is uſually mounted on a firm wooden block.

Forged Anvils are better than thoſe of caſt-work. Lockſmiths have alſo a ſmaller kind of Anvil called a ſtake, which is moveable and placed ordinarily on their work-bench. Its uſe is for ſetting ſmall cold work ſtraight, or to cut or punch on with the cold chiſſel, or cold punch. *Moxon's Mech. Exerc.* p. 3.

ANNUNCIA'DA, a ſociety founded at Rome in the year 1640, by cardinal John Turrecremata, for the marrying poor maids. It is now grown ſo very rich, that it gives fortunes of 60 Roman crowns to above 400 maids for their portion, with a ſuit of white ſerge, and a florin for ſlippers every Lady-day. The popes have ſo great a regard for this charitable foundation, that they make a cavalcade, attended with the cardinals, &c. to diſtribute the tickets for theſe 60 crowns, &c. for thoſe who are to receive them. If any of theſe maids are deſirous to be nuns, they have each of them 120 crowns, and are diſtinguiſhed by a chaplet of flowers on their head.

AORA'SIA *, in antiquity, the inviſibility, of the gods.

* The word is Greek, ἀορασία, and derived from α privative, and ὁράω, to ſee.

The opinion of the ancients, with regard to the appearance of the gods to men, was, that they never ſhewed themſelves face to face, but were known from their backs, as they withdrew. Whence it followed, according to them, that every being they had time to look at in the face, was not a deity. Neptune aſſumed the form of Calchas to ſpeak to the two Ajaxes, but they knew him not till he turned his back to leave them; and diſcovered the god by his majeſtic ſtep, as he went from them. Venus appeared to Æneas in the character of a huntreſs, but her ſon knew her not till ſhe departed from him; her divinity was betrayed, if I may uſe the word, by her radiant head, her flowing robe, and her majeſtic pace.

AORI'STUS *, ἀόριϛος, in the Greek grammar, an indefinite or indeterminate kind of tenſe which ſometimes expreſſes the preſent, ſometimes the future, but ofteneſt the paſt time.

* The word is compounded of α priv. and ὁρίζω, to bound or limit.

Critics are divided as to the proper and primary import of the Greek Aoriſtus. Some take them for mere variations of the præterperfect tenſe, introduced only for copiouſneſs, without any peculiar ſignification; but it is certain the ancient grammarians of that nation allowed a difference between the Aoriſt and præter tenſes. According to them, the præterperfect tenſe expreſſes a thing juſt now, or lately compleated; whereas the Aoriſt denots it paſt, but indeterminately whether it were lately or long ago. This diſtinction, however, is rejected by Gretzer, who produces inſtances among the ancients, where the two are uſed indifferently. Urſinus alſo allows this promiſcuous uſe, but looks deeper into the origin and reaſon of the Aoriſt. According to this writer, an Aoriſt is then properly uſed ἀορίϛως, as an Aoriſt, when it does not denote any certain or definite time, but, in reality, comprehends all times. That this is the primitive uſe of the Aoriſt, he ſhews by a great number of inſtances. This appears a peculiarity in the Greek tongue, unknown in any other language, to have a tenſe merely indefinite, yet comprehending all the other tenſes.

The Greeks uſually diſtinguiſh two Aoriſts. Some, however, will not allow any ſecond Aoriſt, maintaining that what grammarians call the ſecond Aoriſt, is the ſame tenſe with the firſt, only under a little difference of termination. *Bibl. Anc. & Mod.*

AO'RTA, (*Dict.*)— The Aorta is ſubject to many diſorders; the following caſes will give ſome light into the nature of others, which it is neceſſary to know, in order to diſtinguiſh them, and make a proper prognoſtic; for they are always incurable.

Mr. Littre, having opened the body of a woman who died ſuddenly in the ſtreet, and who had, till the very moment of her death, been vigorous, found, beſides other things, the coats which form the trunk of the Aorta oſſified in ſeveral places, and its interior part full of ulcers and fungous excreſcences, but yet without any inflammation: the ſigmoid valves were likewiſe become hard and callous.

This ſtate of the Aorta, beſides other concurring cauſes, may have contributed very conſiderably to the ſudden death of this patient; for the arteries are all along in their courſe furniſhed with fleſhy fibres, which, by their action and ſpring, continue to the blood that momentum or impulſe, which it at firſt received from the heart; for it is plain, that the contractile force of the heart, conſidering its weakneſs, could not, without this continued impulſe, throw the blood ſo far, and that too in canals ſo winding and ſo ſmall; but it is in a particular manner impoſſible, that, without this impulſe of the arteries, the contraction of the heart ſhould propel the blood with ſuch a degree of force, as to make it enter the imperceptible orifices of the diſtant veins. Thus the arteries, and all their ramifications, are, as it were, ſo many continued hearts, ſeconding and promoting the action of the chief and principal one. Now it is plain, that in this woman the oſſification and conſumption of a part of the ſubſtance of the trunk of the Aorta muſt have abſolutely taken away its ſpring, and, conſequently, deprived the heart of that aſſiſtance, without which it could not carry on the circulation of the blood.

Mr. Merry ſays, that, having opened a man that died ſuddenly, he found his Aorta ſo dilated, that it had begun to ſeparate itſelf from the baſe of the heart, in which caſe, the circulation of the blood muſt have neceſſarily had an immediate ſtop put to it. *Hiſt. de l'Acad.* 1710.

Mr. Morand the younger, upon opening the body of a merchant in Paris, who died ſuddenly, after having been ſome time ſubject to palpitations of the heart, was not ſurpriſed to find polypous concretions formed in the Aorta, and in the branches of the pulmonary arteries and veins; but was aſtoniſhed with ſome other uncommon circumſtances; for, on the left ſide of the heart, one of the two valvulæ mitrales of the pulmonary ſack was transformed into a kind of cyſtis, the bottom of which lay towards the ſack itſelf, and the mouth towards the ventricle of the heart. This cyſtis was the valve itſelf, dilated to ſuch a degree as to be able to contain one's thumb, thickened, and having ſmall bones in ſeveral parts of it; the ſigmoid valves of the Aorta, in like manner, being conſiderably thickened, and in each of them, in ſeveral places, ſmall bones, very ſolid, irregularly ranged, and riſing like ſo many rocks. Nor is it eaſy to conceive, that, of the blood, which flowed from the pulmonary ſack to enter the left ventricle, ſome part muſt remain in this cyſtis, preternaturally formed; and that the other part could not, without a great deal of difficulty, make its way through the Aorta, the valves of which, being thickened and oſſified, did not become flat, as they ought to have done, in order to perform their functions duly. *Hiſt. de l'Acad.* 1729.

AOVA'RA, in natural hiſtory, a fruit as large as a hen's egg, which grows with many others in a cluſter, incloſed in a great pod, faſtened to a ſpecies of very high and prickly palm-tree, which grows in the Eaſt-Indies and Africa.

When the pod is ripe, it burſts, and there appears a cluſter of fruit, which, being ripe, are fleſhy, and of a golden yellow colour: the Indians eat them; the fleſh incloſes a ſtone very hard and bony, as large as a peach-ſtone, having at its ſuperficies three holes at the ſide, and two leſſer near each other. The bark of the ſtone is two lines thick; it contains a fine white kernel, which, being chewed, at firſt hath an agreeable taſte; but, at the end, it becomes of a ſharp taſte, which approaches that of ſome ſorts of cheeſe. They extract from the kernel a ſort of palm-oil.

The kernel of Aovara is aſtringent, and good to ſtop a looſeneſs, being eaten. *Lemery des Drogues.*

APA'NAGE, Appenage, Appanage, Apannage, or Apennage, in the French laws, the fortune of a king's younger ſon: or a ſettled portion of lands, &c. aſſigned for the ſubſiſtance of the cadets, or younger ſons of a ſovereign prince.

Some will have the Apanages, at their firſt inſtitution, to have been only penſions, or annual payments of a certain ſum of money.—The younger ſons of England have no certain Apanages, as in France; but only what the good pleaſure of the king beſtows upon them.

Even in France, during the firſt and ſecond race of kings, the right of primogeniture, and Apanages, were unknown; but the domains were divided pretty equally among all the children.

Great inconveniences ariſing hence, it was at length found proper to put off the younger born with counties, duchies, or other diſtricts, on condition of their paying homage and fealty for the ſame, and of their reverting, in defect of heirs-male, to the crown.

This has happened accordingly to the firſt and ſecond branch of the dukes of Burgundy.— The duchy of Orleans is the Apanage of the ſecond ſon of France.

APARI'NE, *cleavers*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf and is bell-faſhioned, very wide, and open at the mouth, and divided into ſeveral ſegments; the cup becomes a fruit, which is dry, covered with a very thin ſkin, and compoſed of two round bodies, which contain an umbilicated ſeed. The leaves of this plant are rough and hairy, and ſtand in rundles round the ſtalk.

Aparine, in the Linnæan ſyſtem of botany, makes a diſtinct genus of plants; the characters of which are theſe: the calyx is an extremely ſmall perianthium, placed on the germen, and divided by four notches at its end. The flower conſiſts of one ſingle petal which forms no tube, but is placed flat, and divided into four ſegments; the ſtamina are four pointed filaments ſhorter than the flower. The antheræ are ſimple; the germen of the piſtillum is double, and ſituated below the receptacle; the ſtyle is ſlender, ſomewhat bifid at the end, and of the ſame length with the ſtamina; the ſtigmata are headed. The fruit is compoſed of two roundiſh dry bodies, growing together, and armed with hooked hairs which make them rough and rigid, and ſtick to things; the ſeeds are ſingle, roundiſh, umbilicated, and large. *Linnæi Genera Plantarum.*

APATU'RIA *, in antiquity, a ſolemn feaſt celebrated by the Athenians in honour of Bacchus.

* The word is generally derived from the Greek ἀπάτη, fraud.

It is ſaid to have been inſtituted in memory of a fraudulent victory, obtained by Melanthus king of Athens, over Xanthus, king of Bœotia, in a ſingle combat, which they agreed upon, to put an end to a debate between them relating to the frontiers of their countries.—Hence Budæus calls it *feſtum deceptionis*, the feaſt of deceit.

Other authors give a different etymology of this feaſt, from what we have now related; they tell us, that the young Athenians were not admitted into the tribes on the third day of the Apaturia, till their fathers had firſt ſwore that they were their own children; and that till that time they were ſuppoſed, in ſome meaſure, to be without fathers, ἀπατόρες, whence the feaſt, ſay they, took its name.

Xenophon, on the other hand, informs us, that the relations and friends met on this occaſion, and joined with the fathers of the young people who were to be received into the tribes; and that from this aſſembly the feaſt took its name: that, in ἀπαȣ́τρια, the α, far from, being a privative, is a conjunction, and ſignifies the ſame thing with ὁμȣ͂, together.

This feaſt laſted four days: the firſt day, thoſe of the ſame tribe made merry together; and this they called δορπία. The ſecond day, which they called ἀνάῤῥυσις, they ſacrificed to Jupiter and Minerva. The third day, which they called κȣρεώτις, ſuch of their young men and maids as were of age, were admitted into their tribes. The fourth day they called ἔπιβδης.

APHA'CHA, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind, and its piſtil, which ariſes from the cup, finally becomes a pod which contains roundiſh ſeeds. To this it is to be added, that there are only two leaves at every joint of the ſtalk, and that the tendrils grow from the alæ of theſe leaves.

There is only one known ſpecies of Aphacha, which is the yellow vetching, called, by ſome, the bind-weed-leaved vetch. *Tournef. Inſt.*

APHA'NIS, in the Linnæan ſyſtem of botany, the name of a genus of plants, the characters of which are theſe: the cup is a tubular perianthium remaining till the ſeeds are ripe; it conſiſts of one leaf divided at the extremity into eight ſegments, which are extremely ſmall, and alternately different in ſize. There are no petals; the ſtamina are four erect, pointed, and very ſmall filaments, inſerted on the rim of the cup; the antheræ are roundiſh. The piſtillum has two germina of an oval figure, and two ſtyles of the ſame length with the ſtamina, inſerted on the baſis of the germina; the ſtigmata are headed. The cup ſupplies the place of a fruit, ſhutting together at its mouth, and containing two oval, pointed, compreſſed ſeeds, of the length of the ſtyles. *Linnæi Genera Plantarum.*

APHE'A, in mythology, a goddeſs worſhipped by the Cretans and people of Ægina.

Aphea, before ſhe was made a deity, went by the name of Britomartis in Crete; her paſſion for hunting attached her to the train of Diana, and dedicated her virginity to the goddeſs; to avoid the purſuit of Minos, who was deſperately in love with her, ſhe threw herſelf into the ſea, and was taken up in the nets of ſome fiſhermen. Diana rewarded her virtue with the honours of immortality. Britomartis afterwards appeared to the people of Ægina, who paid adoration to her under the name of Aphea.

APHE'LION, *(Dict.)*— The celebrated Dr. Halley has given us the following geometrical method of finding the Aphelia of the planets.

The annual motion of the earth through the ecliptic occaſions an optical inequality in the motions of the other planets, which is well known to aſtronomers that embrace the Copernican ſyſtem, by the name of the parallax of the orbit. And this inequality, which without much labour is derived from obſervations, I lay down as the ſtrongeſt foundation of the following method. In which, beſides obſervations, nothing elſe is ſuppoſed, than that the orbits of the planets are ellipſes, and that the ſun is placed in the common focus of all the orbits; and laſtly, that the periodical times of them all are ſo well known, that no error can be perceived at leaſt in two or three revolutions. Theſe things being granted, firſt I muſt begin with the motion of the earth, which is neceſſarily required to account for the motions of the other planets.

Let S be the ſun, A B C D E *(plate* IV, *fig.* 1.) the orbit of the earth, P, the planet Mars, which for many reaſons is chiefly to be preferred for this purpoſe. And firſt let the true time and place be obſerved, when Mars is oppoſite to the ſun; for then the ſun and earth coincide in the ſame right-line with Mars; or, if he has latitude (which almoſt always happens) with that point where a perpendicular from Mars falls upon the plain of the ecliptic. Thus, in the ſcheme S, A, and P are in a right-line. Again, after 687 days Mars returns to the ſame point P, where he was oppoſed to the ſun in the former obſervation: but, as the earth does not return to A till after 730½ days, in B it regards the ſun in the line S B, but Mars, in the line B P; and, the longitude of the ſun and Mars being obſerved, all the angles of the triangle P B S are given, and, P S being ſuppoſed 100000, in the ſame parts the length of the line S B is found. In like manner, after another period of Mars, the earth being in C, the line S C is found, and ſo likewiſe the lines S D, S E, S F; and the differences of the obſerved places of the ſun are the angles at the ſun A S B, B S C, C S D, D S E. Thus we come at laſt to this geometrical problem, three lines being given both in length and poſition, meeting in one of the focus's of an ellipſis, to find the length of the tranſverſe diameter, and the diſtance of the foci. The reſolution of this problem may be extended alſo to the other planets, if, after the theory of the earth's motion is known, we find out (according to the method propoſed by the right reverend the biſhop of Saliſbury, in his geometrical aſtronomy, lib. 2. part 2. cap. 5.) three diſtances of any planet from the ſun with its poſitions. Now, becauſe the biſhop ſuppoſes the planet ſo to move in its orbit, that in equal lines it compleats equal angles at the other focus of the ellipſis, and upon this ſuppoſition builds his calculations; it will not be improper to ſhew how the ſame thing may be done without that ſuppoſition, which obſervation obliges us to reject.

Let S be the ſun, A L B K *(fig.* 2.) the earth's orbit, P, the planet, or the point in the plain of the ecliptic, marked out by the perpendicular from the planet; A B, the line of the earth's apſides. Firſt let the longitude and latitude of the planet be obſerved, and alſo the ſun's longitude from the earth, in K; and after a period of the ſame planet, the earth being in L, let two poſitions of the planet and the ſun be again obſerved as before. Now from the obſerved longitudes of the ſun and the earth's Aphelion are given the angles A S K, A S L, and conſequently the ſides S K, S L. Now, in the triangle K S L, are given the ſides K S, L S, and the angle K S L; required the ſide K L, and the angles S K L, S L K. Then in the triangle K L P are given K L, K P L, the difference of the obſerved longitudes of the planet, and P K L the difference of the angles S K L laſt found, and of S K P the planet's elongation from the ſun in the firſt obſervation; required L P. Then in the triangle L S P are given the ſides L S, L P, and the angle P L S, the planet's elongation from the ſun in the ſecond obſervation; required the ſide S P and the angle L S P; which being found, it is, as S P to L P, ſo is the tangent of the latitude obſerved at L to the tangent of inclination or latitude to the ſun; and, as the co-ſine of inclination to radius, ſo is S P, the curtated diſtance, to the true diſtance of the planet from the ſun. So at laſt we have found the deſired poſition and longitude. It remains to ſhew, how from three given diſtances from the ſun, with the intercepted angles, to find the middle diſtance excentricity of the ellipſis.

Let S be the ſun, and S A, S B, S C, *(fig.* 3.) three diſtances in due poſition, and drawing A B, B C, let A B be the diſtance of the foci in an hyperbola, and $SA - SB = EH$ be the tranſverſe diameter. Theſe things being premiſed, let the hyperbolical line be deſcribed, whoſe internal focus is at the point A, and the extremity of the longer line S A. In like manner let B, C, be the foci of another hyperbola, whoſe diameter is $SB - SC = KL$; from which let the hyperbolical line be deſcribed, having its internal focus at the point B. I ſay theſe two hyperbola's thus deſcribed will interſect one another in the point F, which is one of the foci of the ellipſis required; and drawing the line F A, F B, or F C, either $SA + FA$, $SB + FB$, or $SC + FC$, will be equal to the tranſverſe diameter, and S F is the diſtance of the foci. Theſe being ſuppoſed, the deſcription of the ellipſis will be very eaſy. But, whereas the reaſon of this conſtruction may not be obvious to every one, it will not be improper to give ſome illuſtration of it. I ſay therefore, that, from the moſt known property of the ellipſis, it is $SB + FB = SA + FA$, and tranſpoſing the parts of the equation $FB - FA = SA - SB$, ſo that, though we did not know F B and F A, yet their difference is equal to $SA - SB$, that is, to E H. And ſince it is from the nature of the hyperbola, that it has any two lines from their foci to any point in the curve, conſtantly differing by the quantity of the tranſverſe diameter; it is plain that the point F is ſomewhere in the curve of the hyperbola, whoſe tranſverſe diameter is equal to $SA - SB$, and its foci A and B. In a like manner it may be demonſtrated, that the point F is in an hyperbola, whoſe diameter is $SB - SC$, and its foci B and C. Therefore it muſt neceſſarily be in the interſection of theſe two hyperbola's, which, as they interſect one another in one point only, plainly ſhew where the other focus of the ellipſis required muſt be.

Now, that the ſame thing may be performed analytically, ſuppoſe it done, and let $FB = a$, $Sa - SB = FB - FA = b$, $AB = c$, $SB - SC = FC - FB - d$, $BC = f$, and let the ſine of the angle $ABC = S$, and the coſine of the ſame $= s$.

Then $c : b :: 2a - b : \frac{2ab - bb}{c}$; and $\frac{2ab - bb + cc}{2c} = BD$, by 36. *Eucl.* III.

And $f : d :: 2a + d : \frac{2ad + dd}{f}$; and $\frac{ff - 2ad - dd}{2f} = BG$, by the ſame. Now, to abbreviate the calculation, make $\frac{cc - bb}{2c} = g$, and $\frac{b}{c} = h$; alſo make $\frac{ff - dd}{2f} = k$, and $\frac{d}{f} = l$. Then $BD = g + ha$, and $BG = k - la$.

And becauſe in every $\left\{\begin{matrix}\text{Obtuſe-angled}\\ \text{Acute-angled}\end{matrix}\right\}$ Triangle the ſquare of the baſe is equal to the $\left\{\begin{matrix}\text{Sum}\\ \text{Difference}\end{matrix}\right\}$ of the ſquares of the ſides, and of the double rectangle of the ſides into the coſine of the contained angle; it will be $gg + 2gha + hhaa + kk - 2kla + llaa + 2gks - 2glsa + 2khsa - 2hlsaa$ is equal to the ſquare of D G. But D G is equal to the ſine of the angle D F G or D B G drawn into F B or a (for F B D G is a quadrilaterum inſcribed in the circle whoſe diameter is F B) therefore $SSaa = gg + 2gha + hhaa + kk - 2kla + llaa + 2gks - 2glsa + 2khsa - 2hlsaa$: which equation is eaſily reſolved, ſince it does not exceed an affected quadratic, and is always compoſed of thoſe ſquares and rectangles. Yet the ſigns + and —, becauſe of the different conſtitution of the three lines, muſt be applied to the rectangles with good caution. *Philoſ. Tranſ. Numb.* 128.

Kepler places the Aphelion of Saturn, for the year 1700, in 28°. 3′. 44″. of Sagittarius: De la Hire, in 29°. 14′. 41″.— The Aphelion of Jupiter in 8°. 10′. 40″. of Libra: De la Hire, in 10°. 17′. 14″.— The Aphelion of Mars in 0°. 51′. 29″. of Virgo: De la Hire, in 0°. 35′. 25″.— The Aphelion of the earth in 8°. 25′. 30.″ of Cancer.— The Aphelion of Venus in 3°. 24′, 27″. of Aquarius: De la Hire, in 6°. 56′. 10.″.— And the Aphelion of Mercury in 15°. 44′. 29″. of Sagittarius: De la Hire, in 13°. 3′. 40″.

The annual motion, according to Kepler, of the Aphelion of Saturn is 1′. 10″. of Jupiter 47″. of Mars 1′. 7″.— Of Venus 1′. 18″. and of Mercury 1′. 45″. According to De la Hire, that of Saturn is 1′. 22″. of Jupiter 1′. 34″. of Mars 1′. 7″. of Venus 1′. 26″. and of Mercury 1′. 39″.

APHO'NIA *(Dict.)*—a loſs of ſpeech.

The learned Frederic Hoffman has given a very accurate account of this diſeaſe, and the method of cure.

By the word ſpeech we commonly underſtand ſuch an emiſſion of articulate ſounds, as is capable of conveying the ideas of a man's mind to his neighbour; whereas the voice is not, properly ſpeaking, an articulate ſound, but a certain diverſified illuſion and repercuſſion of the air thrown with a kind of force through the aſpera arteria, the larynx, and its fiſſure called the glottis, to the cavity of the mouth and jaws. Thus, though ſpeech and voice are different things, yet the former cannot ſubſiſt without the latter: for, when the organs neceſſary for emitting ſounds, eſpecially the aſpera arteria, and its head the larynx, with their reſpective cartilages, muſcles, and nerves, or the roof of the mouth, are vitiated, the power of forming ſounds, and, conſequently, the faculty of ſpeech, is deſtroyed. Now, Galen long ago proved by reiterated experiments, that when one of the recurrent nerves which are formed by the par vagum and the nervus acceſſorius, and reach to the larynx, and, according to Winſlow, to the tongue itſelf, is cut, the animal becomes only capable as it were of an half and unfiniſhed pronunciation; and, when both are cut, it loſes at once the power of uttering ſounds, and the faculty of ſpeech; or, in other words, becomes intirely dumb.

This incapacity of emitting ſounds, and conſequent loſs of ſpeech, a caſe which frequently happens in hyſteric ſuffocations, is by phyſicians called Aphonia. But I take the word Aphonia in a more reſtrained ſenſe, and confine it to the incapacity of ſpeaking or emitting articulate ſounds, which depends on ſome fault of the tongue; in which caſe ſounds may be uttered, but the faulty tongue cannot articulate them right, and ſeems, as it were, to be ſilenced by its own fruitleſs ſtruggles. There is an affinity betwixt this diſtemper and that heſitation in ſpeaking, which we commonly call ſtammering; in which caſe indeed articulate ſounds are formed, but not diſtinctly enough expreſſed, becauſe the tongue is too ſlow, as it were, and incapable to cloath the ideas with language, with the ſame celerity with which they are excited in the mind.

Now, ſince in an Aphony the tongue is principally in fault, and ſince we conſider it as the ſeat of the diſorder, it will not not be improper to take ſuch a view of its ſtructure as we think neceſſary, to anſwer our preſent purpoſe. The tongue then is a muſcle of all others perhaps the moſt moveable, by reaſon of its longitudinal, tranſverſe, perpendicular, acuminated, angular, and other variouſly diſpoſed fibres; and by means of the mylo, ſtylo, hyo, and genioglossi muſcles, as well as thoſe aſcribed to the os hyoides, it can move itſelf moſt nimbly and expeditiouſly in all poſſible directions. Theſe muſcles now mentioned derive their vis motrix, or moving power, from the third branch, called the lower maxillary branch, of the fifth pair of nerves, which is almoſt totally employed in producing motion; juſt as the ninth pair ſeems to be deſtined for the purpoſes of taſte.

If by the volubility of the tongue, and its capacity of moving in all directions, ſounds formed by the aſſiſtance of the larynx are modified into certain letters, ſpeech is produced; but, the more difficult the motion of the tongue is, the more difficult ſpeech muſt conſequently be; and when its mobility ceaſes, the facility of ſpeech is deſtroyed with it, though ſounds at the ſame time may be clearly enough uttered.

Since the motion of any given part is either diminiſhed or deſtroyed by the diminution or interception of the nervous fluid, which ſhould flow into its nerves; and ſince the nerves, deſtined for the motion of the tongue, ariſe principally from the fifth pair; it plainly appears, that the ſeat of an Aphony is to be ſought for in the ſaid pair, and that the influx of the nervous fluid into that nerve, being more or leſs diminiſhed, is to be aſſigned as its immediate cauſe. In this opinion we ſhall be confirmed, if we carefully diſſect human ſubjects, who during their lives were aphonous. Thus Bonetus (in Sepulchr. Anat. lib. 1. ſect. 22. obſ. 7.) affirms, that in a man, whoſe melancholy degenerated into madneſs, and who remained aphonous to his very death, he found the brain very dry, and the origin of the nerves in the ſame ſtate, but much ſmaller than ordinary, the tongue in the mean time remaining unaffected; and (obſ. 20.) he quotes a caſe, from Riverius, of a ſtammering perſon, in whoſe brain about the lingual nerves a cyſtis was found with a hole in it, from which a ſerum always drivelled.

Whatever therefore tends to hinder the influx of the nervous fluid into the nerves deſtined to the motion of the tongue, that very thing contributes proportionably to the bringing on an Aphony. Hence a palſy of the tongue, which is either antecedent or ſubſequent to hemiplectic or apoplectic diſorders, deſerves our moſt attentive conſideration. This diſorder ſometimes happens in old men, and in languid or much weakened conſtitutions. If it appears alone, it is generally the unwelcome omen of an approaching hemiplexy or apoplexy; but if it ſucceed theſe diſorders, and is complicated with a weakneſs of memory, and a ſluggliſh heavineſs of the mental powers, it threatens the return of the former diſtemper. In this caſe the tongue is generally tumid, flaccid, half numbed, leſs ſuſceptible of motion than in its natural ſtate, and its taſte impaired; and in an hemiplegia is vitiated and faulty only in one ſide.

That Aphony is like to terminate more happily, which proceeds from a ſtagnation, or ſeceſſion of ſerous humours compreſſing the nerves of the fifth pair, which run to the tongue; but it is no leſs afflicting to the patient, and proves ſufficiently obſtinate againſt the means of cure. Aphonies of this kind happen after the ſtriking-in of ſerous puſtules and effloreſcences, eſpecially in moiſt and rainy ſeaſons.

There alſo ariſes an Aphony from too great a congeſtion of blood in the fauces and tongue; but this ſpecies of the diſorder generally uſes to quit the patient immediately, upon leſſening the quantity of humours. An inſtance of this degree of diſorder's being cured, by a ſubſequent hæmorrhage from the noſe, may be ſeen in the *Acta Academ. Natur. Curioſ.*

An Aphony proceeding from worms lodged in the cavities of the ſtomach and inteſtines deſerves our conſideration, becauſe it occurs pretty frequently. This ſpecies of the diſeaſe ſeizes the patient ſuddenly, but ceaſes to rage when the worms, its remote and ſecondary cauſe, are diſlodged.

The cure.—The firſt intention of cure, in an Aphony, is to remove the cauſes compreſſing the lingual nerves, and thereby hindering the influx of the nervous fluid into them. The ſecond is to ſtrengthen them, and corroborate the weakened parts: but, as theſe cauſes differ widely from one another, ſo he that will take the trouble of thinking, muſt plainly perceive, that they call for proportionably different methods of treatment; and it is no hard matter for any one to ſee, that an Aphony, produced by a cauſe that lies latent and remote in the cavity of the cranium, muſt with incredible difficulty admit of a cure.

That ſpecies of Aphony therefore which proceeds from a true palſy of the tongue, calls for a diſcuſſion and evacuation of the ſerum, which compreſſes the nerves and brain: the cure is therefore to be attempted by veneſection, pretty ſharp clyſters, diuretics, ſternutatories, &c. but eſpecially nervous and balſamic medicines are to take place, and be applied even externally to the tongue itſelf. For this purpoſe the following are recommended:

Strong waters of lily of the valley, couſlips, roſemary, mother of thyme, of ants, eſſence of amber, and of Peruvian balſam, oil of cinnamon, and of clove-gilliflowers, and a few drops of my balſamum vitæ, taken in ſugar, and kept under the tongue. Internally alſo the ſame balſamum vitæ, mixed with three parts of the vinous ſpirit of ſal ammoniac, and two parts of the acid tincture of antimony, may be taken with great ſucceſs, twice or thrice a day; and the doſe may be thirty drops. Neither will it be improper to apply a gentle veſicatory to the nape of the neck.—The reader will find the method of making the balſamum vitæ, under the article BALSAMUM *Vitæ*.

If ſuppreſſions of ſweat, or a ſtop put to the uſual excretion in caſe of a catarrh, have contributed to the diſorder, nothing can be uſed with greater advantage and efficacy, than diaphoretics and diuretics, duly and ſkilfully preſcribed; for, immediately upon the diaphoreſis being reſtored, the faculty of ſpeech returns. Infuſions to be drank by way of tea, a mild regimen, ſuccinated ſpirit of harts-horn, acid tincture of antimony, and eſſence of amber, eſpecially if they be mixed with balſam of Peru, or my balſamum vitæ, are alſo moſt ſovereign and efficacious remedies in this caſe.

An Aphony ſometimes ſeizes the patient under a mercurial ſalivation, that is, when the ſerous and ſalival humours flow to the tongue and fauces in too great a quantity. In this caſe, the intention of cure conſiſts in making a derivation and evacuation of thoſe humours from the head. This end is moſt effectually anſwered by diaphoretic decoctions drank warm; by laxatives, and eſpecially by cephalic pills of a pretty ſharp and ſtimulating quality, a proper regimen in the mean time being entered into, and carefully perſiſted in.

In an Aphony which remains after the ſhocks of an hemiplexy or apoplexy, and has all the appearances of being ſufficiently obſtinate, I have obſerved remarkable effects, produced by applying to the nape of the neck plaiſters prepared of turpentine or pitch, and the gums caranna and maſtich; for other remedies, how rich and generous ſoever, generally come ſhort of expectation, and diſappoint our hopes in this caſe.

If an Aphony proceeds from too great a congeſtion of blood in the head, the whole cure conſiſts almoſt in letting blood in proper places, and in due quantities. The quantity taken from the patient muſt be large, and drawn, juſt as circumſtances require, either from the arm, the feet, or ſometimes the veins under the tongue. Cupping and ſcarification are alſo proper. The feet muſt alſo be waſhed, in order to procure a derivation of the humours to the inferior parts. Nitrous antiſpaſmodic medicines are alſo to be uſed internally, becauſe, in caſes of this nature, the ſpaſms of the lower parts are generally complicated with ſome other diſorders: for this reaſon, temperating powders, mixed with nitre and cinnabar, or my anodyne liquor, mixed with eſſence of caſtor, are highly ſerviceable in this caſe. See *Anodyne* LIQUOR.

Though bleeding is a circumſtance of great importance and efficacy in the preſent caſe, yet it is not to be uſed indiſcriminately and at random; for in old men, languid conſtitutions, and patients of phlegmatic habits, or thoſe whoſe ſtrength is exhauſted, it does more harm than good; and, if drawn in a larger quantity than is ſufficient to anſwer the end, is ſo far from guarding againſt it, that it even excites and brings it on. Phlebotomy then ſhould rather take place where the pulſe is quick and large, and the face red and turgid with blood. And even in this caſe it is not to be uſed, till the strictures of the lower parts are relaxed, and mitigated by previous clyſters, frictions, and bathing of the feet. Plethoric people before bleeding ſhould carefully abſtain both from the internal and external uſe of the hotter, more ſpirituous, and nervous medicines; becauſe they ſtimulate the humours more, and hurry on their congeſtion to the fauces.

If ſpaſmodic conſtrictions of the fauces and tongue have produced an Aphony, as happens in hyſteric and hypochondriac paroxyſms, which are attended with difficulty of deglutition, external paregorics are of more ſervice than internal medicines. For this purpoſe a little caſtor, or nutmeg, or theriaca, or ſage, may be held under the tongue; or a few drops of the balſamum vitæ, mixed with ſome anodyne liquor, may be poured upon the tongue. Beſides, bathing the feet, carminative clyſters, emollient fomentations and baths, are highly ſerviceable in this caſe.

Laſtly, that Aphony which is produced by worms lodged in the cavities of the inteſtines and ſtomach, is eaſily cured by anthelminthic medicines, and ſuch as relax and mitigate the ſtrictures of the inteſtines; for, when theſe are at an end, the power of ſpeaking returns, but is again frequently loſt, till the worms, the remote cauſe of the diſorder, are diſlodged: For this reaſon, when the ſpaſms are gone, the phyſician is to endeavour, by proper remedies, to diſlodge theſe troubleſome animals, as effectually as he poſſibly can. *Hoffman.*

APHRA′CTÆ, in antiquity.—The gallies of the ancients which were open without any deck, and had only one bank of oars, were diſtinguiſhed by this appellation from the cataphractæ which had decks.

The Aphractæ had only at the ſtem and ſtern a little floor of planks, which they mounted to fight on; but this method of building was not general.

It alſo appears from hiſtory ſome veſſels were called Aphractæ, which were cloſe and had a deck with one of theſe raiſed floors at their ſtern which they called roſtra. Livy, ſpeaking of Octavius, ſays, that when he ſailed from Sicily with thirty men of war and two hundred ſtore-ſhips, he had not good weather all the voyage, for, when he was juſt arrived in ſight of the African coaſt with a fair wind, on a ſudden he was retarded by a calm; after which the wind changed, and a ſtorm riſing diſperſed his fleet, and he had great difficulty to keep his naves roſtratæ from ſinking by the help of his oars. Here he calls thoſe naves roſtratæ, which he had before called naves longæ, men of war. He ſays, beſides, that open boats were built with roſtra at their ſtern; from whence it follows, that the difference between the Aphractæ and cataphractæ conſiſted principally in this, that the Aphractæ were open boats, the cataphractæ decked veſſels; for the roſtrum was common to both.

APHRODI′SIA, in antiquity, feſtivals in honour of the goddeſs 'Αφροδίτη, or Venus. There were ſeveral of theſe Aphrodiſia, obſerved in divers parts of Greece; the moſt remarkable was that at Cyprus, firſt inſtituted by Cinyras, out of whoſe family certain prieſts of Venus were elected, and for that reaſon named κινυράδια. At this ſolemnity ſeveral myſterious rights were practiſed: all who were initiated to them offered a piece of money to Venus as an harlot, and received, as a token of the goddeſs's favour, a meaſure of ſalt, and a φάλλος; the former, becauſe ſalt is a concretion of ſea water, to which Venus was thought to owe her birth; the latter, becauſe ſhe was the goddeſs of wantonneſs. *Pott. Archæol. Græc.*

APHRODI′TE *, a name of Venus.

APHRODI′TES, in natural hiſtory, a name given by ſome authors to the fineſt ſpecies of amethyſt.

The ancients had a way of diſtinguiſhing what they allowed to be gems, into ſeveral kinds, according to their degrees of colour: theſe they called ſo many ſpecies, and gave to each its peculiar name. This has been the occaſion of no little confuſion among the writers on theſe ſubjects, by ſeemingly enlarging the number of the gems. The pæderos and gemma Veneris of the antients are the ſame ſtone with this, though many have applied theſe names to the opal.

A′PHTHÆ *(Dict.)* Aphthæ, or ſmall ulcers, are frequent in acute diſeaſes, attended with inflammations of ſome of the viſcera. Theſe are ſmall, round, ſuperficial ulcers, on the inſide of the mouth; which, upon an accurate examination, appear to be exulcerations of the extremities of the excretory ducts of thoſe glands which ſeparate the ſalivary humour, and convey it to the mouth: now, when this fluid is, by any cauſe, rendered too thick and viſcid, it ſtops up the extremities of theſe canals, which, upon this, exulcerate.

Every part, therefore, into which ſuch excretory ducts diſcharge themſelves in a natural ſtate, are ſubject to Aphthæ; as the lips, gums, internal parts of the cheeks, tongue, palate, fauces, tonſils, uvula, throat, ſtomach, and ſmall inteſtines.

It is ſaid, that the large inteſtines, though rarely, are infeſted with theſe ſmall exulcerations; and that they are propagated through the whole inteſtinal tube.

The northern people, who inhabit marſhy places, are moſt ſubject to Aphthæ in a hot and rainy ſeaſon; and infants and old people are, in general, moſt affected with them. But in countries which are warm or mountainous, or where the air is habitually ſerene and dry, they are ſcarcely, if ever, known.

Aphthæ, in the mouth, are uſually preceded by a continual putrid fever; or an intermittent, degenerated into a continual fever, which began with a diarrhœa or dyſentery; a conſiderable and perpetual nauſea, vomiting, loſs of appetite, and great anxieties about the præcordia, frequently returning; by great weakneſs, or any conſiderable evacuation of the humours; by ſtupor and heavineſs; by unequal, but perpetual, and not very violent drowſineſs; and by perpetual complaints of a ſenſation of heavineſs and pain about the ſtomach: and it is remarkable, that thoſe preceded by great evacuations of the humours are very dangerous.

Sometimes, in the beginning, a ſolitary puſtule will appear in different parts of the mouth; as upon the tongue, in the angles of the lips, in the fauces, or elſewhere, without any certainty as to the part on which they are firſt viſible; and theſe are generally of a mild nature. But, ſometimes, they appear firſt at the lower part of the fauces, and a white thick cruſt, ſhining like new bacon, which adheres firmly to the parts, and aſcends ſlowly, ſeems, as it were, to proceed from the œſophagus: theſe are uſually a very bad ſort, and generally fatal. But the worſt ſort, and of which the patient very ſeldom recovers, are thoſe which cover the whole mouth, as far as the extremities of the lips, with a hard, firm, thick, and tenacious kind of cruſt. The two laſt ſpecies ſhould ſeem to have their origin in the ſtomach, and thence to aſcend into the mouth.

The malignancy of Aphthæ may be eſtimated by their colour. Thus thoſe which are white and pellucid, and almoſt of the colour of pearls, are the leaſt malignant; thoſe which are white, but opaque, by reaſon of their thickneſs, are more ſo; but not ſo bad as thoſe which are brown, yellow, or livid: the black are, of all others, the worſt.

When theſe Apthæ, or apthoſe cruſts, have adhered ſome time to the parts affected, they begin to ſeparate, and be looſened from the ſubjacent part, and to fall off, ſo that all the affected parts are, by degrees, and ſucceſſively, freed from them: but this ſeparation is effected in ſome kinds ſooner, in others later. And hence, alſo, we may judge of the degrees of malignity; for, the ſooner the ſeparation happens, the leſs is the danger.

Sometimes theſe, when fallen off, are immediately ſucceeded by freſh Aphthæ; but ſometimes this ſucceſſion happens more ſlowly, and ſometimes not at all: ſometimes, alſo, the ſucceeding Aphthæ are as thick, or more ſo, than the firſt; and hence, alſo, the danger may be eſtimated; for the ſooner they are renewed, and the thicker, the greater is the malignity.

From conſidering what has been premiſed, we may readily form an idea of the ſeat, nature, cauſe, and ſymptoms of the Aphthæ, and of their different ſorts; and hence, alſo, their effects may be underſtood.

Thus, if ſuch an aphthoſe cruſt, as is above deſcribed, covers the whole ſuperficies of the parts mentioned, all ſenſation, which ſhould be communicated to the nerves, is intercepted, and the patient loſes his taſte. Beſides this, the egreſs of the fluids, by theſe obſtructed emiſſaries, is utterly prevented; the conſequences of which are, a drineſs of the parts, a dilatation of the ſubjacent veſſels, a putrefaction of the fluids ſtagnating under the aphthoſe cruſt, and an inflammation of the parts themſelves in which they ſtagnate.

Hence, alſo, the orifices of the abſorbent veſſels are obſtructed in ſuch a manner, that no freſh chyle, fluids, or medicines, can enter them; and this produces all thoſe diſorders which may proceed from a deficiency of nouriſhment, and, in the end, death.

When theſe cruſts fall off, there is an increaſed flux of humours from the mouths of the diſtended veſſels now opened; hence a large diſcharge of ſaliva, or a diarrhœa, which are good ſymptoms, if the aphthoſe cruſts are not renewed; but bad, if they are.

Upon the falling off of the cruſts, a great pain ſucceeds of the parts underneath, which are now inflamed and expoſed: theſe often diſcharge blood, whence bloody ſaliva, and a bloody dyſentery.

If what has been ſaid is applied to the ſtomach, the excretory ducts of the liver, pancreas, and of the other glands which open into the inteſtines, we may form an idea of an infinite number of diſorders ariſing from this diſtemper; inſomuch that a farther detail of the prognoſtics will be ſuperfluous.

If theſe ulcerous cruſts are very ſlow of ſeparation, thick, broad, and compact, the ſubjacent fleſh, being, as it were, ſuffocated, inflames, ſuppurates, or even mortifies; the conſequences of which are malignant ulcers, which ſometimes affect the os palati, and its perioſteum: hence we may judge of their effects in the ſtomach and inteſtines.

The cure.— 1ſt, The impulſe of the vital fluids, upon the parts affected, is to be gently excited, and ſo conducted, that, by a proper ſupply of fluids, the ulcerous cruſts may be looſened, ſeparated, and fall off: this is effected by drinking great quantities of warm, diluting, reſolving, and abſterging liquids. And becauſe, in ſome bad caſes, the orifices of the lacteals are ſo obturated, as not eaſily to admit the liquids thus taken; fomentations, vapours, and baths, are of ſingular uſe. The very beſt aliment is bread boiled in water, and then mixed with wine and honey.

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* The word is Greek, and derived from ἀφρὸς, foam; becauſe, according to the poets, Venus ſprung from the foam of the ſea.

Take, of ſweet almonds blanched, two ounces; of piſtachio-nut kernels, one ounce; of the four greater and leſſer cold ſeeds bruiſed, each three drachms; of excorticated oats, three ounces: boil theſe in a ſufficient quantity of water, that two pints of liquor may at laſt remain in a cloſe veſſel for an hour; and then add, of liquorice root, an ounce, and let them boil together a little: then let the boiled ingredients be thoroughly bruiſed in the decoction, and of this let the patient drink frequently; and with this let him waſh his mouth: Or,

Take, of the roots of carrots, ſkirrets, china, ſarſaparilla, and turneps, each four ounces; of whole barley, an ounce: let theſe ingredients be well bruiſed, and boiled in water; and, to thirty ounces of the expreſſed liquor, add, of ſyrup of marſh-mallows, an ounce. Let this be uſed as the preceding.

Take, of the roots of turneps unpared, a ſufficient quantity; let them be grated or raſped, and let the juice be preſſed out; and, whilſt it is boiling, let it be deſpumated; then, to ſixteen ounces of this juice, add the yolks of two eggs, and of ſyrup of violets two ounces. Let the patient take half an ounce every half hour.

The moſt proper aliments, beſides thoſe mentioned before, are decoctions of the farinaceous vegetables.

2dly, The cruſt muſt be diſpoſed to ſeparate ſoon and eaſily; which is effected by fomentations, gargariſms, and clyſters: theſe muſt conſiſt of warm, relaxing, emollient, and deterging liquors, which moiſten the parts by adhering to them a ſufficient time, and which reſiſt putrefaction. Thus,

Take, of the leaves of mallows, brank-urſine, marſh-mallows, pellitory of the wall, mullein, mercury, lady's-mantle, each two ounces; of the roots of marſh-mallows, one ounce; of the roots of turneps, ten ounces: to three pints of the decoction, made with water and expreſſed, add the yolks of four eggs, and honey of roſes two ounces. With this let the mouth be perpetually waſhed or gargled.

Make a cataplaſm of the reſiduum, to be applied externally to the region of the fauces.

Let clyſters, alſo, of this decoction, be adminiſtered.

3dly, As ſoon as the cruſt is fallen off, it will be proper to uſe anodyne and demulcent remedies, and ſuch as contribute to ſtrengthen the relaxed parts. Thus,

Take, of ſyrup of white poppies, two ounces; of cream, two ounces; the yolks of two eggs; of roſe-water, two ounces: let a little of this be held continually in the mouth. Or,

Take of the jelly of harts-horn, or of fleſh, made very thick, and cut into ſlices, a ſufficient quantity: let one of theſe ſlices be perpetually diſſolving on the tongue, and ſo gradually ſwallowed.

Theſe two medicines act agreeably upon the excoriated parts, and the following contributes to ſtrengthen them.

Take, of the decoction of the freſh leaves of agrimony, ſeven ounces; of honey of roſes, an ounce: let this be applied perpetually to the afflicted parts.

4thly, As ſoon as the fever is abated, a ſediment appears in the urine, and the pulſe begins to be free, corroborating medicines are to be directed. Thus,

Take, of the root of the ſharp-pointed dock, one ounce; of the Peruvian bark, and that of tamariſk, each ſix drachms; of the leaves of agrimony, one handful: boil theſe ingredients in a ſufficient quantity of water, and to a pint and an half of the decoction add, of the ſyrup of kermes, an ounce. Of this let the patient take half an ounce every hour. This corroborates the relaxed veſſels of the inteſtines. *James's Dict.*

APHYLLA'NTHES, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the liliaceous kind, and is compoſed of ſix petals which ariſe from the center of a ſquamoſe and ſome degree tubular cup; the piſtil ariſes alſo from the cup, and finally becomes a trigonal turbinated fruit, which, when ripe, burſts into three parts or cells, which contain roundiſh ſeeds. *Tournef. Inſt.* p. 657.

There is only one known ſpecies of this plant, which is the Montpelier Aphyllanthes, called by ſome the blue Montpelier pink.

A'PIARY (*Dict.*) — Methods of making an Apiary. When there are but few bees, it is uſual to ſet them in any corner of the garden, or court; and ſometimes in cloſes adjoining to the houſe; though ſome, for want of room without doors, have ſet them in lofts or upper rooms; but this is not ſo proper for them. If a perſon intends to have a conſiderable ſtore of bees, a ſquare plat muſt be made by itſelf, proportioned to the number of bees intended to be kept, not quite a ſquare, but rather lower extended from eaſt to weſt, but ſo contrived that they may have as much of the morning and evening ſun as poſſible. The Apiary ſhould be ſecurely defended from high winds on either ſide, either naturally by hills, trees, &c. or artificially by houſes, barns, walls, &c. It ought alſo to be well fenced from cattle, eſpecially hogs, and from all ſorts of fowl, their dung being very prejudicial to them; neither ſhould there be any ill ſmells, nor any poultry kept near the place.—The Apiary ſhould be furniſhed with ſtools or benches, of wood or ſtone; but the firſt is beſt, ſtone being hot in ſummer, and cold in winter: theſe are placed at different heights, but about twelve inches is a good height; they ſhould be ſet a little ſhelving, that the rain may run off; they ſhould alſo be two or three inches wider than the hives ſet upon them, and at leaſt five feet diſtant from the other.

To have a compleat Apiary, for every ſtock of bees intended to be kept, make a cot or houſe about two feet ſquare, and two and a half high, ſet on four legs about ten inches above ground, covered over with boards or tiles to keep off the rain, the back or north ſide being cloſed up, and the ſides facing the eaſt and weſt, to have doors with latches and haſps to them; the fore or ſouth ſide to have a falling door to cover one half thereof, which is to be raiſed up at pleaſure, and in ſummer-time ſerves for a pent-houſe, not only to keep off the beating rain from the hives, but to defend them from the extreme heat of the ſun, which at noon-day is apt to melt the honey. The other lower half ſhould have two ſmall doors to open to either hand, which will ſerve to defend the doors or holes of the hives from injurious winds: all the doors may be faſtened in winter, when the weather is too cold, or in ſummer, when it is too hot for the bees; only making a little open ſquare at the bottom of the little doors juſt againſt the bee-hole, that the bees may have ſome liberty to fly abroad, after the doors have been ſhut: by means of the ſide doors, eſpecially if the weſt door be made to open to the right hand, a perſon may ſit ſafe, and ſee the ſeveral workings of the bees in glaſs hives, if any ſuch are uſed; if not, at theſe places he may order, view, and obſerve them better than when they ſtand on naked ſtools, and with leſs offence to the bees, and more ſecurity to himſelf.

In the winter ſeaſon, if the Apiary ſtand cold, good ſweet ſtraw may be ſtuffed within the doors about the hives to keep them warm; but extremity of cold does not hurt bees ſo much in the winter as wet, from which theſe caſes beſt preſerve them; or as light, and the warm beams of the ſun, at ſuch time when there is no proviſion abroad for them, againſt which this houſe or cot is the beſt preſervative; for, when the doors are ſhut, though the ſun ſhine, yet they are inſenſible of it, the hives ſtanding ſix or eight inches within the doors; whereas, after the common way of benches or ſtools, the ſun caſts rays to their very doors, which warmth and light together draw them out, at the expence of their proviſions and lives together, as is evident from frequent experience, the mildeſt and cleareſt winters ſtarving and deſtroying moſt bees; when, on the contrary, the coldeſt and moſt frozen beſt ſecure them.

A'PIOS, the knobbed-rooted Viginian liquorice vetch, in botany, a genus of plants, whoſe characters are: it has a climbing ſtalk; the leaves grow almoſt oppoſite, and faſtened, as it were, to the mid-rib; the root is tuberous.

There is, at preſent, but one ſpecies of this plant known to us, which is, *Apios Americana Cornuti*; the American Apios of Cornutus.

This plant hath large knobbed roots, which part as they grow old, by which means the plant is increaſed; for it rarely produces ripe ſeeds with us: it is hardy, and will endure the cold in the open ground, if planted in a dry ſoil; but is ſubject to rot with too much wet in winter: it dies to the root every autumn, and riſes again the ſucceeding ſpring, and will twiſt itſelf round a pole, and grow to the height of eight or ten feet, and produce, in July, fine ſprigs of flowers: it hath alſo been planted near arbours, where it hath covered them very well towards the latter end of ſummer, but is cut down with the firſt cold of autumn: and in ſevere froſts the roots are often deſtroyed, where they are not well covered with litter or tanners bark; for want of this precaution, moſt of the roots of this plant were deſtroyed in the hard winter, 1739-40. *Miller's Gard. Dict.*

A'PIS, a famous deity among the Egyptians, repreſented by an ox with certain external marks. Into this animal, according to the Egyptians, the ſoul of the great Oſiris retired and withdrew itſelf from the world. He gave this creature the preference, becauſe the ox is the ſymbol of agriculture, the perfection of which this prince had very much at heart.

The ox, Apis, muſt have a ſtar in the forehead, that is, a ſquare white mark, the figure of an eagle on his back, a knot under his tongue in the form of a beetle, the hair of his tail double, and a creſcent on his right flank; and the cow that bore him muſt have conceived by a clap of thunder.

As it is difficult to apprehend nature ſhould produce an animal with all theſe marks, requiſite for an Apis, we muſt ſuppoſe that the prieſts took care, by impreſſing the neceſſary marks on young calves, to be provided always with one.

And if it happened at any time an Apis could not immediately be found, and they were obliged to put it off for ſome time, it was, certainly, becauſe they were very careful not to be thought guilty of the impoſition. But this artifice ſeems needleſs; people, on theſe occaſions, voluntarily ſhut their eyes. When they had found the Apis, before they carried him to Memphis, they fed him forty days in a city on the Nile. Women only were permitted to ſee and wait upon him, and theſe were obliged to preſent themſelves before the divine ox in an undreſs. After theſe forty days, they put him on board a ſuperb veſſel, and brought him down the Nile to Memphis, where the prieſts received him with all imaginable pomp; they were attended by numbers of people, and children were happy who could ſmell his breath, becauſe they imagined it inſpired them with the gift of prophecy.

On his arrival at Memphis, they conducted him to the temple of Oſiris, wherein were two magnificent ſtalls; one of which was built by Pſammeticus, ſupported by ſtatues, after the manner of the coloſſus, twelve cubits high; here he continued almoſt always ſhut up, being hardly ever ſeen but by ſtrangers, to whom he was ſhewn in a little meadow joining to the temple. If they at any time led him about the city, he was attended by officers to keep off the croud, and accompanied by young children who ſung his praiſes.

According to the ſacred books among the Egyptians, the god Apis had a certain appointed time to live; near the expiration of which, the prieſts brought him forth, and led him to the banks of the Nile with great pomp and ſolemnity, and drowned him in that river. He was afterwards embalmed, and his obſequies celebrated in ſo expenſive a manner, that the charge generally ruined the perſon to whom the care of his funeral was committed. Under Ptolemæus Lagus, they borrowed fifty talents to celebrate the funeral of Apis. The people, at the death of Apis and his embalming, lamented as if they had loſt Oſiris, and the mourning continued till the prieſts thought proper to ſhew them another Apis to ſucceed him. At the ſight of their new god they rejoiced, as if their prince had riſen from the dead; and the feſtival on this occaſion laſted ſeven days.

Cambyſes, king of Perſia, on his return from Ethiopia, found the Egyptians celebrating their feſtival on account of the appearance of their god Apis; and, imagining they made rejoicings at the ill ſucceſs of his expedition, commanded the pretended god to be brought before him, whom he ſlew with his ſword, buffeted the prieſts, and ordered his ſoldiers to deſtroy all they ſhould find celebrating this feſtival.

The Egyptians conſulted Apis as an oracle; if he took what was offered him to eat readily, it was looked on for a good omen; his refuſal, on the contrary, was accounted a preſage of ill fortune. Pliny, an author of no mean reputation for ſagacity and judgment, obſerves that Apis would not eat what Germanicus offered him, and that this prince died ſoon after. Surely, he could not be of opinion there was any connection between theſe two events. It was the ſame with regard to the two ſtalls they had built him, his continuing in one foreboded happineſs to Egypt; his removal into the other, the contrary. Thoſe who went to conſult this god, laid their mouth cloſe to his ear, and their hands upon their own, keeping them ſtopped till they were without the walls of the temple, and then took the firſt thing they heard for the anſwer of the god.

APO'CALYPSE (*Dict.*)— This book, according to Irenæus, was written about the year 96 of Chriſt, in the iſland of Patmos, whither St. John had been baniſhed by the emperor Domitian. But Sir Iſaac Newton, with very good reaſon, places the writing this book earlier, viz. in the time of Nero, Some attribute this book to the arch-heretic Cerinthus: but the ancients unanimouſly aſcribed it to John, the ſon of Zebedee, and brother of James. This book has not, at all times, been eſteemed canonical. There were many churches in Greece, as St. Jerom informs us, which did not receive it; neither is it in the catalogue of canonical books prepared by the council of Laodicea, nor in that of St. Cyril of Jeruſalem: But Juſtin, Irenæus, Origen, Cyprian, Clemens of Alexandria, Tertullian, and all the fathers of the fourth, fifth, and the following centuries, quote the Revelations as a book then acknowledged to be canonical. The Alogians, Marcionites, Cerdonians, and even Luther himſelf, rejected this book: but the Proteſtants have forſaken Luther in this particular; and Beza has ſtrongly maintained againſt his objections, that the Apocalypſe is authentic and canonical.

The Apocalypſe conſiſts of twenty-two chapters. The three firſt are an inſtruction to the biſhops of the ſeven churches of Aſia Minor. The fifteen following chapters contain the perſecutions, which the church was to ſuffer from the Jews, Heretics, and Roman emperors. Next, St. John propheſies of the vengeance of God, which he will exerciſe againſt thoſe perſecutors, againſt the Roman empire, and the city of Rome, which he deſcribes under the name of Babylon, the great whore, ſeated upon ſeven hills. In the laſt place, the 19th, 20th, 21ſt, and 22d chapters deſcribe the triumph of the church over its enemies, the marriage of the Lamb, and the happineſs of the church triumphant.

'It is a part of this prophecy (ſays Sir Iſaac Newton) that it ſhould not be underſtood before the laſt age of the world; and therefore it makes for the credit of the prophecy, that it is not yet underſtood.— The folly of interpreters has been to foretel times and things by this prophecy, as if God deſigned to make them prophets. By this raſhneſs they have not only expoſed themſelves, but brought the prophecy alſo into contempt. The deſign of God was much otherwiſe: he gave this and the prophecies of the Old Teſtament, not to gratify men's curioſities, by enabling them to foreknow things, but that, after they were fulfilled, they might be interpreted by the event, and his own providence, not the interpreters, be then manifeſted thereby to the world.— There is already ſo much of the prophecy fulfilled, that as many as will take pains in this ſtudy, may ſee ſufficient inſtances of God's providence.— Amongſt the interpreters of the laſt age, there is ſcarce one of note, who has not made ſome diſcovery worth knowing; and thence I gather, that God is above opening theſe myſteries.

The Apocalypſe of John is written in the ſame ſtyle and language with the prophecies of Daniel, and hath the ſame relation to them, which they have to one another; ſo that all of them together make but one conſiſtent prophecy, pointing out the various revolutions that ſhould happen, both to the church, and to the ſtate, and, at length, the final deſtruction and downfal of the Roman empire. *Newton on Prophecies.*

APO'CRYPHA *, or *apocryphal books*, ſuch books as are not admitted into the canon of ſcripture, being either not acknowledged as divine, or rejected as heretical and ſpurious.

* The word is Greek ἀπόκρυφα, which is derived from ἀπὸ and κρύπτω, which ſignifies to hide or conceal.

When the Jews publiſhed their ſacred books, they only gave the appellations of canonical and divine to ſuch as they then made public; and ſuch as were ſtill retained in their archives they called Apocryphal, for no other reaſon, but becauſe they were not public; ſo that they might be really ſacred and divine, though not promulged as ſuch.

Thus, in reſpect of the Bible, all books were called Apocryphal, which were not inſerted in the Jewiſh canon of ſcripture.—Voſſius obſerves, that, with regard to the ſacred books, none are to be accounted Apocryphal, except ſuch as have neither been admitted into the ſynagogue, nor the church, ſo as to be added to the canon, and read in public.

The Proteſtants do not only reckon thoſe books to be Apocryphal which are eſteemed ſuch in the church of Rome, as the prayer of Manaſſeh king of Judah, the third and fourth books of Maccabees, the third and fourth book of Eſdras, St Barnabas's epiſtle, the book of Hermas, the addition at the end of Job, and the 151ſt pſalm.

But alſo Tobit, Judith, Eſther, the book of Wiſdom, Jeſus the ſon of Sirach, Baruch the prophet, the ſong of the three children, the hiſtory of Suſanna, the hiſtory of Bell and the dragon, and the firſt and ſecond book of Maccabees.

It is not pretended that theſe books were received by the Jews, or ſo much as known to them. None of the writers of the New Teſtament cite or mention them: neither Philo nor Joſephus ſpeak of them. The Chriſtian church was for ſome Ages an utter ſtranger to theſe books. Origen, Athanaſius, Hilary, Cyril of Jeruſalem, and all the orthodox writers, who have given catalogues of the canonical books of ſcripture, unanimouſly concur in rejecting theſe out of the canon. And for the New Teſtament they are divided in their opinions, whether the epiſtle to the Hebrews, the epiſtle of St. James, and the ſecond epiſtle of St. Peter, the ſecond and third epiſtles of St. John, the epiſtle of St. Jude, and the Revelations, are to be acknowledged as canonical or not.

The Proteſtants acknowledge ſuch books of ſcripture only to be canonical as were ſo eſteemed to be in the firſt ages of the church; ſuch as are cited by the earlieſt writers among Chriſtians, as of divine authority; and after the moſt diligent enquiry were received, and ſo judged to be by the council of Laodicea. The ſeveral epiſtles above mentioned and the book of Revelations, whatever the ſentiments of ſome particular perſons are, or may have been of them, are allowed by all the reformed churches to be parts of the canon of the New Teſtament.

APOCY'NUM, *dogs-bane*, in botany, a genus of plants, whoſe characters are: the leaves are produced oppoſite, by pairs, upon the branches: the flower conſiſts of one leaf, which is cut into ſeveral ſegments: from its flower-cup ariſes the pointal, which is fixed like a nail in the back part of the flower, and is afterwards changed into a fruit, which is, for the moſt part, compoſed of two capſules, or pods, which open from the baſe to the top, incloſing many ſeeds, which have a long pappous down adhering to them: to this may be added, that the whole plant abounds with a milky juice.

There are ſeveral ſorts of this plant cultivated in the curious gardens of plants, ſome of which are very beautiful, and deſerve a place in every good garden. *Miller's Gard. Dictionary.*

APOLLINA′RIAN *Games*, *Apollinares ludi*, in antiquity, games at Rome, celebrated yearly in honour of Apollo, on the fifth day of July, under the direction of the prætor, in the circus maximus.

The occaſion was a kind of oracle delivered by the prophet Marcus after the fatal battle at Cannæ, declaring, that to expel the enemy, and cure the people of an infectious diſeaſe, which then prevailed, ſacred games were to be annually performed in honour of Apollo. The prætor to have the direction of them, and the decemviri to offer ſacrifices after the Grecian rite. *See Livy, l.* 25. *c.* 12.

APOLLO′NIA, ’Απολλωνία, in antiquity, feaſts ſacred to Apollo at Egialea.

The occaſion of their inſtitution is thus related: Apollo, after his victory over Python, went to Egialea, accompanied with his ſiſter Diana; but, being frighted thence, fled into Crete. After this the Egialians were infected with an epidemical diſtemper, and, being adviſed by the prophets to appeaſe the two offended deities, ſent ſeven boys, and as many virgins, to intreat them to return; Apollo and Diana accepted their piety, and came with them to the citadel of Egialea, in memory of which a temple was dedicated to Pitho the goddeſs of perſuaſion; and it became a cuſtom to appoint choſen boys and virgins to make a ſolemn proceſſion, in ſhew, as if they deſigned to bring back Apollo and Diana; which ſolemnity was continued till Pauſanias's time. *Pott. Archæol Græc.*

APO′MYOS *Deus*, in the mythology of the ancients, a name under which Jupiter was worſhipped at Elis, and both Hercules and Jupiter at the Olympic games.

APO′PHTHEGM, a wiſe, ſhort, and pithy ſaying.

A′POPLEXY *(Dict.)*— It has been the general opinion of phyſicians, that an Apoplexy is cauſed by an extravaſation of the fluids, or the fulneſs of the veſſels. But the learned M. le Cat, by curing a ſurprizing hydrocele in the head, has ſhewn that this opinion is ill founded; for the patient, notwithſtanding the prodigious quantity of water, which continually preſſed on the brain, had not the leaſt ſymptom of an Apoplexy.

“ How can one then believe, ſays this author, that the Apoplexy is cauſed by the extravaſation of the liquids, or by the fulneſs of the veſſels, after having ſeen a brain filled with water, and diſtended ſo vaſtly as this was, without any one apoplectic ſymptom? Verduc, who in his pathology propoſes an objection ſimilar to this againſt his own ſyſtem, endeavours to ſolve it, but has not ſucceeded. The objection remains victorious.

Nevertheleſs, when the brain of a perſon dead of an Apoplexy is opened, and extravaſated blood is found in it, his death is imputed to this extravaſation alone, and the Apoplexy is pronounced ſanguineous. This has happened on the death of M. de Frequienne, preſident of our parliament. On opening him I found about a tea-ſpoon full of blood extravaſated within the medulla oblongata, between the third and fourth ventricle, at the beginning of the latter. Could ſo ſmall a quantity of blood preſs on the principles of the nerves ſo as totally to intercept the courſe of the ſpirits? No, certainly; for this would be miſtaking the effect for the cauſe. This extravaſated blood was but an accident owing to the convulſive motions of the dura mater, and of the veſſels of the whole baſis of the ſcull, ſeized with the apoplectic diſorder, which moſt commonly is nothing elſe but the matter of the gout or rheumatiſm fixing on this ſource of the nerves. Now this general attack, which ſwells and diſtends the dura mater throughout this whole baſis, makes the blood ſtagnate in the veſſels, ſome of the weakeſt of which burſt, and at the ſame time cloſes all the canals of the nerves, and conſequently kills the patient. Unleſs a perſon would chuſe to ſay, that theſe broken canals were thoſe, which concurred in the ſubſtance of the brain to the formation of the ſpirits, that give motion to the heart: which opinion is not free from difficulties; ſince it is well known, that this organ receives the influences of ſeveral nerves at a time, all which ought to bear their part in this accident, which, after all, is but the rupture of a ſimple capillary veſſel.

The drift of theſe reflections is to engage practitioners to have ſomewhat leſs confidence in their theories, and, for example, not to make a poor apoplectic patient die under the lancet; a thing, which I have ſeen ſeveral times, from the notion which they hold, that it is the over-great quantity of blood, that kills: for, beſides that this falſe opinion is fatal to this patient in particular, it will ſtill be ſo to all future apoplectics, if the prejudice in favour of this theory be ſuch as to prevent ſeeking the true cauſes, and the real remedies of the Apoplexy.” *Philoſophical Tranſactions, vol.* 47, *pag.* 271.

APOSTA′GMA, in natural hiſtory, the juice which flows from the grapes, before they are trodden or preſſed.

APO′STLE *(Dict.)*— The Apoſtles of our Saviour were the firſt and moſt diſtinguiſhed of his diſciples; he inveſted them with an authority ſuperior to that of others, filled them with the Holy Spirit, truſted them particularly with his myſteries, and choſe them, out of all thoſe that followed him, to raiſe the edifice of his church upon them. Jeſus Chriſt, after his reſurrection, ſent them into all the parts of the world, with commiſſion to preach and baptize in the name of the Father, and of the Son, and of the Holy Ghoſt, and with power to work miracles and cures of all kinds.

The Apoſtles continued to exerciſe their miniſtry in Paleſtine near twelve years, our bleſſed Saviour having commanded them not to depart from Jeruſalem, and the parts adjacent, till twelve years after his aſcenſion. According to Apollonius and Clemens Alexandrinus, they reſolved to diſperſe, and apply themſelves to the full execution of the commiſſion Chriſt had given them, to go teach and baptize all nations; and, having ſettled the general affairs and concerns of the church, they betook themſelves to the ſeveral provinces of the Gentile world, preaching the goſpel to every nation under heaven. Many believe, that before their departure they compoſed the creed, called the Apoſtles creed, and thoſe canons called the Apoſtles canons; but moſt learned men are ſatisfied that they are both the compoſure of later times, though the former is acknowledged to be the ſummary of the Apoſtles doctrine. It is generally affirmed by the ancients, that the Apoſtles agreed among themſelves, what parts of the world they ſhould take; and this, according to ſome, was done by lot, though not without the guidance and direction of the Holy Ghoſt. According to this diviſion, St. Peter went into Pontus, Galatia, and thoſe other provinces of the leſſer Aſia. St. Andrew had thoſe vaſt northern countries of Scythia and Scydiana to his portion: though afterwards he is ſuppoſed to return towards Greece, and to have founded the biſhopric of Byzantium. St. John's portion was partly the ſame with St. Peter's, namely, the leſſer Aſia: though, it is believed he did not immediately enter upon his charge, but ſtayed ſome years in Jeruſalem, till after the bleſſed Virgin's death. St. Philip had the upper Aſia appointed him, with ſome parts of Scythia and Colchis. Arabia Felix was allotted to St. Bartholomew, into which parts he carried the goſpel of St. Matthew. St. Matthew himſelf preached in the Aſiatic Ethiopia, by Chaldea, Perſia, and Parthia: but Parthia was more particularly allotted to St. Thomas, who alſo preached to the Hyrcanians, Bactrians, and Indians. St. James the leſs, being biſhop of Jeruſalem, continued principally in that city. As for St. James the great, we have no certain account what became of him immediately after our Saviour's aſcenſion. St. Jerom tells us, that he preached to the diſperſed Jews, by which, he probably means the Jewiſh converts, diſperſed after the death of Stephen. And we may conclude, that ſince the Apoſtles, after our Lord's aſcenſion, ſtaid ſeveral years together at Jeruſalem, or in the bounds of Judea; and ſince St. James lived ſo ſhort a while; it is utterly improbable that he went either to Spain, Portugal, Britain, or Ireland, to plant chriſtianity; however, ſome Spaniſh and other monaſtic writers affirm it; but, there being no account of this earlier than the middle age of the church, it is ſafeſt to confine his miniſtry to Judea, and the parts thereabouts. St Simon had for his portion Egypt, Cyrene, Lybia, and Mauritania. St Jude had Syria and Meſopotamia; and St. Matthias, Cappadocia and Colchis. Of all their travels and actions we have but a very ſhort and imperfect account. Had we the writings of Papias, biſhop of Hierapolis, and, according to Irenæus, ſcholar to John; the commentaries of Hegiſippus, Clemens Alexandrinus's inſtitution, Africanus's chronology, and other writers about that time, mentioned by the ancients; we might expect a much more perfect and authentic account. Dr. Cave among the moderns, in his Antiquitates Apoſtolicæ, gives the beſt account we have ſeen of the Apoſtles travels, the ſucceſs of their miniſtry, the places and countries to which they went, the churches they planted, and their acts and martyrdoms. There are no authors extant, who wrote an hiſtory of the church near the apoſtolic times; the firſt eccleſiaſtic hiſtorian that now remains being Euſebius, who wrote in the 4th century.

In order to qualify the Apoſtles for the arduous taſk of converting the world to the Chriſtian religion, they immediately received the doctrine they taught from the mouth of Chriſt himſelf. They were infallibly ſecured from errors, in delivering the principles of chriſtianity, and to this end had the ſpirit of truth promiſed to them, who ſhould guide them into all truth. Hence there was an exact harmony among them in all their doctrines: theſe twelve ſtars all ſhone with the ſame light, conveyed to them by the ſun of righteouſneſs. They had been eye-witneſſes of all the material paſſages of our Saviour's life, and reported nothing but what they had ſeen with their own eyes, and of the truth whereof they were as competent judges as the moſt antient philoſopher in the world: they were miraculouſly enabled to ſpeak the languages of the ſeveral nations to whom they were to preach, and were endowed with the power of working miracles, ſuch as healing diſeaſes, caſting out devils, foretelling things to come, and raiſing the dead, in confirmation of the doctrine they taught; gifts which were unneceſſary, and therefore ceaſed in future ages of the church, when chriſtianity came to be eſtabliſhed by the civil power.

Apostle, was an appellation given the ordinary travelling miniſters of the church.

Apostle, was alſo a title given to thoſe ſent by the churches to carry their alms to the poor of other churches. This uſage they borrowed from the ſynagogues, who called thoſe, whom they ſent on this meſſage, by the ſame name.

Apostle, in the Greek liturgy, is particularly uſed for a book containing the epiſtles of St. Paul, printed in the order wherein they are to be read in churches, through the courſe of the year.

Apostle, is alſo uſed, among the Jews, for a kind of officer, anciently ſent into the ſeveral parts and provinces in their juriſdiction, by way of viſitor, or commiſſary; to ſee that the laws were duly obſerved, and to receive the monies collected for the reparation of the temple, and the tribute payable to the Romans.

Theſe Apoſtles were a degree below the officers of the ſynagogue called patriarchs, and received their commiſſions from them.

APOSTO'LIC, or apostolical, ſomething that relates to the apoſtles, or deſcends from them. Thus we ſay, the apoſtolical age, apoſtolical doctrine, apoſtolical character, conſtitutions, traditions, &c. The Romaniſts calls their church the catholic and Apoſtolic church; and thus appropriated a title to Rome, which anciently was held in common with it by ſeveral other churches.

Apoſtolic, in the primitive church, was an appellation given to all ſuch churches as were founded by the apoſtles; and even to the biſhops of thoſe churches, as being the reputed ſucceſſors of the apoſtle. Theſe were confined to four, viz. Rome, Alexandria, Antioch, and Jeruſalem.

In after-times, other churches aſſumed the ſame quality, on account, principally, of the conformity of their doctrine with that of the churches which were apoſtolical by foundation, and becauſe all biſhops held themſelves ſucceſſors of the apoſtles, or acted in their dioceſes with the authority of apoſtles.

The firſt time the term apoſtolical is attributed to biſhops, as ſuch, is in a letter of Clovis to the council of Orleans, held in 511; though that king does not here expreſsly denominate them apoſtolical, but (apoſtolica ſede digniſſimi) highly worthy of the Apoſtolic ſee. In 581 Guntram calls the biſhops met at the council of Manſon apoſtolical pontiffs, apoſtolici pontifices.

In progreſs of time, the biſhop of Rome growing in power above the reſt; and the three patriarchates of Alexandria, Antioch, and Jeruſalem falling into the hands of the Saracens, the title apoſtolical became reſtrained to the Pope, and his church alone. Though ſome of the Popes, as St. Gregory the great, not contented to hold the title by this tenure, began, at length, to inſiſt, that it belonged to them by another and peculiar right, as being the ſucceſſors of St. Peter.

APO'THECARY (*Dict.*)— This is a very genteel buſineſs, and has been in great vogue of late years, there being, as has been computed, upwards of 1000 in and about London. There are, in this profeſſion, various degrees, as to employ and extent.

Some do little elſe but make up medicines, according to the preſcription of the diſpenſatory (compiled by the order of the college of phyſicians, for their direction) and thoſe of particular phyſicians, beſides viſiting their patients.

Others not only prepare almoſt all kinds of medicines, as well galenical as chemical, but likewiſe deal in drugs; with all which they ſupply their brethren in trade, and ſo become a ſort of wholeſale dealers, as well as Apothecaries.

Others, again, practiſe ſurgery, manmidwifery, and, many times, even officiate as phyſicians, eſpecially in the country, and often become men of very large practice, and eminent in their way. There is another branch, alſo, many of them fall into, which is that of curing lunatics, &c.

A youth intended for this profeſſion ſhould be a pretty good ſcholar, and have a tolerable knowledge in the Latin tongue at leaſt, that he may be the better able, in due time, to read ſome of the beſt authors who have wrote upon the ſubjects of botany, pharmacy, anatomy, and medicine; though it muſt be owned there are, at preſent, almoſt innumerable helps in our mother-tongue.

In London, they are one of the city companies, and were firſt incorporated with the grocers in the year 1606, in the reign of king James I, but not alone till 1617.

They have a hall, where there are two fine elaboratories, out of which all the ſurgeons cheſts are ſupplied with medicines for the uſe of the Britiſh navy.

In the year 1712, the 10th of queen Anne, an act paſſed for reviving and continuing ſeveral acts therein mentioned, one whereof was for exempting the Apothecaries from ſerving the offices of conſtables and ſcavengers, and other pariſh and ward-offices, and from ſerving upon juries: which act was made perpetual in the 9th year of king George the Firſt.

The Apothecaries in England are obliged to make up their medicines according to the formula's preſcribed in the diſpenſatory of the college of phyſicians, and are under an obligation to have the medicines there enumerated always ready in their ſhops; and their ſhops are liable to be viſited by the cenſors of the college, who have it in their power to deſtroy ſuch medicines as they judge not to be good.

The Apothecaries of Paris make but one corporation with the merchants-grocers, which is the ſecond of the ſix corporations of merchants.

By a regulation of the 15th of October, 1631, all the Apothecaries of Paris are prohibited to give any medicine to patients, unleſs by the order, and with the advice of a regular-bred phyſician, or of a perſon approved by the faculty; nor are they to make up any preſcription, given, or drawn up, by any perſon ſtiling himſelf an empiric phyſician, or operator.

Among the good regulations made in Denmark, that which the Apothecaries are obliged to obſerve, is reckoned one of the beſt: for no perſon can have leave to follow that profeſſion, unleſs he be approved of by the college of phyſicians, and confirmed by the king himſelf. There are but two Apothecaries allowed for the city of Copenhagen, and but one in every other conſiderable town. The magiſtrates, attended by the doctors of phyſic, viſit their ſhops and drugs twice or thrice a year, and thoſe drugs that are either ſtale or bad are ſeized, and publickly thrown upon a dung-hill without the city; and this is a ſtain upon the character of ſuch Apothecary, that is ſcarce ever wiped off. The price of all drugs is fixed, ſo that one may, without fear of being impoſed upon, ſend even a child for any drug to an Apothecary's ſhop, where nothing is ſold but what is good, and at a reaſonable price. All drugs are ſold for ready money, and yet the Apothecaries are obliged to regiſter in a book what they ſell, to whom, and by what phyſician's preſcription. So that there ſeldom happens any accident by poiſon, either accidentally, or with deſign: and, if any ſuch thing happens, it is eaſily found out, and quickly puniſhed. Preſent ſtate of Denmark (in French) by Des Roche, 1730, tom. 9. p. 431.

APOTHEO'SIS (*Dict.*)— It was one of the doctrines of Pythagoras, which he had borrowed from the Chaldees, that virtuous perſons, after their death, were raiſed into the order of the gods.

And hence the ancients deified all the inventors of things uſeful to mankind, and who had done any important ſervice to the common-wealth.— Tiberius propoſed to the Roman ſenate the Apotheoſis of Jeſus Chriſt, as is related by Euſebius, Tertullian, and St. Chryſoſtom. Juvenal, rallying the frequent Apotheoſes, introduces poor Atlas, complaining that he was ready to ſink under the prodigious burden of ſo many new gods as were almoſt every day added to the heavens.

Seneca ridicules the Apotheoſis of Claudius with admirable humour.— Herodian, lib. 4, in ſpeaking of the Apotheoſis of Severus, gives us a very curious deſcription of the ceremonies uſed in the Apotheoſis of the Roman emperors.— After the body of the deceaſed emperor, ſays he, had been burnt with the uſual ſolemnities, they placed an image of wax, perfectly like him, but of a ſickly aſpect, on a large bed of ivory, covered with cloth of gold, in the veſtibule of the palace. The greateſt part of the day, the ſenate ſat ranged on the left ſide of the bed, dreſſed in robes of mourning; the ladies of the firſt rank ſitting on the right ſide, in plain and white robes, without any ornaments.— This laſted for ſeven days ſucceſſively, during which, the phyſicians came from time to time to viſit the ſick, always making their report that he grew worſe; till at length they publiſhed it, that he was dead.

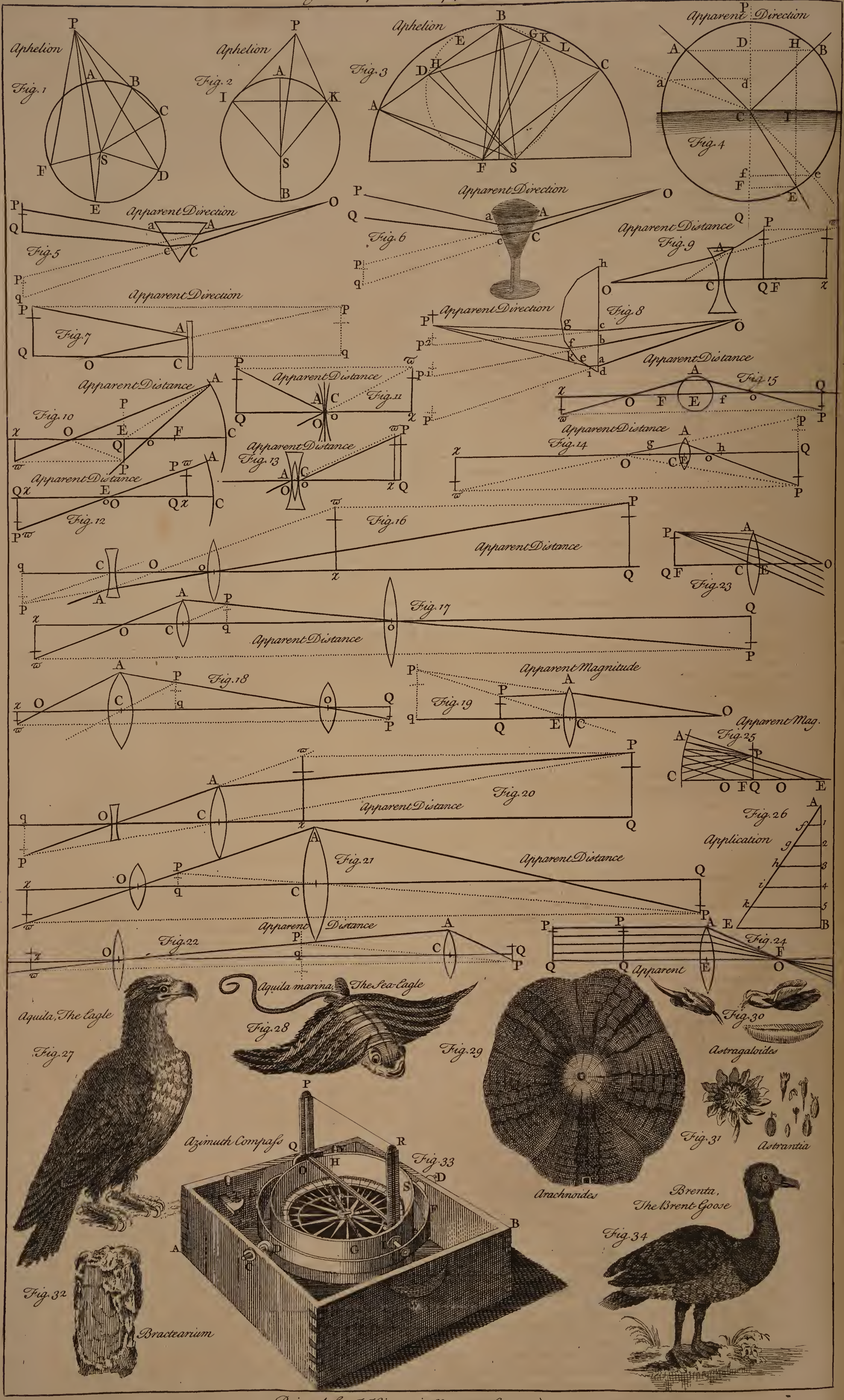
This done, the young ſenators and Roman knights took the bed of ſtate upon their ſhoulders, carrying it through the via ſacra, to the old forum, where the magiſtrates were uſed to diveſt themſelves of their offices. There they ſet it down between two kind of amphitheatres, in the one whereof were the youth, and in the other the maidens of the firſt families in Rome, ſinging hymns ſet to ſolemn airs, in praiſe of the deceaſed. Theſe hymns ended, the bed was carried out of the city into the Campus Martius, in the middle of which place, was erected a kind of ſquare pavilion, the inſide whereof was full of combuſtible matters, and the outſide hung with cloth of gold, and adorned with figures of ivory, and various paintings.

Over this edifice were ſeveral others, like the firſt in form and decoration, but leſs; always diminiſhing and growing ſlenderer towards the top.— On the ſecond of theſe was placed the bed of ſtate, and a great quantity of aromatic perfumes; and odoriferous fruits and herbs were thrown all around: after which, the knights made a proceſſion or cavalcade in ſolemn meaſures around the pile; ſeveral chariots alſo run round it, thoſe who conducted them being clad in purple robes, and bearing the images of the greateſt Roman emperors and generals.

This ceremony ended, the new emperor came to the catafalco or pile, with a torch in his hand; and at the ſame time fire was ſet to it, on all ſides; the ſpices and other combuſtibles kindling all at once.

While this was doing, they let fly, from the top of the building, an eagle, which, mounting into the air with a fire-brand, carried

PLATE IV. *Engraved for the Supplement.* *Facing* Apparent.



Printed for J. Hinton in Newgate Street.

carried the ſoul of the dead emperor along with it into heaven, as the Romans believed; and thenceforward he was ranked among the gods.— It is for this reaſon, that the medals, wherein Apotheoſes are repreſented, have uſually an altar with fire upon it; or, however, an eagle taking its flight into the air, and ſometimes two eagles.

A'PPANAGE. See the article APANAGE.

APPA'RENT *Directions of viſible Points*, in optics. — Any ſmall object or point of an object, ſeen by refracted or reflected rays, appears ſomewhere in the direction of that line, which the viſual ray deſcribes after its laſt refraction or reflection in falling upon the eye.

By experiments made to prove the laws of reflection and refraction, the pin at B (*plate* IV. *fig.* 4.) ſeen by a ray reflected from the water, appears ſomewhere in the line A C produced, which the viſual ray B C A deſcribes after reflection at C, when it advances to the eye. And as the whole line C E appears lifted up by the refraction at the water, as if it had been a continuation of the line A C ſtraight on; ſo, if a ſtraight oar be in part immerſed obliquely in the water, it appears crooked, as if the part immerſed was broken at the ſurface, and lifted higher. For this part of the oar is ſeen in the direction of rays which are bent downwards by refraction, at their emergence from the water, and, conſequently, advance to the eye, as if they came from a place in the water which is higher than the real place of the oar. In like manner any point P (*fig.* 5, 6, 7.) of an object ſeen by the ray P A O twice refracted, either by paſſing through the edge of a priſm, or of a concave or convex lens, or through the ſides of a globe or decanter, or of a drinking-glaſs filled with any tranſparent liquor; or ſeen by a ray P A O reflected from a plane or ſpherical looking-glaſs; appears to the eye at O, ſomewhere in the direction of the laſt refracted or reflected ray A O. Laſtly, an object P (*fig.* 8.) viewed by the eye at O, through a multiplying-glaſs, appears at one view in as many different places, *p*, *p* 1, *p* 2, ſituated in as many different directions O A, O B, O C of the laſt refracted rays produced, as the glaſs has different ſurfaces, D E, E F, F G, differently inclined to the oppoſite ſurface D H. For theſe ſurfaces, like ſo many different priſms, give the viſual rays P I A O, P K B O, P G C O, ſo many different bendings at I and A, K and B, G and C, and make them fall upon the eye at O, in as many different directions A O, B O, C O. And in all theſe inſtances when the refracting or reflecting ſurfaces of the water or glaſſes are ſhaken by the wind, or otherwiſe, the objects ſeen by reflection or refraction appear to ſhake and tremble; becauſe the laſt directions of the viſual rays are ſhaken and varied by thoſe motions.

Now, the reaſon why an object or point of an object appears always in the direction of the laſt refracted or reflected ray, is, becauſe the place of its picture upon the retina is the ſame as it would be if the object was really removed from its proper place into the direction of that ray, and was ſeen by direct rays. And having no ſenſation of the previous reflections or refractions of the rays at the glaſſes, but only of their action upon a certain place of the retina, we form the ſame judgment of the place of the object as we uſed to do in the more common caſes of direct viſion. How we know and judge of the place and poſition of an object by the place and inverted poſition of its picture upon the retina, will be ſhewn under the article EYE; whence it will appear to be entirely the effect of experience.

It is manifeſt from what has been ſaid, that any point P of an object P Q, ſeen by refractions or reflections, appears ſomewhere in the line *p* O, drawn from the correſponding point *p* of its laſt image to the eye at any place O; becauſe all the rays which flowed from P, do after the laſt refraction or reflection flow from or towards the correſponding point *p* of the laſt image. The reaſon why I ſay the laſt image will be mentioned under APPARENT *Magnitude*.

It is alſo manifeſted why an object ſeen by refracted or reflected rays appears ſometimes upright and ſometimes inverted. For when the refracted or reflected rays A O, C O, have the ſame ſituation with reſpect to each other, as two rays that come directly from the ſame points of the object to the eye, theſe points will appear in the ſame ſituation with reſpect to each other in both caſes. But, if the rays that come from theſe points ſhall have croſſed each other before they arrive at the eye, they will then have a contrary ſituation to that of two rays coming directly from the ſame points to the eye; and, conſequently, theſe two points will appear in the glaſs in a contrary ſituation. And one may add that, in the former caſe, the picture upon the retina of the eye will have the ſame poſition, though not the ſame magnitude, as if the glaſs was removed, and will have a contrary poſition in the latter caſe. *Smith's Optics.*

APPARENT *Diſtance* (*Dict.*)— The Apparent diſtance of an object, perceived by ſight, is an idea of a real diſtance uſually meaſured by feeling, as by the motion of the body in walking, or otherwiſe; and is ſuggeſted to the mind by the Apparent magnitude of the object in view, if ſeen alone (as a bird in the air, or as an object in a teleſcope or microſcope;) but if it be ſeen with other objects, as it uſually happens, its diſtance is ſuggeſted both by its own apparent magnitude, and by the apparent magnitudes of other adjoining objects obliquely extended between the eye and the object in view; as the ſurface of the ground, rivers, walks, high-ways, hedges and ditches, or the houſes in a ſtreet, or the walls and ceiling of a room, or the ſky over head. For what is the Apparent magnitude or Apparent extenſion of an object, but the Apparent diſtance of its extremities from one another? And what is the Apparent diſtance between two objects in any ſituation, or between one object and the ſpectator himſelf, but the Apparent extenſion of intermediate objects? And ſince they are ſeldom ſeen alone, excepting through glaſſes, it cannot be doubted, but we eſtimate their diſtances from one another, and from ourſelves, by our ideas of the magnitudes of thoſe intermediate objects: and every one knows that ſurveyors, gunners, travellers, and all ſorts of artificers, who are converſant in meaſuring diſtances, are able to make a truer eſtimate of diſtance by the eye, than others that have not had ſo much experience. Sometimes, indeed, without attending to thoſe oblique ſurfaces, we are ſenſible of the approach of a body by the increaſe of its own Apparent magnitude, and on the contrary; and, ſometimes, we are alſo ſenſible of it when the body is at reſt, provided it be known and familiar to us. For bodies are diſtinguiſhed into ſorts chiefly by their ſhapes and colours, and we reckon them ſmall or great, not with compariſon with bodies of another ſort, but with one another; and having found by experience, that certain quantities of Apparent magnitudes of a known body are conſtantly attended by certain quantities of diſtance, the ſenſation of the magnitude of the body immediately excites the uſual idea of its diſtance: which is alſo evident in oblique ſurfaces, as well as thoſe that are perpendicular to the eye: for the ideas of variable diſtances muſt either mediately or immediately be excited in the mind by variable ſenſations, cauſed by ſome certain variations in the pictures upon the retina. But, while the diſtance of the object varies, nothing is varied in its picture, excepting its magnitude; its figure, colour, brightneſs, and diſtinctneſs, receive no ſenſible variation in moſt caſes: and, for one idea to excite another, every one knows it is ſufficient that they have been conſtantly obſerved to go together; as in languages, and a thouſand things beſides. Laſtly, I have found by abundance of experiments made with glaſſes of all ſorts, that, while the Apparent magnitude of an object increaſes by moving the glaſs, eye, or object, it always appears to approach and to recede, while its Apparent magnitude decreaſes, excepting a particular caſe or two to be mentioned hereafter. And theſe experiments ſeem to me to put the queſtion beyond diſpute. For in looking through a glaſs with one eye only, and on a ſingle object, when nothing is perceived in the ſpace interpoſed, how it is poſſible for different Apparent magnitudes of the object to ſuggeſt the ideas of different quantities of that inviſible ſpace, according to a certain rule to be mentioned hereafter, if thoſe ideas had not uſually gone together, before we looked into the glaſſes? I find, alſo, that by altering the degrees of Apparent brightneſs and diſtinctneſs of an object, either by looking through little holes made with a pin, or through lenſes of different figures put cloſe to my eye, or through both at once put cloſe together and to my eye, that neither the Apparent magnitude, nor Apparent diſtance, is ſenſibly altered thereby. The reaſon is, we have had no experience in ſuch confuſed viſion with the naked eye, and, therefore, though different degrees of confuſion and diſtinctneſs in glaſſes are plainly perceived, yet, like the words of an unknown language, their ſignification of diſtance, or of any thing elſe, is entirely unknown. The ſame may be ſaid of the degrees of brightneſs and obſcurity. By day-light objects appear equally bright at all moderate diſtances from the eye, and we retain much the ſame ideas of their diſtances in the night, when we ſee them more obſcurely. The permanent colours, and ſhades of bodies, ſerve chiefly to diſtinguiſh their Apparent ſhapes; and their colours and ſhapes are manifeſt diſtinctions of their various ſorts, but, being permanent, they are no diſtinctions of their Apparent diſtances from the eye. When the eye is fixed, and a fixed line is extended from it, the divergency of rays, from different points of that line, is neither diſtinguiſhed, nor ſo much as perceived by ſenſe, by perſons that ſee diſtinctly. It is a rational deduction from ſenſe, which informs us that rays diverge from the points of an object; which the majority of mankind are entirely ignorant of: and the ancient philoſophers, who thought that ſomething like rays proceeded from the eye to the object, could diſtinguiſh diſtances as well as we. Therefore, the divergency of rays from points at different diſtances is not the medium which introduces the ideas of diſtances into the mind. Sometimes, indeed, there are degrees of its diſtinctneſs and confuſion conſequent upon it, but their relation to diſtance, as I ſaid before, is not perceived. Beſides this, in viſion with glaſſes, we have ideas of as many different degrees of diſtance conveyed to us, as well when the rays come converging towards points behind the eye, as when they diverge from points before it, as will be ſhewn hereafter. The divergency of rays from the place of an object is, therefore, no cauſe of its appearing in that place. It is alſo matter of fact, in painting and perſpective, that our ſenſible ideas of the places of the objects in the picture are quite different from our rational ideas of the places from whence the rays diverge: and the difference in theſe ideas is cauſed by the different Apparent magnitudes of the known objects repreſented in the picture. It is alſo evident, that our ſenſible ideas of the places of the remote parts of a long walk or gallery, and of the clouds over head, and of all celeſtial bodies, are quite different from the rational ideas of the places from whence the rays diverge, as will appear more fully hereafter. Neither is diſtance ſuggeſted to the mind by the magnitudes of the angles in a triangle made by the optic axes, and the interval between the eyes. For theſe angles are all varied by turning the head ſideways while we look at the object, till at laſt we ſee it at the ſame diſtance with one eye as with both: which ſhews, alſo, that the faint and confuſed appearance of collateral objects does not alter our ideas of their diſtances. Nor is diſtance ſuggeſted by feeling the turn of the eyes in widening or contracting the interval between pupils, when we direct them to different places. For the place of the object is generally perceived by a ſide-view, before we direct our eyes to view it more diſtinctly. From what has been ſaid, it appears to me, that the ideas of diſtance are ſuggeſted to the mind by the ideas of the magnitudes of objects.

Hence it follows, that an object, ſeen by refraction or reflection, appears at the ſame diſtance from the eye, as it uſually does from the naked eye, when it appears of the ſame magnitude as in the glaſſes. To determine this diſtance in all caſes, I conceive a ray A O (*plate* IV. *fig*. 9, 10.) to go from the eye at O, and after its laſt reflection or refraction to belong to the focus o, in the common axis O C Q of all the ſurfaces, and to meet an object P Q in P, placed perpendicular to O Q; and that a line P ϖ is drawn parallel to the axis O Q till it meets the ray O A, produced, in ϖ. Then, ſuppoſing the object P Q to be removed to the place $\varpi\varkappa$, and there to be viewed by the naked eye; ſince it appears under the ſame angle ϖ O $\varkappa$ or A O C as it appeared under in the glaſſes, when it was at P Q, it will alſo appear of the ſame magnitude, and, conſequently, at the ſame diſtance from the eye in both caſes. Therefore, if, when the object is placed at $\varpi\varkappa$, its Apparent diſtance from the naked eye be repreſented by its real diſtance O $\varkappa$, the ſame O $\varkappa$ will alſo repreſent its Apparent diſtance in the glaſſes when it was at P Q. I ſhall, therefore, call O $\varkappa$ the Apparent diſtance of the object P Q, and $\varpi\varkappa$ the Apparent object.

When the point P and the ray O A, by which it is ſeen, are on contrary ſides of the axis O Q, the point ϖ and the line $\varpi\varkappa$ will be behind the eye, and, therefore, muſt be viewed by the naked eye inverted and turned about. But, if you had rather $\varpi\varkappa$ ſhould always be before the eye, in this caſe invert the object P Q, and then ſlide it along the axis; and its extremity P will touch the viſual ray O A, produced, at the ſame diſtance from the eye as before; becauſe the oppoſite angles A O C, ϖ O $\varkappa$, are equal.

Hence, while the eye, object, or glaſſes are in motion, the Apparent diſtance of the object will be increaſed in the ſame proportion as its Apparent magnitude decreaſes; and, on the contrary. For the ſame Apparent diſtance of the ſame object, ſeen at $\varpi\varkappa$ by the naked eye, varies in the proportion of the ſame Apparent magnitude.

Hence, alſo, the Apparent diſtance, O $\varkappa$, of an object, P Q, ſeen in glaſſes, is to its Apparent diſtance, O Q, ſeen by the naked eye, as its Apparent magnitude to the naked eye to its Apparent magnitude in the glaſſes. For conceiving a line O P, which is omitted in the figures for the ſake of ſimplicity; ſince P Q and $\varpi\varkappa$ are equal, the former diſtance, O $\varkappa$, is to the latter O Q, as the latter angle P O Q to the former ϖ O $\varkappa$. The ratio of the Apparent and true magnitudes being determined in moſt caſes in the next article, their Apparent diſtances are alſo determined by this rule. But, becauſe this ſubject of Apparent diſtance has hitherto been handled but very imperfectly by all optic writers, it may not be unacceptable to ſome readers to ſee it purſued a little farther. I will, therefore, deduce all the caſes of Apparent diſtance immediately from the definition of it, without the help of thoſe former demonſtrations.

The Apparent and true diſtances (*fig*. 11, 12, 13.) O $\varkappa$ and O Q will be equal, firſt, when the object touches any thin lens or any ſingle ſurface; for then the points P, A, ϖ, will coincide. Secondly, when the eye touches any thin lens or reflecting ſurface. For, when the points O, A, C, coincide at a lens, the viſual ray will paſs through the middle of it very nearly; and, conſequently, its incident and emergent parts produced will be nearly parallel and coincident, and ſo the points P, ϖ, will nearly coincide; and when the points O, A, C, coincide at a reflecting ſurface, the incident and reflected rays produced will make equal angles with the perpendicular Q C $\varkappa$, and ſo the triangles P C Q, ϖ C $\varkappa$, will be equal. Thirdly, when the eye is at the center of a reflecting concave; then the incident and reflected rays, and, conſequently, $\varpi\varkappa$ and P Q will coincide. Fourthly, when a ray (*fig*. 10, 14, 15.) P O, coming directly to the eye, makes an angle P O Q equal to A O C or ϖ O $\varkappa$; for then the triangles P O Q, ϖ O $\varkappa$, are equal. This happens in a reflecting concave, when the object is very near its center; for producing the object P Q till it cuts the reflected ray in p, ſince the angles P O Q, ϖ O $\varkappa$, or p O Q, are ſuppoſed to be equal, the lines P Q, p Q, will alſo be equal, and, conſequently, a line Q A will nearly biſect the angle P A p, when A is very near to C, as a line drawn from the center E will do, and ſo the points Q, E, are almoſt coincident.

The Apparent diſtance of an object ſeen in a teleſcope, or a microſcope, is to its Apparent diſtance perceived by the naked eye, as its Apparent magnitude to the naked eye to its Apparent magnitude in the teleſcope or microſcope; for conceiving (*fig*. 20, 21, 22.) A C to be the object-glaſs, and the eye to be cloſe to the eye-glaſs at O, the viſual ray A O will go in a manner ſtraight through it; and ſo the Apparent magnitude, and Apparent diſtance of the object, will continue the ſame as when there was no eye-glaſs: and ſince, when the viſion is diſtinct, the rays in every pencil come parallel through the eye-glaſs, the Apparent magnitude, and, conſequently, the Apparent diſtance, will ſtill continue the ſame as before, while the eye is drawn back.

Conſequently, the Apparent diſtance in a teleſcope is to the Apparent diſtance perceived by the naked eye, as the focal diſtance of the eye-glaſs to the focal diſtance of the object-glaſs, by the 120th and 141ſt articles; which may thus be demonſtrated, independently of the 120th article: let $p\,q$ be the image of a remote object terminated by the line P C p, ſo that q C and q O may be the focal diſtances of the object-glaſs and eye-glaſs; then ſuppoſing the object viewed by the naked eye at C, ſince the angles ϖ O $\varkappa$, P C Q, have equal ſubtenſes $\varpi\varkappa$ and P Q, the Apparent diſtance, O $\varkappa$, in the teleſcope, is to the Apparent diſtance, C Q, to the naked eye at C, as the latter angle P C Q to the former ϖ O $\varkappa$, or as the oppoſite angle p O q, or, ſince $p\,q$ ſubtends them both, as the latter focal diſtance q O to the former q C.

The ſame proportion may be proved when (*fig*. 16, 17, 18.) A C repreſents the eye-glaſs of a teleſcope or microſcope, and the object-glaſs is placed at o, the conjugate focus to O. For let $p\,q$ be the image of the remote object P Q terminated by the line P o A, and when $q\,o$ and q C are the focal diſtances of the glaſſes at o and C, the ray A O will be parallel to p C. Now the Apparent diſtance O $\varkappa$ is to the Apparent diſtance o Q, perceived by the naked eye at o, as the latter angle P o Q to the former ϖ O $\varkappa$, or as the oppoſite angle $p\,o\,q$ to the oppoſite angle A O C, or its equal p C q, or as the latter diſtance q C to the former $q\,o$.

An object ſeen in any glaſs will appear behind it, or at it, or before it, according as (*fig*. 9, 10.) $\varpi\varkappa$ or P Q, the real magnitude of the object, is bigger, equal, or leſs, than A C, the part of the glaſs in which it appears. For ſince $\varpi\varkappa$ and A C do both ſubtend the ſame, or equal angles, at the eye, O ϖ will be bigger, equal, or leſs, than O C, according as $\varpi\varkappa$ or P Q is bigger, equal, or leſs, than A C.

Hence it follows, that an object always appears behind any ſurface or glaſs which cannot make rays go parallel that diverged from the eye; for then P Q or $\varpi\varkappa$ will always be greater than A C.

The rule is true in a globe, or in any number of ſurfaces, taking A for the concourſe of the incident and emergent parts of the viſual ray produced, and a perpendicular A C upon the axis, inſtead of the aperture of a ſingle glaſs. *Smith's Optics*.

APPARENT *Magnitude* (*Dict.*) — The Apparent magnitude of an object P Q (*plate* IV. *fig*. 8.) ſeen by refracted or reflected rays, either upright or inverted, is a quantity of viſible extenſion, meaſured by the angle A O C, which the two rays, A O, C O, that came from its extremities, P, Q, do make, after their laſt refraction or reflection, in falling on the eye. Or, in other words, the object appears greater or ſmaller, in proportion as that angle A O C is greater or ſmaller; becauſe its extremities appear in the directions of the laſt refracted or reflected rays O A, O C; and, alſo, becauſe its picture upon the retina is greater or ſmaller, in proportion as theſe rays conſtitute a greater or ſmaller angle at the eye.

Therefore, the Apparent magnitude of an object P Q (*fig*. 19.) is alſo meaſured by the angle p O q, which its laſt image $p\,q$ ſubtends at the eye. For the lines A O, pO, are but one line continued, and ſo are C O, q O; and, therefore, the angles A O C, p O q, are the ſame when the image lies before the eye, and are equal when it lies behind it.

Hence, the Apparent magnitude of an object increaſes and decreaſes, in proportion as the eye approaches to, or recedes from, its laſt image (juſt as if it was a real object) placed either before or behind the eye; for, when the image is fixed, the angle p O q, when ſmall, increaſes in the ſame proportion as O q decreaſes, and on the contrary.

Hence, if the laſt image be removed to an infinite diſtance, that is, if the object be placed in the principal focus of a lens, ſphere, or concave looking-glaſs, its Apparent magnitude to the eye, at any place whatever, will be invariably the ſame;

and equal to its Apparent magnitude ſeen by the naked eye, ſuppoſing it put into the place of the center of the ſphere, lens, or reflecting concave. For ſince all the rays of any one pencil are parallel to its axis P E (*fig.* 23.) the angle C O A, which meaſures the Apparent magnitude at any point O, is every where equal to the angle Q E P at the center E.

The Apparent magnitude of the object will alſo be invariable wherever it be placed (*fig.* 24.) when the eye is fixed at the principal focus of any glaſs which makes parallel rays converge to the eye. For, conceiving them to flow back again from the eye to the object, they will fall upon the ſame points of the object from whence they came, while it is moved in any place along the axis of the glaſs: and no other rays but theſe can return from the ſame points of the object to the eye, in that place: therefore, the ſeveral parts of the object will always be ſeen under the ſame angles, and, conſequently, will appear of the ſame magnitudes.

The Apparent magnitude of an object ſeen by reflected or refracted rays being meaſured by the angle which its laſt image ſubtends at the eye, and its Apparent magnitude to the naked eye in any place being meaſured by the angle which the object itſelf ſubtends at the eye in that place, it follows that the former Apparent magnitude is to the latter, as the former angle to the latter angle. For the meaſures of things and the things meaſured by them are proportionable.

Conſequently, the Apparent magnitude of an object, ſeen in a glaſs, will be equal to its Apparent magnitude to the naked eye in the ſame place, if the glaſs was removed. Firſt, when the object touches any thin lens or any ſingle ſurface. For the image is then equal to the object, and coincides with it. Secondly, when the eye touches any thin lens or any reflecting ſurface. For then the ray P A O will paſs from the object to the eye, through the middle of the lens very nearly, and, therefore, being almoſt ſtraight, will make nearly the ſame angle with the axis as an unrefracted ray would do: and, when the point of incidence, A (*fig.* 25.) coincides with C at any reflecting ſurface, the incident and reflected rays P A, A O, produced, will alſo make equal angles with the axis or perpendicular Q C; and ſo the object will appear under the ſame angle as it would do to the naked eye turned about. Thirdly, when the eye is at the center of a reflecting concave, for then the incident and reflected rays, P A, A O, will coincide with the direct ray P E, and, conſequently, will make the ſame angles with the axis. Fourthly, when the object is at the center of the reflecting concave; for then the reflected image is alſo at the center, and is equal to the object. Fifthly, when a ray, coming directly from P to O, would make an angle with the axis equal to the angle A O C, which the refracted or reflected ray P A O makes with it on the other ſide.

Theſe caſes being excepted, the Apparent magnitude of an object, ſeen through a concave lens, is always leſs than the true; and when it is ſeen uprightly through a convex lens, or a globe, it is greater than the true; for the ray P A O, coming from the extremity of the object to the eye, is bent by the concave lens from its axis, and therefore makes a leſs angle with it at the eye, than a ray coming directly from that extremity to the eye. But the ſame ray is bent by the convex lens towards its axis, and therefore makes a greater angle at the eye than the direct ray: and the Apparent magnitudes are meaſured by theſe angles.

What has hitherto been demonſtrated concerning the Apparent magnitude of an object P Q, will continue in force, if you ſuppoſe the object P Q to be an image formed by another glaſs, or other glaſſes; for the rays diverge from either of them in the ſame manner, and for this reaſon I have always called *p q* the laſt image of the object.

The place of the eye at O (*fig.* 19.) being given, to determine what part of an object is viſible in a given portion or aperture A C of any refracting or reflecting glaſs, draw A O to the edge of the aperture and produce it till it cuts the image in *p*, and through the center of the glaſs draw *p* E cutting the object in P; and P Q will be the part in view in the aperture A C. For the whole pencil of rays flowing from P will belong to *p* after refraction or reflexion, and, conſequently, ſome one of thoſe rays will advance to the eye in the line A O drawn through *p*. If the image be at an infinite diſtance, all the rays that belonged to *p* will be parallel to the axis of the pencil; therefore P Q is now determined by drawing E P parallel to O A. In a plane looking-glaſs, *p* P muſt be drawn from *p* parallel to *p* Q, or perpendicular to the glaſs, to cut off the part P Q viſible in the aperture A C. For this glaſs may be conſidered as having a center at an infinite diſtance from it.

Hence, if the glaſs and object be fixed, the part in view in a given aperture will decreaſe perpetually while the eye recedes from the glaſs, unleſs the image be behind the eye. For then it will decreaſe only till the eye arrives at the image, and, after the eye has paſſed by the image, it will increaſe perpetually. The reaſon is, becauſe the object and image, being fixed in their places, do both increaſe or both decreaſe together, being both terminated by two lines P *p*, Q *q*, that meet or croſs in E the center of the glaſs.

Therefore the part in view is greateſt when the eye is cloſe to the glaſs, and leaſt when cloſe to the image; and, in this latter caſe, it appears infinitely magnified. For, conceiving the diſtance O *q* infinitely diminiſhed, the parts *p q*, P Q, cut off by the lines A O *p*, *p* E P, will both be infinitely diminiſhed; but the magnitude of the angle at O, ſubtended by *p q* or by A C, continues finite, while the angle ſubtended by P Q at O is infinitely diminiſhed: and ſo the diſproportion between theſe angles, that is, between the Apparent and true magnitudes of the particle P Q, is infinitely great. It appears alſo infinitely confuſed, when the pupil is open, for the reaſon given under the article EYE.

APPARENT *Place* (*Dict.*)— Opticians are divided in their opinions with regard to the Apparent place of an object, ſeen by a mirrour, or through a glaſs. It was thought in general, till lately, that the object appeared in that point where the reflected or broken ray, paſſing through the center, met the perpendicular drawn from the object on the ſurface of the mirrour or glaſs. This principle father Taquet has applied, in his Catoptrics, to explain the phænomena of convex and concave mirrours; M. Mairan, in a memoir read before the Academy of Sciences at Paris, publiſhed in the year 1740, proceeded on the ſame principle to find the apparent curve of the bottom of a baſin full of water. But father Taquet himſelf acknowledges, at the end of his Catoptrics, that this principle is not univerſal, and is contradicted by experiments. With regard to M. Mairan, he rather lays it down as a principle of geometry than optics, and owns that Sir Iſaac Newton, Dr. Barrow, and other authors, of the firſt reputation, never entirely admitted it. They, to determine the Apparent place of the object, imagine firſt, that the object throws, on the ſurface of the glaſs or mirrour, two rays infinitely near each other, which, after ſuffering one or more refractions or reflexions, paſs to the eye. Theſe broken or reflected rays, being continued, meet in one point, and, conſequently, enter the eye as if they came from this point; from whence it follows, according to Newton and Barrow, that the Apparent place of the object is the point of concourſe of theſe reflected or broken rays, which paſſes on to the eye, and is eaſy to determine by the laws of geometry. Dr. Barrow produces an experiment which ſeems unanſwerable, by which he demonſtrates that a plumb line ſunk in water forms a curve; whence it follows that the Apparent place of an object, ſeen by refraction, is not in the point where the refracted ray cuts the perpendicular drawn from the object to the refracting ſurface. But we muſt own alſo, that Dr. Barrow, at the end of his Optical Lectures, mentions an experiment that ſeems to contradict the foregoing principle. He adds that this experiment contradicts Taquet's principle, as well as his own. He is however of opinion that a particular caſe which does not conform to this principle, ought to be looked upon only as a trifling exception againſt a general rule. With regard to Sir Iſaac Newton, though he follows the principle of Dr. Barrow about determining the Apparent place of the image, yet he looks on this problem as one of the greateſt difficulties in all optics; his words are theſe: Puncti illius accurata determinatio problema ſolutu difficillimum præbebit, niſi hypotheſi alicui ſaltem veriſimili, ſi non accurate veræ, nitatur aſſertio. *Opt. Schol. Prop.* VIII. *p.* 80.

APPA'RITORS.— Among the Romans, Apparitors were the ſame with ſerjeants or tip-ſtaffs among us; or rather Apparitor was a general term, and comprized under it all the miniſters and attendants of the judges and magiſtrates, appointed to receive and execute their orders. And hence, they ſay, the name was derived, viz. from apparere, to be preſent, or in waiting.

Under the general name of Apparitores the ancients comprehended the ſcribæ, accenſi, interpretes, præcones, viatores, lictores, ſtatores, and even carnifices or hangmen.

They were uſually choſen out of the freed-men of the magiſtrates; and their condition was held in ſuch contempt, that, as a mark of ignominy, the ſenate appointed a city that had revolted from them, to furniſh them with Apparitors.

There were alſo a kind of Apparitors of cohorts, called cohortales, or conditionales, as being attached to a cohort, and doomed to that condition. The Apparitors of the prætors, prætoriani, were thoſe who attended the prætors, or governors of provinces; and who, on their maſter's birth-day, were always changed and preferred to better poſts. Add, that the pontifices had alſo their Apparitors, as appears from an inſcription of an ancient marble in the Via Appia.

APPEA'L, of wrong impriſonment, is uſed by Bracton for an action of wrong or falſe impriſonment.

Appeal is more particularly uſed for a private accuſation of a murderer, by one who had intereſt in the murdered party; or of any felon by one of his accomplices in the fact.

If an appeal of murder or felony be uſed by any common perſon againſt a peer, he ſhall be tried by commoners, and not by his peers.

The perſon who brings an Appeal, is called the appellant; and the perſon appealed to, the appellee.

APPEA'RANCE, the exterior ſurface of a thing; or that which firſt ſtrikes the ſenſe, or the imagination.

The Academics maintain, that the ſenſible qualities of bodies are only appearances; and the like doctrine is held by ſome later philoſophers.

Appearance, in perſpective, is the repreſentation or projection of a figure, body, or the like object, upon the perſpective plane.

The Appearance of an objective right-line is always a right-line. The appearance of an opake body and a luminary given, we can find the Appearance of the ſhadow.

A'PPLE, denotes a well known fruit, of a roundiſh figure, of conſiderable uſe both as a food, a remedy, and likewiſe yielding cyder.

The Apple is compoſed of four diſtinct parts, viz. the peel, the parenchyma, the branchery, and the core.

The peel or ſkin is only a dilatation of the outermoſt ſkin or rind of the bark of the branch on which it grew.

The parenchyma or pulp, as tender and delicious as it is found, is only a dilatation, or, as Dr. Grew calls it, a ſwelth, or ſuperbience of the inner part of the bark of the branch.

This appears not only from the viſible continuation of the bark from the one through the pedicle or ſtalk to the other, but alſo from the ſtructure common to both, as being both compoſed of bladders; with this only difference, that whereas, in the bark, the veſiculæ are ſpherical, and very ſmall, ſcarce exceeding one ſixteenth part of an inch in diameter; in the pulp they are oblong, and very large, generally meaſuring one third of an inch in length. But all uniformly ſtretched out by the arching of the veſſels from the core towards the circumference of the Apple.

The branchery or veſſels are only ramifications of the woody part of the branch ſent throughout all the parts of the parenchyma, the greater branches being made to communicate with each other by inoſculations of the leſs. The main branches are uſually twenty; ten of them diſtributed through the parenchyma, moſt of which inarch themſelves towards the cork or ſtool of the flower; the other ten, running from the ſtalk in a directer line, at laſt meet the former at the cork, and are there inoſculated with them. To theſe branches the coats of the kernels are faſtened. Moſt of the branches were originally extended beyond the fruit, and inſerted into the flower for the due growth thereof; but when the fruit afterwards grew to a head, and thus intercepted the aliment before ſent to the flower, this latter being ſtarved and falling off, the ſervice of the ſaid branches became wholly appropriated to the fruit, fifteen to the pulp, and five to the ſeed. The Apple core is originally from the pith of the branch; the ſap of which, finding room enough in the parenchyma, through which to diffuſe itſelf, quits the pith, which by this means hardens into a core.

All the ſorts of Apples are propagated by grafting or budding, upon the ſtocks of the ſame kind; for they will not take upon any other ſort of fruit-tree. In the nurſeries there are three ſorts of ſtocks generally uſed, to graft Apples upon: the firſt are called free-ſtocks: theſe are raiſed from the kernels of all ſorts of Apples, indifferently; and theſe are alſo termed crab-ſtocks; for all thoſe trees which are produced from the ſeeds, before they are grafted, are termed crabs without any diſtinction: but, as I before obſerved, I ſhould always prefer ſuch ſtocks as are raiſed from the kernels of crabs where they are preſſed from verjuice: and I find ſeveral of the old writers on this ſubject of the ſame mind. Mr. Auſtin, who wrote an hundred years ago, ſays, the ſtock which he accounts beſt for Apple-grafts, is the crab; which is better than ſweeter Apple-trees to graft on, becauſe they are uſually free from canker, and will become very large trees; and, I conceive, will laſt longer than ſtocks of ſweeter Apples, and will make fruits more ſtrong and hardy to endure froſts: and it is very certain, that, by frequently grafting ſome ſorts of Apples upon free-ſtocks, the fruits have been rendered leſs firm and poignant, and of ſhorter duration.

The ſecond ſort of ſtock is the Dutch creeper: theſe are deſigned to ſtint the growth of the trees, and keep them within compaſs for dwarfs or eſpaliers.

The third ſort is the paradiſe-Apple, which is a very low ſhrub; ſo only proper for trees which are kept in pots, by way of curioſity; for theſe do not continue long.

Some perſons have made uſe of codlin-ſtocks for grafting of Apples, in order to ſtint their growth: but, as theſe are commonly propagated by ſuckers, I would by no means adviſe the uſe of them; nor would I chuſe to raiſe the codlin-trees from ſuckers, but rather graft them upon crab-ſtocks; which will cauſe the fruit to be finer, laſt longer, and have a ſharper flavour: and theſe trees will laſt much longer ſound, and never put out ſuckers, as the codlins always do; which, if not conſtantly taken off, will weaken the trees, and cauſe them to canker; and it is not only from the root, but from the knots of their ſtems, there are generally a great number of ſtrong ſhoots produced, which fill the trees with uſeleſs ſhoots, and render them unſightly, and the fruit ſmall and crumpled.

The method of raiſing ſtocks from the kernels of crabs or Apples is, to procure them where they are preſſed for verjuice or cyder; and, after they are cleared of the pulp, they may be ſown upon a bed of light earth, covering them over about half an inch thick with the ſame light earth: theſe may be ſown in November or December, where the ground is dry; but, in wet ground, it will be better to defer it till February: but then the ſeeds ſhould be preſerved in dry ſand, and kept out of the reach of vermin; for, if mice or rats can get to them, they will devour the ſeeds: there ſhould alſo be care taken of the ſeeds, when they are ſown, to protect them from theſe vermin, by ſetting of traps to take them, &c. In the ſpring, when the plants begin to appear, they muſt be carefully weeded; and, if the ſeaſon ſhould prove dry, it will be of great ſervice to water them two or three times a week; and, during the ſummer, they muſt be conſtantly kept clear from weeds; which, if ſuffered to grow, will ſoon over-top the plants, and ſpoil their growth: if theſe thrive well, they will be fit to tranſplant into the nurſery the October following; at which time the ground ſhould be carefully digged, and cleanſed from the roots of all bad weeds: then the ſtocks ſhould be planted in rows three feet aſunder, and the plants one foot diſtance in the rows, cloſing the earth pretty faſt to their roots: when the ſtocks are tranſplanted out of the ſeed-bed, the firſt autumn after ſowing, they need not be headed; but, where they are inclined to ſhoot downward, the tap-root muſt be ſhortened, in order to force out horizontal roots: if the ground is pretty good in which theſe ſtocks are planted, and the weeds conſtantly cleared away, the ſtocks will make great progreſs; ſo that thoſe which are intended for dwarfs, may be grafted the ſpring twelve-month after they are planted out of the ſeed-beds: but thoſe which are deſigned for ſtandards will require two years more growth, before they will be fit to graft; by which time they will be upwards of ſix feet high.

The other neceſſary work to be obſerved in the culture of theſe trees, while they remain in the nurſery, being exhibited under the article of NURSERY, I ſhall not repeat in this place.

I ſhall next treat of the manner of planting ſuch of theſe trees, as are deſigned for eſpaliers in the kitchen garden; where, if there is an extent of ground, it will be proper to plant, not only ſuch ſorts as are for the uſe of the table, but alſo a quantity of trees to ſupply the kitchen: but, where the kitchen garden is ſmall, the latter muſt be ſupplied from ſtandard-trees, either from the orchard, or wherever they are planted: but as many of theſe kitchen Apples are large, and hang late in the autumn upon the trees, they will be much more expoſed to the ſtrong winds, on ſtandard-trees, than on eſpaliers; whereby many of the fruit will be blown down before they are ripe, and others bruiſed, ſo as to prevent their keeping: therefore, where it can be done, I ſhould always prefer the planting them in eſpaliers.

The diſtance I ſhould chuſe to allow theſe trees, ſhould not be leſs than twenty-five feet, for ſuch ſorts as are of moderate growth (if upon crab or free-ſtocks) but the larger growing ſorts ſhould not be allowed leſs room than thirty or thirty-five feet, which will be found full near enough, if the ground is good, and the trees properly trained: for the branches of theſe trees ſhould not be ſhortened, but trained at their full length, ſo that in a few years they will be found to meet. Indeed, at the firſt planting, the diſtance will appear ſo great, to thoſe perſons who have not obſerved the vigorous growth of theſe trees, that they will ſuppoſe they never extend their branches ſo far, as to cover the eſpalier; but if theſe perſons will but obſerve the growth of ſtandard-trees of the ſame kinds, and ſee how wide their branches are extended on every ſide, they may be ſoon convinced, that, as theſe eſpalier-trees are allowed to ſpread but on two ſides, ſo they will of courſe make more progreſs, as the whole nouriſhment of the root will be employed in theſe ſide-branches, than where there is a greater number of branches on every ſide of the tree, which are to be ſupplied with the ſame nouriſhment.

The next thing to be obſerved, is the making choice of ſuch fruits as grow nearly alike, to plant in the ſame eſpalier. This is of great conſequence, becauſe of the diſtance which they are to be placed; otherwiſe thoſe ſorts which make the largeſt ſhoots, may be allowed leſs room to ſpread, than thoſe of the ſmaller growth: beſide, when all the trees in one eſpalier are nearly equal in growth, they will have a better appearance, than when ſome are tall, and others ſhort.

If theſe Apples are grafted upon crab-ſtocks, I would willingly place them at the following diſtance from each other; eſpecially where the ſoil is good; viz. the largeſt-growing trees at forty feet, the middle-growing at thirty feet, and the ſmall-growing at twenty feet; which, from conſtant experience, I find to be full near enough: for in many places, where I have planted theſe trees at twenty-four feet diſtance, the trees have ſhot ſo, as that in ſeven years their branches have met, and in ſome places, where every other tree have been taken up, the branches have almoſt joined in ſeven years after: therefore it will be much the better way to plant theſe trees at a proper diſtance at firſt; and between theſe to plant ſome dwarf cherries, currans, or other ſorts of fruit, to bear for a few years; which may be cut away when the apple-trees have extended their branches to them: for, when the apple-trees are planted nearer together, few perſons care to cut down the trees, when they are fruitful; ſo that they are obliged to uſe the knife, ſaw, and chiſſel, more than is proper for the future good of the trees; and many times, where perſons are inclinable to take away part of their trees, the diſtances will be often ſo irregular (where there was not this conſideration in planting) as to render the eſpalier unſightly.

When the trees are upon the Dutch dwarf-ſtock, the diſtance ſhould be for the larger growing-trees twenty feet, for thoſe of middle growth ſixteen, and the ſmaller twelve feet; which will be found full near, where the trees thrive well.

The next is the choice of the trees, which ſhould not be more than two years growth from the graft; but thoſe of one year ſhould be preferred: be careful that their ſtocks are young, ſound, and ſmooth, free from canker, and which have not been cut down in the nurſery: when they are taken up, all the ſmall fibres ſhould be intirely cut off from the roots, which, if left on, will turn mouldy and decay, and ſo will obſtruct the new fibres in their growth: the extreme parts of the roots muſt be ſhortened, and all bruiſed or broken roots cut off; and if there are any miſplaced roots, which croſs each other, they ſhould alſo be cut away. As to the pruning of the head of theſe trees, there need be nothing more done, than to cut off any branches which are ſo ſituated as that they cannot be trained to the line of the eſpalier: in the planting, there muſt be care taken not to place their roots too deep in the ground, eſpecially, if the ſoil is moiſt; but rather raiſe them on a little hill, which will be neceſſary to allow for the raiſing of the borders afterwards. The beſt ſeaſon for planting theſe trees (in all ſoils that are not very moiſt) is, from October, to the middle or latter end of November, according as the ſeaſon continues mild; but, as ſoon as the leaves fall, they may be removed with great ſafety. After the trees are planted, it will be proper to place down a ſtake to each tree, to which the branches ſhould be faſtened, to prevent the winds from ſhaking or looſening their roots, which will deſtroy the young fibres, for, when theſe trees are planted pretty early in the autumn, they will ſoon puſh out a great number of new fibres; which, being very tender, are ſoon broken; ſo the trees are greatly injured thereby. If the winter ſhould prove ſevere, it will be proper to lay ſome rotten dung, tanners-bark, or ſome ſort of mulch, about their roots, to prevent the froſt from penetrating the ground, which might damage theſe tender fibres: but I would not adviſe the laying this mulch before the froſt begins; for if it is laid over the roots, ſoon after the trees are planted (as is often practiſed) it will prevent the moiſture's entering the ground, and do much harm to the trees.

The following ſpring, before the trees begin to puſh, there ſhould be two or three ſhort ſtakes put down on each ſide of the tree, to which the branches ſhould be faſtened down as horizontally as poſſible, never cutting them down, as is by ſome practiſed; for there will be no danger of their putting out branches enough to furniſh the eſpalier, if the trees are once well eſtabliſhed in their new quarters.

In the pruning of theſe trees, the chief point is, never to ſhorten any of the branches, unleſs there is an abſolute want of ſhoots to fill the ſpaces of the eſpalier: for, where the knife is much uſed, it only multiplies uſeleſs ſhoots, and prevents their fruiting; ſo that the beſt method to manage theſe trees is, to go over them three or four times in the growing ſeaſon, and rub off all ſuch ſhoots as are irregularly produced; and train the others down to the ſtakes, in the poſition they are to remain: if this be carefully performed in ſummer, there will be little left to do in the winter; and by bending of their ſhoots from time to time, as they are produced, there will be no occaſion to uſe force, to bring them down, nor any danger of breaking their branches. The diſtance which theſe branches ſhould be trained from each other, for the largeſt ſorts ſhould be about ſeven inches, and for the ſmaller four or five. If theſe plain inſtructions are followed, it will ſave much unneceſſary labour of pruning; and the trees will, at all times, make an handſome appearance: whereas, when they are ſuffered to grow rude in ſummer, there will be much greater difficulty to bring down their ſhoots, eſpecially, if they are grown ſtubborn. All theſe ſorts of Apples produce their fruit upon curſons or ſpurs, ſo that theſe ſhould never be cut off; for they will continue fruitful a great number of years. *Miller's Gard. Dict.*

APPLICATION *of one ſcience to another*, is a term generally made uſe of to convey the idea of the uſe we make of applying the principles and truths which belong to one ſcience, to complete and advance another.

In general, it may be ſaid that there is no art or ſcience which has not ſome connection with another; many articles, in this work, furniſh matter enough to prove this.

APPLICATION *of algebra to geometry.*—Algebra being the calculation of magnitude, in general, and the analyſis the uſe of algebra to diſcover unknown quantities; it was natural, after having diſcovered algebra and the analyſis, to think of applying theſe two ſciences to geometry; becauſe the line, the ſurface, and the ſolid, objects of geometry, are commenſurable magnitudes, and, conſequently, bear a proportion to each other: however, till Deſcartes, nobody ever thought on it; though algebra had made a great progreſs, eſpecially under the hand of Vieta. It is in Deſcartes's geometry that we firſt find the Application of algebra to it, as well as ſome excellent methods to carry algebra itſelf to perfection. This great genius has, by theſe means, done immortal ſervice to the mathematics, and given a key to the moſt important diſcoveries we can ever hope to make in this ſcience.

He firſt taught us to expreſs the nature of curves by equations, to reſolve geometrical problems by theſe curves: in ſhort, often to demonſtrate theorems of geometry by the help of algebraical calculation, when it would be too laborious to demonſtrate them any other way; at leaſt by making uſe of the common methods. Under the articles CONSTRUCTION, EQUATION, and CURVE, *in the Dictionary, and Supplement*, may be ſeen in what this Application of algebra to geometry conſiſts. We know not whether the antients had any help like this in their ſtudies; if they had not, we cannot help wondering they continued ſo long in the dark. We have a treatiſe of Archimedes on ſpiral lines, and his own demonſtrations; but it is hard to know, whether theſe demonſtrations exactly ſhew the method by which he arrived at a diſcovery of the property of ſpiral lines; or, whether, after having made the diſcovery by ſome private method, which he kept to himſelf, had a mind to conceal it, by puzzling demonſtrations. But, if he, indeed, followed no other method than that contained in theſe demonſtrations, it is amazing he did not loſe himſelf, and it is impoſſible to give a greater proof of the depth and ſtrength of his genius. Bouillaud confeſſes he never underſtood the demonſtrations of Archimedes; and Vieta has unjuſtly charged them with abſurdity.

But, be this as it may, theſe ſame demonſtrations which gave Bouillaud and Vieta ſo much trouble, and, perhaps, coſt Archimedes as much, may, at preſent, be rendered extremely eaſy, by the Application of algebra to geometry. The ſame may be ſaid of all the geometrical works of the antients: for ſcarce any man can read and underſtand them eaſily, without knowing how to apply algebra to their demonſtrations.

Sir Iſaac Newton, however, who knew, better than any other man, all the advantages of analytical algebra in geometry, complains, in many places of his works, that reading the antient geometricians is ſhamefully neglected.

In ſhort, the method made uſe of by the antients who applied themſelves to geometry, is looked upon to be more difficult, than that of analytical algebra; and on this principally Sir Iſaac Newton's complaints are grounded; apprehending, by the too frequent uſe of algebra, geometry, which is ſo remarkably difficult in its demonſtrations, might be loſt, or leſs cultivated, ſomething ſo much more eaſy being ſubſtituted in its room. I apprehend, this great man recommends reading the antient geometricians, becauſe their demonſtrations exerciſe the mind ſo much more, accuſtom it to greater application, enlarge its views, and form it to a degree of patience and perſeverance, neceſſary for making new diſcoveries. But we muſt be careful not to run into the oppoſite extreme; for, by applying cloſe to the method of the antients, there is no likelihood, that even the fineſt genius will make ſo great diſcoveries in geometry, or, at leaſt, ſo many, as he might by the help of algebra. As to the ſuperiority given to demonſtrations after the manner of the antients, becauſe they are more difficult, I am in great doubt whether the plea be well founded. On opening Sir Iſaac Newton's Principia, I ſee every thing therein demonſtrated after the manner of the antients; but at the ſame time I perceive very plainly, that Sir Iſaac found out his theorems by other methods than thoſe whereby he demonſtrates them, and that his demonſtrations are nothing more than analytical calculations, which he has diſguiſed by ſubſtituting the name of lines to the algebraical ſymbols. If it be objected that the demonſtrations of Sir Iſaac are difficult, which is true, why ſhould not transferring theſe demonſtrations into the language of algebra be difficult alſo? Let us call a line A B, or expreſs it in algebra by the letter *a*, what difference can ariſe from this, as to the certainty of the demonſtration? In truth, this laſt method has this particular in it, that, when we have expreſſed all the lines in algebraical characters, we may perform many operations, without thinking either on the lines or figure; by which advantage, the mind is relaxed; and, as its ſtrongeſt attention is required to ſolve ſome problems, analytical algebra ſpares it as much as poſſible. It is ſufficient to know, that the principles of calculation are right; the hand works, as it were, mechanically, and exhibits the theorem or problem ſought; which, without theſe methods, we ſhould never have obtained, but by a great deal of trouble. The algebraiſt will have no more to do, to give his ſolution or demonſtration the difficulty they pretend it wants, than to turn it into the ſtile of the ancients, as Sir Iſaac has done his.

Admitting the too frequent uſe of algebra may render the mind remiſs, yet it muſt be owned, that it is abſolutely neceſſary in a great number of our enquiries; but I am very much in doubt whether the uſe of algebra renders mathematical demonſtrations leſs difficult or not. We may look on the method of the ancients as a fatiguing, rocky, rough road, into which the geometrician leads his reader; the algebraiſt placed in a more elevated point of view ſees, if I may uſe the expreſſion, all the road, at one caſt of his eye; explores every path; can conduct others into them, or keep them there, as long as he pleaſes.

Beſides, there are ſome caſes wherein algebra, inſtead of ſhortening demonſtrations, renders them more tedious; of this number, among others, is that of comparing angles; on which ſeveral problems and theorems depend.

Theſe angles are not to be expreſſed in algebra, but by their ſines; theſe ſines are often complicated, which makes their conſtructions and expreſſions difficult. Great geometricians muſt decide which is preferable, the method of the ancients or algebraical ſolutions; it is extremely difficult to give general rules with any exactneſs in this point.

APPLICATION *of Geometry to Algebra.* Though the Application of algebra to geometry be much more common and uſeful than that of geometry to algebra, yet, on ſome occaſions, the latter takes place. As we repreſent geometrical lines by letters, we may, ſometimes, repreſent numerical quantities expreſſed by letters in algebra, by lines in geometry; and from this ſometimes reſults a greater facility of demonſtration, in certain theorems, and an eaſier ſolution of ſome problems. To give a plain example, ſuppoſe we would find the ſquare of $a+b$; it is eaſy to demonſtrate by algebraic calculation, that this ſquare contains the ſquare of a plus that of b plus twice the product of a by b. But we can demonſtrate this propoſition geometrically too. In order to this, we need only make a ſquare whoſe baſe and perpendicular muſt be divided each into two parts, one of which we will call A, the other B; afterwards drawing parallel lines through the points of diviſion on the ſides of the ſquare, we ſhall divide it into four ſuperficies, one of which will be the ſquare of a, another that of b, and the two others will be each a rectangle formed by a and b, from whence it follows, that the ſquare of the binomial $a+b$ contains the ſquare of each of the two parts, plus twice the product of the firſt by the ſecond. This plain example may ſerve to ſhew how geometry may be applied to algebra, that is to ſay, how we may ſometimes make uſe of geometry to demonſtrate theorems in algebra.

The Application of geometry to algebra is not ſo neceſſary in the example we have juſt mentioned, as in ſeveral others too complicated for us to make an exact enumeration of. We ſhall therefore only obſerve, that the conſideration of curves of the parabolic kind, and of the courſe of theſe curves with regard to their axis, is often uſeful to demonſtrate ſeveral theorems relating to equations and their roots with more eaſe. We may even ſometimes apply geometry to arithmetic, that is, make uſe of geometry to demonſtrate ſome certain theorems in arithmetic more eaſily, without any particular analyſis in a general manner; as for example, let it be required to prove that a ſeries of odd numbers 1, 3, 5, 7, 9, &c. added, ſhall ſucceſſively give a ſeries of ſquares 1, 4, 9, 16, 25, &c.

To this end make a rectangle triangle (*plate* IV. *fig.* 26.) of which let one ſide be horizontal and the other vertical (we mention the terms horizontal and vertical to fix the imagination) divide the vertical ſide A B into as many equal parts as you pleaſe, and through the points of diviſion 1, 2, 3, 4, &c. draw the parallels $1f$, $2g$, &c. to B E, you will at firſt have the little triangle $A\,1f$; then the trapezium $1fg\,2$, three times as big as the triangle; then a third trapezium $2gh\,3$, 5 times as big as the triangle; ſo that the ſpaces determined by theſe parallels $1f$, $2g$, &c. will be repreſented by the following numbers 1, 3, 5, 7, &c. beginning this arithmetical progreſſion from the triangle $A\,1f$.

Now the ſums of theſe ſpaces will be the triangles $A\,1f$, $A\,2g$, $A\,3h$, &c. which are as the ſquares of the ſides A 1, A 2, A 3, that is to ſay, as 1, 4, 9, &c. then the ſum of the odd numbers gives the ſum of the ſquare numbers. This propoſition may indeed be demonſtrated algebraically, but the preceding demonſtration may ſatisfy thoſe who are ignorant of algebra.

APPLICATION *of Geometry and Algebra to Mechanics.* This is founded on the ſame principles as the Application of algebra to geometry. It conſiſts chiefly in repreſenting the curves which bodies deſcribe in their motion by equations, in determining the equation between the ſpaces which bodies generate (when acted upon by any powers whatever) and the time they take to paſs through theſe ſpaces, &c. We cannot indeed compare two things of a different nature together, ſuch as ſpace and time; but we may compare the proportion of time with the parts of ſpace paſſed over. Time in its nature flows uniformly, and mechanics imply the ſame uniformity.

Further, without knowing time in itſelf and having any exact meaſure of it, we cannot repreſent it more clearly, with reſpect to its parts, than by the parts of an infinite right-line. Now the proportion between the parts of ſuch a line, and that of the parts of ſpace paſſed through by a body, moved in whatever manner, may always be expreſſed by an equation. Let us ſuppoſe a curve, the abſciſſæ of which repreſent the portions of time paſt ſince the begining of the motion, the correſponding ordinates denoting the ſpaces paſſed through during theſe portions of time. The equation of this curve will expreſs, not only the proportion of the time to the ſpace, but, if we may ſpeak ſo, the proportion of the proportion that the parts of time have to their unity, to that which the parts of ſpace, paſſed through, have to their's; for the equation of a curve may be conſidered either as expreſſing the proportion of the ordinates to the abſciſſa, or as the equation between the proportion that the ordinates have to their unity, and that which the correſponding abſciſſa have to their's.

It is evident then, that by the bare Application of geometry and calculation we may account for the general properties of motion, varied by any law whatever, without the help of any other principle. In the article ACCELERATED *Motion*, in the Dictionary, may be ſeen an example of geometry applied to mechaniſm; the time of the deſcent of a gravitating body is there repreſented by the perpendicular of a triangle, the velocity by the baſe, and the ſpaces paſſed through by the area of the parts of the triangle.

APPLICATION *of Geometry and Aſtronomy to Geography.* This conſiſts in three things. 1, In determining the figure of this globe we inhabit. 2, In finding, by their longitude and latitude, the ſituation of places. 3, In determining the ſituation of places near each other. Aſtronomy and geometry are of great uſe in navigation.

APPLICATION *of Geometry and Algebra to Phyſics.* This we owe to Sir Iſaac Newton, as we may owe the Application of algebra to geometry to Des Cartes, and it is founded on the ſame principles. The properties of bodies in general have between each other certain proportions, which we may compare with each other, more or leſs diſtinguiſhable; and theſe we can diſcover by geometry or algebra. On this are founded all the phyſico-mathematical ſciences. One ſingle obſervation or experiment often demonſtrates a whole ſcience. As for example: the bare knowledge of this, that the angle of incidence is equal to the angle of reflexion, which is known to be true, contains the whole ſcience of catoptrics. This principle of being once admitted, catoptrics becomes a ſcience purely geometrical, becauſe it is reduced to comparing angles with given lines of poſition. The thing is the ſame in many other caſes. By the help of geometry and algebra, we can in general determine the power of one effect, which depends on another better known. This ſcience, therefore, is almoſt always neceſſary to compare and examine the facts experiments diſcover to us. It muſt be owned however, that every ſubject of phyſics is not equally capable of the Application of geometry. Several experiments admit of no calculation at all; ſuch are thoſe of the magnet, electricity, and many others; in theſe caſes we muſt forbear applying it. Geometricians, however, are apt to run into this fault, by advancing hypotheſes on experiments, and proceeding to calculation according to theſe hypotheſes; but theſe calculations ought no farther to be regarded, than as the hypotheſes on which they are ſupported, are conformable to nature; and, therefore, obſervations ought to confirm them, which unfortunately ſometimes does not happen. Beſides, ſuppoſing the hypotheſes true, they are not always ſufficient. If there be in an effect a great number of circumſtances owing to ſeveral cauſes, which act all together, and we content ourſelves with conſidering ſome of theſe cauſes only, which, being more ſimple, can be calculated more eaſily; we may gain a partial effect of theſe cauſes; but it will be very different from the total effect, which would reſult from uniting all the cauſes.

APPLICATION *of a Geometrical Method in Metaphyſics.*—Geometry has been ſometimes abuſed in phyſics by applying the calculation of the properties of bodies to arbitrary hypotheſes. A geometrical method has alſo been miſapplied in ſciences, which in their own nature ſubmit to no calculation, I mean the method only, not the ſcience. Several metaphyſical writers, who have publiſhed certain truths, have yet, copying after the manner of geometricians, ridiculouſly enough, ſwelled their page with the pompous words axiom, theorem, corollary, &c.

The authors of theſe works certainly imagined that theſe words, by ſome ſecret charm, compoſed the eſſence of a demonſtration; and that by writing at the end of a propoſition, that it might be demonſtrated, they ſhould make that demonſtrable which was not really ſo. Geometry does not owe its certainty to this method, but to the evidence and ſimplicity of its object: and though a treatiſe on geometry, when diveſted of its ordinary terms, may be very good; yet, a treatiſe on metaphyſics may be often very bad, by the affectation of following a geometrical method. We ought even to diſtruſt this claſs of writers, for the generality of their pretended demonſtrations are only founded upon an abuſe of words.

Thoſe who have conſidered theſe things, know how common and eaſy the abuſe of words is, eſpecially in metaphyſical ſubjects. It is in this particular the ſchool-men have excelled pity; and it is they made no better uſe of their ſagacity.

Application *of metaphyſics to geometry.* Metaphyſics are ſometimes miſapplied in geometry, as well as geometry in metaphyſics. Geometry, like all other ſciences, has a kind of metaphyſics proper to itſelf, which is certain and inconteſtable; becauſe the geometrical propoſitions, which reſult from it, afford an evidence, which demands our aſſent. But, as mathematical certainty ariſes from the ſimplicity of its object, its metaphyſics too muſt be extremely ſimple and clear; muſt always be capable of being reduced to perfect ideas, without any obſcurity. In ſhort, how can the conſequences of any thing be certain and evident, if the principles are not ſo? Yet ſome authors have thought themſelves able to introduce into geometry a kind of metaphyſics, often obſcure, and, what is ſtill worſe, have affected to demonſtrate, metaphyſically, truths which have been already eſtabliſhed on other principles; this ſurely was the way to render thoſe truths doubtful, if they could poſſibly be ſo. The new geometry has principally occaſioned this falſe method. By conſidering parts infinitely ſmall as real quantities, and admitting ſome of theſe to be greater and ſome leſs, they have acknowledged an infinity of ſmall particles of different claſſes; and looked on them as real ſomethings, inſtead of endeavouring to reduce theſe ſuppoſitions and calculations to ſimple ideas.

Another abuſe of metaphyſics in geometry conſiſts in confining metaphyſics to geometrical demonſtrations. Admitting even the metaphyſical principles we ſet out upon to be certain and evident, there are ſcarce any geometrical theorems that can be accurately demonſtrated by their help alone; they almoſt always require lines and calculations: this manner of demonſtration is very material, becauſe it is in ſhort the only ſure and certain method; ſince with our pens, not metaphyſical reaſonings, we can make combinations and certain calculations.

This latter kind of metaphyſics, which we have been ſpeaking of, is however good to a certain degree, provided we do not confine ourſelves too much: it makes us carefully examine the principia of diſcoveries; it furniſhes us with lights; it points out to us the road; but we are not ſure of being right, if we may be allowed the expreſſion, without the ſtaff of calculation, to point out the proper objects which we before ſaw confuſedly.

One would think great geometricians ought always to be excellent metaphyſicians; at leaſt in the objects of their ſcience. This is not, however, always the caſe. Some geometricians are like people who poſſeſs a ſenſe of ſeeing, contrary to that of feeling; this proves yet more how neceſſary calculation is in geometrical truths. One may venture to affirm that the geometrician, who is a bad metaphyſician in the objects he applies himſelf to, will, in others, be intolerable: though geometry, whoſe object is the menſuration of body and matter, may in ſome caſes be applied to thought.

Application *of one thing to another,* is a term made uſe of to denote the ſervice the firſt is of to underſtand or bring the ſecond to perfection. Thus the Application of the cycloid to pendulums ſignifies the uſe made of the cycloid to bring pendulums to perfection.

APPORTIO'NMENT, **Apporcionment**, or **Apportionamentum**, in law, a dividing of a rent into two parts or portions, according as the land, whence it iſſues, is divided among two or more proprietors.

Thus if a man, having a rent-ſervice iſſuing out of land, purchaſe a part of the land; the rent ſhall be apportioned, according to the value of the land. So if a man let lands for years, reſerving rent, and a ſtranger after recover part of the lands, the rent ſhall be apportioned.

But a rent-charge cannot be apportioned, nor things that are intire; as if one hold land by ſervice, to pay to his lord yearly at ſuch a feaſt a horſe or a roſe; there, if the lord purchaſe part of the land, this ſervice is totally extinct; becauſe ſuch things cannot be divided without hurt to the whole. But if part of the land, out of which a rent charge iſſues, deſcends to the grantee of the rent, this ſhall be apportioned. A man purchaſes part of the land where he hath common appendant, the common ſhall be apportioned: of common appurtenant it is otherwiſe; and, if by the act of the party, the common is extinct. Common appendant and appurtenant may be apportioned on alienation of part of the land to which it is appendant or appurtenant. Conditions generally are intire, and cannot be apportioned by the act of the party; a contract may not be divided or apportioned, ſo as to ſubject a man to two actions.

APPRA'ISER, one who rates, or ſets, a value upon goods, &c. He muſt be a ſkilful and honeſt perſon. It is not a buſineſs of itſelf, but generally performed by brokers of houſehold furniture, to which ſet of men the word was formerly, and I believe ſtill is, chiefly applied; yet now alſo upholſterers, and other brokers, are employed, or even any perſon or perſons who are ſuppoſed to be ſkilled in the commodities they are to appraiſe, or ſet a value on.

They are employed in caſes of death, executions brought in upon goods, of ſtock to be turned over from one perſon to another, or divided between copartners; and have the name of ſworn Appraiſers, from their taking an oath to do juſtice between party and party.

They ſometimes appraiſe jointly, each party agreeing to have the ſame Appraiſer, or Appraiſers; ſometimes in oppoſition, each party chuſing one, or more, of a ſide; and ſometimes by commiſſion, or deputation, of truſtees, maſters in chancery, &c.

Their manner is, each one for himſelf, to take an inventory of every article, and mark its value with his own private characters. When they have gone through the whole, they give their eſtimates in a groſs ſum, very rarely of particulars. When they value againſt one another, if they happen to differ much, they reconſider, and at length moſt commonly bring it to an average; and, in ſome caſes, they are obliged to take the goods at their own valuation, if the parties ſhall think proper to relinquiſh them.

At Bourdeaux they call Appraiſers (appreciateurs in French) thoſe clerks of the cuſtom-houſe and of city duties, who appraiſe and rate the merchandizes which are imported or exported, in order to regulate upon what footing the duties of importation or exportation ought to be paid.

The cuſtom-houſe at Bourdeaux is called the convoy, and the office of the city duties is called comptablie. The city duties are ſuch as were granted by the French king to certain cities, either to pay their debts, or for their particular occaſions.

The office of thoſe Appraiſers conſiſts in the following particulars:

1. They are obliged to keep a regiſter, or memorandum-book, marked and numbered by the director of the office, and to tranſcribe and enter into it all the declarations which are delivered from day to day at the office for the receiving the city duties, without augmenting or diminiſhing any thing in them but by the expreſs order of their ſuperiors.

2. To deliver carefully as many receipts, or bills of entry, as there are articles in each declaration.

3. The merchandizes being entered, and carried into the ſaid cuſtom-houſe, according to the order of thoſe receipts, or bills of entries, the Appraiſers are obliged to open and viſit them, when the merchant requires it, in order to know the quantity and quality of them; which being found to agree both with the declarations and bills of entries, the Appraiſers make a true eſtimate, or evaluation, of each merchandize in particular, according to the market-price of them.

4. They muſt enter into their regiſter their eſtimate both of the weight and of the quality and quantity of the merchandize, as they found them by their ſearch, or viſit. And, as to thoſe merchandizes which are weighed in the cuſtom-houſe, the Appraiſers expedite them upon the report of the warehouſe-keeper.

5. They are obliged, after appraiſing the merchandizes, to deliver a ſecond receipt, or bill of entry, which ſerves the merchants to clear their merchandizes, either at the cuſtom-houſe, if any duty be owing there; or at the office of the city duties; as alſo what may be due for brokerage.

6. They ought to write the ſaid bills of entry upon the regiſter of importations by ſea; and, if there be grocery, they muſt alſo regiſter them in the regiſter of receipts deſigned for that purpoſe, that the merchants may pay the duties owing for them at the cuſtom-houſe, according to the printed tariff. And, with regard to the merchandizes that come from the weſtern iſles, the ſaid Appraiſers are obliged to regiſter them all indiſcriminately, in a particular regiſter, as well as in the regiſter of importations by ſea, with their appraiſed price, except ſugars, which are not regiſtered in the regiſters of importations by ſea, nor in that of the city duties, but only in a particular regiſter kept by the receiver of the cuſtom-houſe, as well as that of the weſtern iſles.

7. As for thoſe merchandizes which are not carried to the cuſtom-houſe, as deal-boards, and other timber coming by ſea, the ſaid Appraiſers expedite them upon the report, and after the examination, of the ſearchers of outward-bound ſhips. And, with regard to tar, gum, pitch, train-oil, herrings, pilchards, &c. they expedite them according to the bill of lading: and, as for green or dried fiſh, the Appraiſers expedite it according to the report of the clerks who were preſent at the unloading and landing of it.

8. At the end of every quarter they draw up an alphabetical liſt of all the merchandizes imported by ſea, that have been cleared at the cuſtom-houſe.

9. Finally, with regard to the merchandizes that come by land, the Appraiſers have ſeveral things to obſerve, viz. as to thoſe that come from the inland country by the boats of Thouloufe, Agen, and other places, they follow the ſame rules

rules and methods with regard to thoſe that come by ſea, except that they do not deliver bills of entries for thoſe merchandizes, which is done by the clerks of the office of the city duties, after receiving the declarations.

As for thoſe that come by the ſtage-coaches, by carriers, by waggons, or other carriages, they clear them upon the certificates, or acquits, given by the clerks of the cuſtom-houſe offices through which they paſſed. *Poſtlethwait's Dict. of Commerce.*

APPRE'NTICESHIP, the time during which apprentices are obliged to continue with the merchants or tradeſmen with whom they are bound. Their indentures ought to be recorded in the regiſter of the company, or body, to which their maſters belong; and their time does not begin but from the day on which the indenture is regiſtered. No one, in France, can be admitted a tradeſman, unleſs he produces his indenture, and the certificates of his Apprenticeſhip. *Art.* 3. *of tit.* 1. *of the ordonnance of the year* 1673.

The French give the name of apprentiſſe to a maiden, or woman, who binds herſelf for a time with a miſtreſs, before a notary-public, in order to learn her art, or trade, almoſt after the ſame manner as apprentice-boys.

And with us it is enacted, by *ſtat.* 8. *Ann. cap.* 9. *ſect.* 32, that there ſhall be paid the duty of ſix-pence for every pound, of every ſum of 50 l. or under, and twelve-pence for every twenty ſhillings of every ſum more than 50 l. which for five years ſhall be paid, or agreed for, in the putting out any clerk, apprentice, or ſervant, to learn any profeſſion, trade, or employment; and proportionably for greater or leſſer ſums, to be paid by the maſter or miſtreſs.

The full ſum given, or agreed to be given, with an apprentice, &c. ſhall be written in words, at length, in the indenture, &c. which muſt bear date on the day it was executed, upon pain that every maſter or miſtreſs, offending in theſe particulars, ſhall, for every offence, forfeit double the ſum given, or agreed to be given; one moiety to the crown, the other, with coſts, to him who will ſue within one year after the time limited for ſuch clerk, or apprentice, to ſerve his maſter, &c. is expired. *Sect.* 33.

All indentures, &c. of Apprenticeſhips, which ſhall be executed in any other part of Great-Britain, ſhall, within two months after they are executed, be brought either to the head office, or to ſome collector of the ſtamp-duties; and the duty ſhall be paid; and, in caſe the payment be made to the receiver-general, the indenture ſhall be ſtamped; and, in caſe the payment be made to a collector, he ſhall indorſe in words, at length, a receipt of the money paid to him, and ſubſcribe his name. *Sect.* 37.

Every indenture ſo endorſed, if it is executed within 50 miles of London, ſhall, within three months after date, if executed at a greater diſtance, then within ſix months after date, be brought to the ſaid head office where (the ſame beino produced with a receipt endorſed) it ſhall be ſtamped. *Sect.* 38.

Indentures wherein the full ſum agreed on ſhall not be inſerted, or the duties not paid, or not ſtamped, or tendered to be ſtamped, ſhall be void, and the clerk, or apprentice, ſhall have no privilege of freedom, or uſing his trade.

Money given to put out apprentices, either by pariſhes or public charities, ſhall not pay any duty. *Sect.* 39.

Forging the ſtamps, or any receipt for monies payable by this act, is felony, without benefit of clergy. *Sect.* 41.

No indenture, &c. ſhall be admitted in evidence in any ſuit to be brought by the parties thereunto, unleſs he, for whom it ſhall be given in evidence, firſt makes oath, that, to the beſt of his knowledge, the ſum therein mentioned was all that was paid, &c. on behalf of the apprentice, for the benefit of the maſter, &c. *Sect.* 43.

Where any thing ſhall be given to a maſter, not being money, the duty ſhall be paid for the full value thereof. *Sect.* 45.

APPREHE'NSION, in metaphyſics, an operation of the mind, which makes it perceive an object.

The ſoul according to Father Malbranche is capable of apprehenſion three different ways, the intellectual faculty, the imagination, and the ſenſes. It perceives ſpiritual and univerſal things, ſimple ideas, and, in general, all its thoughts that ariſe from reflection on itſelf, purely from the intellectual faculty. Material things too it perceives this way, as extenſion with all its properties; for there is nothing, but the pure intellectual faculty can conceive a perfect circle or ſquare, a figure of a thouſand ſides, and many things of a like nature. This kind of apprehenſion is called pure or intellectual apprehenſion, becauſe it is not neceſſary the mind ſhould form images in the brain, to repreſent all theſe things to itſelf. It perceives by imagination material beings, though abſent, as if preſent, by forming images of them in the brain. It is in this manner we imagine all kinds of figures: theſe perceptions may be called imaginations; becauſe the ſoul repreſents theſe objects to itſelf, by forming images of them in the brain; and, becauſe we cannot form images of ſpiritual ſubſtances, it conſequently follows, the ſoul cannot imagine them. In ſhort, the ſoul only perceives groſſer objects by the ſenſes, which by being preſent make an impreſſion on the external organs, which impreſſion is communicated to the brain; and theſe perceptions are called ſenſations.

When Father Malbranche ſays, corporeal ſubſtances are repreſented by the imagination, and ſpiritual by the underſtanding or intellectual faculty; does he underſtand himſelf? In either caſe is it not equally a thought of the mind; and is it not equally employed whether it think on a mountain, which is a corporeal object, or an intelligence, which is a ſpiritual being? It may be anſwered, the operation of the mind, that acts by virtue of the impreſſions made in the brain by corporeal objects, is imagination, and that the operation of the mind, independent of theſe impreſſions, is purely the intellectual faculty. When the Carteſians ſpeak of theſe traces in the brain, are they in earneſt? With what kind of microſcope have they diſcovered theſe traces in the brain which form the imagination? Admitting they had diſcovered them, how can they tell, whether the mind may not have occaſion for them, in all her operations, even the moſt ſpiritual?

To ſpeak more juſtly, let us ſay, the faculty of thinking is always the ſame, always equally ſpiritual, on whatever object it is employed. They by no means prove its ſpirituality more by one object than another; no more by what they call the intellectual faculty, than by the imagination. Do not angels think on corporeal as well as ſpiritual objects? Should we therefore diſtinguiſh in them the imagination from the pure intellectual faculty? Have they more occaſion for traces on the brain in either caſe? With us it is the ſame: as ſoon as the mind thinks, it thinks abſolutely, with an eſſential ſpirituality, as real, as that of purer ſpirits; call it which you will, imagination or intellectual faculty.

But, when a body preſents itſelf to the mind, is it not ſaid we form an ideal ſhape of it? This term in uſe among the ancient philoſophers is nothing to the preſent purpoſe, or barely ſignifies the internal object of the mind, when it thinks on a body. Beſides, this internal object is equally ſpiritual, whether it thinks on material or immaterial ſubſtances; becauſe in either caſe it ſtands in need of the ſenſes. We conclude, therefore, that the eſſential difference ſome are fond of eſtabliſhing between the pure intellectual faculty and the imagination, is nothing more than a chimerical diſtinction.

APPROA'CHING, in fowling, a term uſed to expreſs ſuch devices as are contrived for the getting within ſhot of ſhy birds.

It is principally uſed in marſhy low places. The beſt method of Approaching is by the means of three hoops tied together at proper diſtances, according to the height of the man that is to uſe it, and having boughs of trees tied all round it, with cords to hang it over his ſhoulders; a man, getting into this, conceals himſelf, and approaches by degrees toward his game in the form of a moving buſh.

Geeſe, ducks, and teal, quit the waters in the evening and paſs the night in the fields, but at the approach of morning they return to the water again, and even when on the water, they will retire to great diſtances, on the approach even of a horſe or cow, ſo that the buſineſs of the ſtalking horſe is of little uſe; but this device of Approaching by the moving buſh ſucceeds tolerably well with them. *Dict. Ruſt.*

APPRO'XIMATION (*Dict.*)—Under this article in the Dictionary we have given the method of approximating the roots of equations by their limits; we ſhall here add the method of approximating by converging ſeries.

If there be only two letters, x and a, in the propoſed equation, ſuppoſe a equal to an unit, and find the root of the numeral equation that ariſes from the ſubſtitution, See APPROXIMATION in the dictionary. Multiply theſe roots by a, and the products will give the roots of the propoſed equation.

Thus the roots of the equation $x^2 - 16x + 55 = 0$ are found to be 5 and 11. And therefore the roots of the equation $x^2 - 16ax + 55a^2 = 0$, will be $5a$ and $11a$. The roots of the equation $x^3 + a^2x - 2a^3 = 0$ are found by enquiring what are the roots of the numeral equation $x^3 + x - 2 = 0$, and, ſince one of theſe is 1, it follows that one of the roots of the propoſed equation is a; the other two are imaginary.

If the equation to be reſolved involves more than two letters, as $x^3 + a^2x - 2a^3 + ayx - y^3 = 0$, then the value of x may be exhibited in a ſeries, having its terms compoſed of the powers of a and y, with their reſpective co-efficients; which will "converge the ſooner the leſs y is in reſpect of a, if the terms are continually multiplied by the powers of y, and divided by thoſe of a." Or, "will converge the ſooner the greater y is in reſpect of a, if the terms be continually multiplied by the powers of a, and divided by thoſe of y." Since, when y is very little in reſpect of a, the terms y, $\frac{y^2}{a}$, $\frac{y^2}{a^2}$, $\frac{y^4}{a^3}$, $\frac{y^5}{a^4}$, &c. decreaſe very quickly, If y vaniſh in reſpect of a, the ſecond term will vaniſh in reſpect of the firſt, ſince $\frac{y^2}{a} : y :: y : a$. And after the ſame manner $\frac{y^3}{a^2}$ vaniſhes in reſpect of the term immediately preceding it.

But, when y is vaſtly great in reſpect of a, then a is vaſtly great in reſpect of $\frac{a^2}{y}$, and $\frac{a^2}{y}$ in reſpect of $\frac{a^3}{y^2}$; ſo that the terms a, $\frac{a^2}{y}$, $\frac{a}{y^2}$, $\frac{a^4}{y^3}$, $\frac{a^5}{y^4}$, &c. in this caſe decreaſe very ſwiftly. In either caſe, the ſeries converge ſwiftly that conſiſt of ſuch terms; and a few of the firſt terms will give a near value of the root required.

If a ſeries for x is required from the propoſed equation that ſhall converge the ſooner the leſs y is in reſpect of a; to find the firſt term of this ſeries, we ſhall ſuppoſe y to vaniſh, and extracting the root of the equation $x^3 + a^2 x - 2a^3 = 0$, conſiſting of the remaining parts of the equation that do not vaniſh with y, we find, that $x = a$; which is the true value of x when y vaniſhes, but is only near its value when y does not vaniſh, but only is very little. To get a value ſtill nearer the true value of x, ſuppoſe the difference of a from the true value to be p, or that $x = a + p$. And, ſubſtituting $a + p$ in the given equation for x, you will find

$$\left.\begin{aligned} x^3 &= a^3 + 3a^2p + 3ap^2 + p^3 \\ +a^2x &= a^3 + a^2p \\ -2a^3 &= -2a^3 \\ +ayx &= a^2y + apy \\ -y^3 &= -y^3 \end{aligned}\right\} = 0$$

$$\left.\begin{aligned} = 4a^2p + 3ap^2 + p^3 \\ a^2y + apy - y^3 \end{aligned}\right\} = 0.$$

But ſince, by ſuppoſition, y and p are very little in reſpect of a, it follows that the terms $4a^2p$, a^2y, where y and p are ſeparately of the leaſt dimenſions, are vaſtly great in reſpect of the reſt; ſo that, in determining a near value of p, the reſt may be neglected: and from $4a^2p + a^2y = 0$, we find $p = -\frac{1}{4}y$. So that $x = a + p = a - \frac{1}{4}y$, nearly. Then to find a nearer value of p, and conſequently of x, ſuppoſe $p = -\frac{1}{4}y + q$, and ſubſtituting this value for it in the laſt equation, you will find

$$\left.\begin{aligned} p^3 &= -\tfrac{1}{64}y^3 + \tfrac{3}{16}y^2q - \tfrac{3}{4}yq^2 + q^3 \\ 3ap^2 &= \tfrac{3}{16}ay^2 - \tfrac{3}{2}ayq + 3aq^2 \\ 4a^2p &= -a^2y + 4a^2q \\ ayp &= -\tfrac{1}{4}ay^2 + ayq \\ a^2y &= a^2y \\ -y^3 &= -y^3 \end{aligned}\right\} = 0 =$$

$$\left.\begin{aligned} = -\tfrac{65}{64}y^3 + \tfrac{3}{16}y^2q - \tfrac{3}{4}yq^2 + q^3 \\ -\tfrac{1}{16}ay^2 - \tfrac{1}{2}ayq + 3aq^2 \\ +4a^2q \end{aligned}\right\} = 0.$$

And ſince, by the ſuppoſition, q is very little in reſpect of p, which is nearly $= -\frac{1}{4}y$, therefore q will be very little in reſpect of y; and, conſequently, all the terms of the laſt equation will be very little in reſpect of theſe two, viz. $-\frac{1}{16}ay^2 + 4a^2q$, where y and q are of leaſt dimenſions ſeparately; particularly the term $-\frac{1}{2}ayq$ is little in reſpect of $4a^2q$, becauſe y is very little in reſpect of a; and it is little in reſpect of $-\frac{1}{16}ay^2$, becauſe q is little in reſpect of y. Neglect therefore the other terms, and ſuppoſing $-\frac{1}{16}ay^2 + 4a^2q = 0$, you will have $q = \frac{1}{64} \times \frac{y^2}{a}$; ſo that $x = a - \frac{1}{4}y + \frac{1}{16} \times \frac{y^2}{a}$. And by proceeding in the ſame manner you will find $x = a - \frac{y}{4} + \frac{y^2}{64a} - \frac{131y^3}{512a^2} + \frac{509y^4}{16384a^3} -$, &c.

When it is required to find a ſeries for x that ſhall converge ſooner, the greater y is in reſpect of any quantity a, you need only ſuppoſe a to be very little in reſpect of y, and proceed by the ſame reaſoning as in the laſt example of the ſuppoſition of y being very little.

Thus, to find a value for x in the equation $x^3 - a^2x + ayx - y^3 = 0$, that ſhall converge the ſooner the greater y is in reſpect of a. Suppoſe a to vaniſh, and the remaining terms will give $x^3 - y^3 = 0$, or $x = y$. So that, when y is vaſtly great, it appears that $x = y$ nearly.

But, to have the value of x more accurately, put $x = y + p$, then

$$\left.\begin{aligned} x^3 &= y^3 + 3y^2p + 3yp^2 + p^3 \\ -a^2x &= -a^2y - a^2p \\ +ayx &= ay^2 + ayp \\ -y^3 &= -y^3 \end{aligned}\right\} = 0 =$$

$$\begin{aligned} = +3y^2p + 3yp^2 + p^3 - a^2y - a^2p \\ +ay^2 + ayp: \end{aligned}$$

Where the terms $3y^2p + ay^2$ become vaſtly greater than the reſt, y being vaſtly greater than a or p; and conſequently $p = -\frac{1}{3}a$ nearly.

Again, by ſuppoſing $p = -\frac{1}{3}a + q$, you will transform the laſt equation into

$$\left.\begin{aligned} -\tfrac{8}{27}a^3 + 3y^2q + 3yq^2 + q^3 \\ -a^2y - ayq - aq^2 \\ -\tfrac{2}{3}a^2q \end{aligned}\right\} =$$

where the two terms $3qy^2 - a^2y$ muſt be vaſtly greater than any of the reſt, a being vaſtly leſs than y, and q vaſtly leſs than a, by the ſuppoſition; ſo that $3qy^2 - a^2y = 0$, and $q = \frac{a^2}{3y}$ nearly. By proceeding in this manner, you may correct the value of y and find that $x = y - \frac{1}{3}a + \frac{a^2}{3y} + \frac{a^3}{81y^2} - \frac{8a^4}{243y^3}$, &c. which ſeries converges the ſooner the greater y is ſuppoſed to be taken in reſpect of a.

In the ſolution of the firſt example thoſe terms were always compared in order to determine p, q, r, &c. in which y and thoſe quantities p, q, r, &c. were ſeparately of feweſt dimenſions. But, in the ſecond example, thoſe terms were compared in which a and the quantities p, q, r, &c. were of the leaſt dimenſions ſeparately. And theſe always are the proper terms to be compared together, becauſe they become vaſtly greater than the reſt, in the reſpective hypotheſis.

In general; to determine the firſt, or any term in the ſeries, ſuch terms of the equation are to be aſſumed together only, as will be found to become vaſtly greater than the other terms; that is, which gave a value of x, which, ſubſtituted for it in all the terms of the equation, ſhall raiſe the dimenſions of the other terms all above, or all below, the dimenſions of the aſſumed terms, according as y is ſuppoſed to be vaſtly little, or vaſtly great in reſpect of a.

Thus, to determine the firſt term of a converging ſeries, expreſſing the value of x in the laſt equation $x^3 - a^2x + ayx - y^3 = 0$, the terms ayx and $-y^3$ are not to be compared together, for they would give $x = \frac{y^2}{a}$, which ſubſtituted for x, the equation becomes $\frac{y^5}{a^3} - ay^2 + y^3 - y^3 = 0$, where the firſt term is of more dimenſions than the aſſumed terms $ayx - y^3$: and the ſecond of fewer; ſo that the two firſt terms cannot be neglected in reſpect of the two laſt, neither when y is very great nor very little, compared with a. Nor are the terms x^3, ayx, fit to be compared together in order to obtain the firſt term of a ſeries for x, for the like reaſon.

But x^3 may be compared with $-a^2x$, as alſo $-a^2x$ with $-y^3$, for that end. Theſe two give the firſt terms of a ſeries that converges the ſooner the leſs y is; as $x^3 = y^3$ gives the firſt term of a ſeries that converges the ſooner the greater y is.

The comparing x^3 with $-a^2x$ gives theſe two ſeries,

$$x = a - \tfrac{1}{2}y - \frac{y^2}{8a} + \frac{7y^3}{16a^2} - \frac{59y^4}{128a^3}, \text{ \&c.}$$

$$x = -a + \tfrac{1}{2}y + \frac{y^2}{8a} + \frac{9y^3}{16a^2} + \frac{69y^4}{128a^3}, \text{ \&c.}$$

The comparing $-a^2x$ with $-y^3$ gives

$$x = -\frac{y^3}{a^2} - \frac{y^4}{a^3} - \frac{y^5}{a^4} - \frac{y^6}{a^5} -, \text{ \&c.}$$

And theſe ſeries give three values of x, when y is very little; the laſt of which is itſelf alſo very little in that caſe, as it appears indeed from the equation, that, when y vaniſhes, the three values of x become $+a$, $-a$, and 0; becauſe, when y vaniſhes, the equation becomes $x^3 - a^2x = 0$, whoſe roots are a, $-a$, 0.

A'PRICOCK. See ARMENIACA.

A'PSIS (*Dict.*)— Some mechanic philoſophers conſider the motion of a plant from one Apſis to the other, as vibrations of a pendulum: for example, the motion of the moon from her perigee to her apogee, and from her apogee to her perigee; and apply the laws of vibration to this motion; from whence they infer, that theſe oſcillations of the heavenly bodies will ceaſe on the reſtoration of the equilibrium, which will one day return.

Others are of opinion there is ſomething not mechanical in this motion; they aſk why was the equilibrium deſtroyed; and why have theſe vibrations taken place? Why is not the equilibrium reſtored; and why continue theſe vibrations to interrupt it? See *Memoires de Trev. April* 1730, *p.* 709 *& ſeq.*

Theſe queſtions they look on as unanſwerable; which only proves they were ſtrangers to the Newtonian philoſophy. See *Newton's Principia, lib.* 1. *ſect.* 9. *Herman. Phoron. lib.* 1. *cap.* 4.

Among the authors who have compared theſe vibrations to that of a pendulum, one of the moſt celebrated is Bernouilli, late profeſſor of mathematics at Bale, in a piece intitled, 'New Thoughts on the Carteſian Syſtem, with the Manner 'of reducing the Orbits and Aphelia of the Planets from it.' This carried the prize at the Royal Academy of Sciences at Paris in the year 1730. In it he endeavours to explain, how it might happen, even in the ſyſtem of vortices, that a planet muſt not neceſſarily be always at the ſame diſtance from the ſun, but alternately approach nearer to it, or recede farther from it. But in natural philoſophy it is not ſufficient to give a plauſible explication of a particular phænomenon. The hypotheſis we lay down for explaining this phænomenon, muſt be conſiſtent with itſelf, and what depends on it. Now, if we examine the explanation given by Bernouilli, it will appear difficult to conceive how he can ſhew it poſſible a plant ſhould deſcribe an ellipſis round the ſun, and the ſun poſſeſs one focus of that ellipſis; and yet the area of the diſtances, deſcribed round the ſun, be proportionable to the time of its revolution, as deduced from obſervations. See, on this ſubject, a Memoir of Monſieur Bouguer, Member of the Academy, publiſhed in 1731, on the curvilinear Motion of Bodies in the Mediums wherein they move.

If the line of the greateſt diſtance of a planet, and that of the leaſt diſtance, be not ſituated in a right line, but form an angle more or leſs than 180 degrees, it is called the motion of the line of the Apſides, or the motion of the Apſides. And, if the angle be leſs than 180 degrees, we ſay the motion of the Apſides is contrary to the order of the ſigns: on the contrary, if the angle be more than 180, we ſay it is according to the order of the ſigns. As to a method of determining the poſition of the Apſides, ſeveral ways have been made uſe of. The antients, who thought the planets deſcribed perfect circles, of which the ſun was not the center, made uſe of a method to determine the Apſides, explained by Keil in his Aſtronomical Inſtitutions. Since it has been diſcovered that the planets deſcribe ellipſes, of which the ſun poſſeſſes one of the foci, new methods have been diſcovered to determine the ſituation of the Apſides in their orbits. Halley has propoſed one which requires only the time of the revolution of the planet to be given. Seth Ward has laid down another, which ſuppoſes three different obſervations of the planet to be made in any three different parts of its orbit; but this is founded on an hypotheſis not exactly true, and the celebrated Mr. Euler has publiſhed a far better method in the 7th vol. of the Memoirs of the Academy of Petersburgh; all theſe different methods, except the laſt, may be ſeen in Keil's Aſtronomy. See Halley's method under APHELION.

Sir Iſaac Newton has given a curious method for determining the motion of the Apſides in his Principia, by ſuppoſing the orbit deſcribed by the planet to be little different from a circle, as almoſt all the planetary orbits are. This great philoſopher has ſhewn, that if the ſun were fixed, and all the planets gravitated towards him in an inverſe ratio of the ſquare of their diſtances, there would be no motion of the Apſides; that is, the lines of the greater and leſſer diſtance would be exactly 180 degrees diſtant from each other; and, conſequently, form a right line. The reaſon, therefore, why the two points of the Apſides are not always exactly in a right line with the ſun, is, becauſe the reciprocal tendence of the planets towards each other, and their gravitation towards the ſun, is not exactly in an inverſe ratio to the ſquare of their diſtances. Sir Iſaac gives a very nice method of determining the motions of the Apſides, by ſuppoſing we knew the force added to the gravitation of the planet towards the ſun, and that this additional force always has its direction towards the ſun.

APUI′, or Appui, in the manage, q. d. reſt or ſtay upon the hand, the reciprocal effort between the horſe's mouth and the bridle-hand; or the ſenſe of the action of the bridle on the hand of the horſeman.

A juſt Appui of the hand, is the nice bearing up or ſtay of the bridle; ſo that the horſe, being awed by the ſenſibility and tenderneſs of the mouth, dares not reſt too much upon the bit-mouth, nor check or beat upon the hand to withſtand it.

A dull, obtuſe Appui, is when a horſe has a good mouth, but his tongue ſo thick, that the bit cannot work, or bear upon the bars; the tongue not being ſo ſenſible as the bars: though the like effect is ſometimes owing to the thickneſs of his lips. A horſe is ſaid to have no Appui, when he dreads the bit-mouth, is too apprehenſive of the hand, and cannot bear the bit. He is ſaid to have too much Appui, when he reſts or throws himſelf too much, too hardily upon the bit. Horſes, deſigned for the army, ought to have a full Appui upon the hand.

A′PUS, in aſtronomy, a conſtellation in the ſouthern hemiſphere placed near the pole, between the triangulum auſtrale and the chameleon, ſuppoſed to repreſent the bird of paradiſe. *Keil, Aſtron. lect.*

The Apus is ſuppoſed one of thoſe birds called apodes, as having no feet.

There are four ſtars of the ſixth, three of the fifth, and four of the fourth magnitude, in the conſtellation Apus.

Dr. Halley, in 1677, obſerved the longitude and latitude of the ſtars in Apus, which Hevelius, in his Prodromus, reduced, with ſome alteration, to the year 1700.

P. Noel has alſo given the places of theſe ſtars, with their right aſcenſions and declinations for the year 1687: but his obſervations differ widely from thoſe of Dr. Halley. Hevelius has repreſented the figure of Apus, and its ſtars, in his Firmamentum Sobieſcianum, according to Halley's account; Noel has done the like, according to his own account. Wolfius, with what juſtice we ſhall not pretend to ſay, gives the preference to this laſt.

APU′TTASY, in botany, a name given by the people of Guinea to a tree, a decoction of which is in great uſe among them for waſhing the mouth to cure the ſcurvy in the gums, and preſerve the teeth; the leaves of this tree ſtand very irregularly; ſometimes in pairs, ſometimes alternately, and ſometimes at ſmaller, ſometimes at greater diſtances from one another. They have ſcarce any pedicle; they are broad at the baſe, and narrow at the point; ſmooth and gloſſy above, and whitiſh and ſomewhat hoary underneath; eſpecially the large ribs, which, being obſerved againſt the light, are clouded; the largeſt leaves are two inches and a half long and about one inch broad; the tree is large and ſpreading. *Phil. Tranſ.* N°. 232.

A′QUA-FO′RTIS (*Dict.*)—The diſtillation of Aqua-fortis is as follows, viz.

Put vitriol into an earthen or iron pot: if you make a fire under it, the vitriol begins to melt and ſmoak; by increaſing the fire gradually, it thickens, and aſſumes an aſh colour. Let it be ſtirred with a twig before it becomes ſolid, till it be perfectly dry; but let it be taken as yet boiling out of the pot, for, if it grows cold therein, it will ſtick ſo faſt that you will hardly be able to get it out. Pound to a ſubtile powder three pounds weight of this calcined vitriol, and mix them well with four pounds of nitre well dried, and pulverized very fine. Put theſe together in a cucurbit, or retort, or an iron pot, and then put it in a furnace.

At firſt, let the fire be made not much greater than is neceſſary to boil water. When the recipient grows warm, continue the ſame degree of fire, till all the phlegm is expelled, which you will know from the diminution of the heat of the recipient: increaſe the fire gradually, till you ſee a few yellow vapours ariſe. Keep up the ſame fire for an hour or two, and make it ſo ſtrong as to warm the veſſels moderately. Continue this for ſome hours, and, letting the veſſels cool, pour the liquor, now emitting reddiſh fumes, out of the recipient into a glaſs veſſel, having a glaſs ſtopple: this liquor thus prepared is your Aqua-fortis.

Remarks.

1. In this operation you muſt always proportion the duration of the degrees of your fire to the quantity of the matter to be diſtilled.

2. For ſecurity's ſake, you muſt leave, in the cloſure of the recipient and veſſel that contains the matter to be diſtilled, a hole, which may be ſtopped and opened with a wooden peg: for, if you happen to exceed the juſt degree of fire, eſpecially in the beginning of the operation, the firſt and more ſubtile ſpirits, which are very elaſtic, come forth; the opening, therefore, of the hole may give them a paſſage, leſt the veſſels ſhould burſt, which would be very dangerous.

3. The better your nitre is refined, the better will the Aqua-fortis be. Avoid carefully the mixture of ſea-ſalt therewith, for the reaſon we ſhall give, when we treat of Aqua-regia.

4. There are many other ingredients uſed in the making of Aqua-fortis, ſuch as burnt allum, ſand, and the like; the reaſon whereof is, to hinder the ſpecies, which may happen not to be ſufficiently calcined, from fuming, and from breaking the veſſel with great violence. But, when theſe ſpecies are duly calcined and dried, theſe additions are quite needleſs; and, indeed, by overſwelling the maſs to be diſtilled, require veſſels of a ſize proportionable.

5. There are many other needleſs and noxious ingredients uſed by ſome in making Aqua-fortis. Theſe are blood-ſtones, unſlaked lime, plume allum, &c. all which ſhould be avoided, they making a much worſe, as well as a more expenſive Aqua-fortis. Water thus made, therefore, ſhould never be uſed in docimaſtical operations, before it has been accurately tried; for, Aqua-fortis being tainted with theſe heterogeneous matters, the major part of it conſumes away, and becomes frequently ſo fixed, that the ſtrongeſt fire is hardly able to take off any of it. Nothing ſhould be uſed beſides calcined vitriol, intimately mixed with nitre, there being no need of any thing elſe.

6. However, bole, clay, and brick-duſt expel Aqua-fortis out of nitre, which then is called the ſpiritus nitri; but you muſt add four times as much of theſe, in proportion to the nitre: conſequently, this method, requiring larger veſſels and more fire, cannot be ſo profitable, as without theſe ingredients.

7. As the extracted ſpirits of nitre are with difficulty condenſated into drops, eſpecially in ſultry weather, it will be proper, by reaſon of the calcined ingredients, to pour into the recipient one quarter part of pure water, or rather of the phlegm, extracted out of the Aqua-fortis; by which means the ſpirits will be much eaſier received.

The beſt Aqua-fortis is often tinged with a greeniſh colour, which happens if, Aqua-fortis having been expoſed ſome days to the air, and loſt its red fuming ſpirit, there be mixed with it ſome freſh ſtrong Aqua-fortis ſtill emitting its fumes, or if Aqua-fortis be diluted with water. As this colour may, however, proceed from copper diſſolved in it, to be certain that it does not, a little is to be poured into a cucurbit, and as much of ſome alcaline liquor to be added to it as will ſaturate the acid. Then, if there be ever ſo little copper in it, the colour becomes a deep blue, and there is a cloudy precipitation made, becauſe the nitre has been regenerated by this proceſs, and does not diſſolve copper, ſo much as Aqua-fortis does: but, if there be no copper in the Aqua-fortis, the colour diſappears.

The nice aſſayer, after having carefully proved this Aqua-fortis, muſt concentrate it to a certain degree; for, if too weak, it often retards the ſolution, and ſometimes does not even affect the ſilver; but this concentration is only to be in a certain degree; for, if carried too far, and the Aqua-fortis made too ſtrong by it, it vaniſhes into fumes, which ruſh violently out of the receiver, or veſſel the ſolutions are made in, though ſufficiently high, and carries away a part of the ſilver with it in vapours; and if there is any thing of gold in the ſilver, it will be corroded into a fine duſt, which it proves very difficult afterwards to collect together. *Cramer's Art of Aſſaying.*

When Aqua-fortis is too weak, it is to be put into a deep cucurbit, and the watery part is to be drawn from it, by a gentle fire, till yellow fumes begin to ariſe. To find out whether it be too ſtrong, the following method is to be uſed: melt together one part of gold, and four parts of ſilver; of this make a flat plate, which cut into three or more parts; roll up up each part, that it may be conveniently put into the neck of a cucurbit: when rolled up, and gently heated at the fire, put it into a cucurbit, pour upon it three times its weight of Aqua-fortis, and ſet it into a gentle heat: if the ſilver be eroded from the gold, and the gold retain the ſame figure of a piece of plate rolled up, and there appear no reddiſh duſt at the bottom of the veſſel, then the Aqua-fortis has its proper degree of ſtrength: but, if the diſſolution has been made with ſo much violence, that the gold was eroded, or the plate almoſt broken, then the Aqua-fortis was too ſtrong.. It muſt then be diluted with a tenth, or an eighth part, of Aqua-fortis phlegm; or, if that is not at hand, with the ſame quantity of common water. This done, the trial is to be repeated, by the diſſolution of a like plate rolled up; and this ſeveral times over, till the ſilver be diſſolved, without the leaſt diminution of the gold. By this the aſſayer is aſſured of a due degree of ſtrength in his menſtruum, for all the purpoſes he requires it for. *Cramer's Art of Aſſaying.*

AQUA MARINA, (*Dict.*)— This precious ſtone, is of a colour compounded of green and blue, nearly reſembling that of ſea-water, from whence the name.

It ſeems very probable that the ancients knew it under the name of the beryl-ſtone; for Pliny obſerved that the moſt beautiful beryls were thoſe that imitated the colour of ſea-water; he likewiſe diſtinguiſhes ſeveral ſorts of beryls, which bear no reſemblance with our Aqua marina; as the chryſoberyls, which were of a golden colour. Whatever the ancients called the Aqua-marina, we are now to endeavour to find out a ſure means to diſtinguiſh this precious ſtone from all others. The colour being a mixture of green and blue, we cannot confound it either with green or blue ſtones as the emeralds and the ſaphires: for if we ſuppoſe the emerald of a pure green without any tincture of blue, and the ſaphire blue as indigo, and free from any tincture of green, we may eaſily diſcover that all ſtones, compounded of a green and blue, can neither be emeralds nor ſaphires. This mixture of an emerald-colour with that of a ſaphire, that is, of green and blue, deſcribes ſo well the Aqua marina, that it ſeems impoſſible to be miſtaken. Not but that there are ſome of theſe ſtones, where the green is more predominant than the blue; as well as others, where the blue is more powerful than the green. Theſe ſtones are very different from each other, with reſpect to their hardneſs. The oriental are reckoned the hardeſt, and bear the fineſt poliſh; and, conſequently, are more beautiful, more ſcarce, and dearer than the occidental.

The moſt beautiful Aqua marina's come from the Eaſt-Indies; and it is ſaid that ſome of them are found on the borders of the Euphrates and at the foot of Mount Taurus. The occidental ones come from Bohemia, Germany, Sicily, the Iſle of Elba, &c. And it has been affirmed that ſome of them have been found on the ſea-ſhore.

AQUA-*Regia* (*Dict.*)—This menſtruum is made in the following manner:

Take one pound of common ſalt: melt it in a clean crucible, or iron ladle: pour it out into an iron mortar; and when cold, break into little bits of the ſize of peaſe. Put theſe into a retort, and pour upon them twice their weight of good Aqua-fortis. Set the retort in a ſand-furnace; lute on a recipient, and apply a gradual fire, till no more liquor drops from the noſe of the retort.

An Aqua-regia may likewiſe be made, by mixing one part of ſpirit of ſalt with three of Aqua-fortis; or by diſſolving the ſame quantity of ſal armoniac in it: but this ſhould be done ſlowly, and by degrees; otherwiſe great quantity of offenſive fumes will ariſe.

Aqua-regia diſſolves perfectly iron, copper, tin, gold, mercury, regulus of antimony, biſmuth, and zink. It even diſſolves lead more than ſpirit of ſalt does; however, it becomes ſomewhat troubled in the operation. If it has its requiſite degree of ſtrength, it does not diſſolve ſilver: but if you have put in the mixture a quantity of ſal-armoniac, or of marine ſalt, or of ſpirit of common ſalt, not ſufficient, it then corrodes ſilver, nay, it even diſſolves it in part, this Aqua-regis being imperfect.

The reaſon is then ſelf-evident, why, in the ſeparation of ſilver and gold by Aqua-regia, it is better to uſe a quantity of ſpirit of ſalt, or of marine ſalt, or of ſal armoniac, exceeding, than one ſhort of the right meaſure. Nor is it leſs evident thence, why an exact ſeparation of ſilver and gold is better effected with Aqua-fortis than with Aqua-regia; as the former never corrodes gold, whereas the latter corrodes ſilver frequently.

AQUIFO'LIUM, *the holly-tree*, in botany, a genus of trees, whoſe characters are:

The leaves are ſet about the edges with long ſharp ſtiff prickles: the berries are ſmall, round, and, for the moſt part, of a red colour, containing four triangular ſtriated ſeeds in each.

Botanical authors enumerate thirty-three ſpecies of this tree.

Theſe trees were formerly in much greater requeſt than at preſent, and there was ſcarcely a ſmall garden of any worth, but was filled with theſe trees, which were clipped either into pyramids, balls, or ſome other figures; but as this was crouding a garden too much with one ſort of plant, and the faſhion of clipping greens going off, they are now almoſt wholly neglected: ſuch are the changes in men's tempers and fancies, that what is one year eſteemed, is the next deſpiſed.

The manner of raiſing the common hollies, is, by ſowing the berries, which, if ſown as ſoon as ripe, will lie two years in the ground, that is, until the ſpring-twelvemonth after; you may therefore mix the berries with dry ſand, and put them in a large garden-pot, burying it in the ground till next Auguſt or September; and take them out, and ſow them on a bed of common earth, covering the ſeeds about a quarter of an inch with light mould, and the ſpring following the plants will appear above-ground: but as this is a tedious method, and the young plants making but ſmall progreſs for the two or three firſt years, I would rather adviſe, the purchaſing of young ſtocks, of about three or four years growth, of ſome nurſery-men, who raiſe them for ſale, and theſe will be fit to bud or graft the ſecond year after they are planted; or you may purchaſe ſuch young plants, of ſeveral kinds, as have been budded or grafted two years, which are generally ſold very reaſonably in the nurſeries; than to hazard the budding them yourſelf, eſpecially if you are not ſure of being provided with cuttings very near you.

Hollies are alſo planted for hedges, and have been by ſome very much eſteemed for that purpoſe; but the leaves being very large, when theſe hedges are clipped, they are generally cut in pieces, and appear very ragged; otherwiſe they make a very durable ſtrong hedge, and very proper for an outſide fence of a green-garden.

The great variety of variegated hollies, which were ſo much cultivated in the nurſeries ſome years ago, and were ſold for large prices, are now almoſt entirely neglected, few perſons caring to plant them in their gardens; nor indeed are they ſo beautiful as the common green holly, which is alſo much more hardy than the variegated ſorts, which in ſevere winters are often greatly injured, and ſometimes killed, by froſt.

The Dahoon holly is a native of Carolina, from whence the plants have been procured. This ſort hath ſmooth ſhining-green leaves, which are a little indented on their edges; the leaves are as large as thoſe of the bay-tree, and its having a beautiful green renders it one of the beſt kinds of ever-green trees: the berries are produced in large cluſters cloſe to the branches, which are of a bright red colour, and make a fine appearance when they are ripe. *Miller's Gardener's Dictionary.*

A'QUILA, *the eagle*; the general characters of theſe birds are, that they are birds of prey, flying about in the day-light, not like the owl kind in the night, very large in ſize, extremely bold and fierce, and have beaks growing crooked, immediately from their inſertion at the head. The eagle differs from the hawk in ſize, and from the vulture in the crookedneſs of his whole beak. *Willoughby's Ornithol.* See *Plate* IV. *fig.* 27.

AQUILA *marina*, the ſea-eagle, in ichthyology, the name of a ſpecies of cartilaginous flat-fiſh, of the paſtinachia marina kind. It is generally found ſmall, but ſometimes grows to a very large ſize. Its head is large for a fiſh of this genus, and ſomewhat reſembles a toad's in ſhape; its eyes are large and prominent: its mouth is placed in the under part of the head, and is large, and furniſhed with ſtrong teeth. It ſides are broad and thin, and repreſent the expanded wings of an eagle, whence it had its name. *Salvian de Aquat.* See *Plate* IV. *fig.* 28.

AQUILE'GIA, in botany. See COLUMBINE.

ARABE'SQUE, or ARABESK, ſomething done after the manner of the Arabians.

A'RABIC, *Arabicus*, ſomething that relates to Arabia, or the Arabs.

ARABIC, or ARABIC *Tongue*, is a branch or dialect of the Hebrew.

Father Angelo de St. Joſeph ſpeaks much of the beauty and copiouſneſs of the Arabic. He aſſures us it has no leſs than a thouſand names for a ſword; five hundred for a lion; two hundred for a ſerpent; and eighty for honey.

ARABIC *Figures* (*Dict.*) — The origin of theſe characters, has been a ſubject of diſpute in the republic of letters.

The learned are generally of opinion, that the Arabic figures were firſt taught us by the Saracens, who borrowed them from the Indians. Scaliger was ſo ſatisfied of their novelty, that he immediately pronounced a ſilver medallion, he was conſulted about, modern, upon his ſeeing of the numeral figures 2 3 4; 2 3 5, on it. The common opinion is, that Planudes, who lived towards the cloſe of the thirteenth century, was the firſt Chriſtian who made uſe of them. Father Mabillon even aſſures us, in his work de Re Diplomatica, that he has not found them any where earlier than the fourteenth century.

Yet Dr. Wallis inſiſts on their being of a much older ſtanding; and concludes they muſt have been uſed in England, at leaſt as long ago as the time of Hermannus Contractus, who lived about the year 1050; if not in ordinary affairs, yet at leaſt in mathematical ones, and particularly aſtronomical tables. *Vid. Wall. Algebr.*

The ſame author gives us an inſtance of their antiquity in England, from a mantle-tree of a chimney in the parſonage houſe of Helmdon in Northamptonſhire, wherein is the following inſcription in baſſo relievo, M°. 133, being the date of the year 1133. *Philoſ. Tranſact.* N°. 255.

Mr. Luffkin furniſhes a yet earlier inſtance of their uſe, in the window of a houſe, part of which is a Roman wall, near the market-place in Colcheſter; where between two carved lions ſtands an eſcutcheon, containing the figures 1090. *Philoſ. Tranſact.* N°. 255.

Mr. Huet is even of opinion, that theſe characters were not borrowed from the Arabs, but from the Greeks; and that they were originally no other than the Greek letters, which we all know that people made uſe of to expreſs their numbers by.

ARA'BIAN *Philoſophy*, or *the ſtate of philoſophy among the ancient* ARABIANS. Authors of great antiquity inform us, that the ancient Arabians applied themſelves very much to philoſophy, and diſtinguiſhed themſelves by a peculiar and ſuperior ſagacity: but all they ſay on this head ſeems very uncertain. Indeed, after Iſſamim, learning and the ſtudy of philoſophy were greatly eſteemed among this people; but this has no place in hiſtory till we come to the philoſophy of the middle age; and, conſequently, proves nothing with regard to the philoſophy of the ancient inhabitants of Arabia Felix.

Some men of letters have aſſerted, that the ancient Arabs applied themſelves to philoſophical ſpeculations; and to maintain their opinion, raiſe imaginary ſyſtems which they attribute to them, and draw in the religion of the Sabeans to their aid, which they pretend to have been the offspring of philoſophy. But all they advance in favour of this opinion, is founded on aſſertions and conjectures; and what are theſe where proof and teſtimony are wanting? They are even forced to acknowledge, that the Greeks were of another opinion, looking on them as a moſt barbarous and ignorant people without the leaſt tincture of learning. If credit may be given to Abulfaragius, the Arabian writers themſelves confeſs, that before Iſſamim they were ſunk into the deepeſt ignorance. But theſe reaſons do not ſeem ſtrong enough to thoſe on the other ſide of the queſtion, to induce them to retract their opinion of the philoſophy they attribute to the ancient Arabs. The contempt the Greeks expreſs for this nation, ſay they, proves the pride of the Greeks, not the barbarianiſm of the Arabians. But what authority can they produce, or what writers can they quote, in favour of their opinion concerning the philoſophy of the ancient Arabians? They agree with Abulfaragius, that there are none; this opinion therefore ſtands on a very weak foundation. Joſeph Peter Ludewig has ſignalized himſelf moſt in this diſpute, and ſeems to have had the honour of the ancient Arabians very much at heart. He ſets out in this manner: "Pythagoras, ſays he, as Porphyry relates, in his travels to improve his learning, did the Arabians the honour of a viſit; ſtaid ſome time among them, and learned of their philoſophers divination by the chirping and flight of birds; an art in which they excelled. Moſes himſelf, inſtructed in all the learning of the Egyptians, choſe Arabia for a retreat in his exile, preferable to other countries. Can one imagine the great legiſlator of the Hebrews would have choſe this retreat, if the people had been barbarous, ſtupid, and ignorant? Beſides, their origin leaves no room to doubt of the improvement of their mind: they boaſt of their lineage from Abraham, whom no one can deny to have been a great philoſopher. By what ſtrange accident is that ſpark of philoſophic ſpirit extinguiſhed which they inherited from their common father Abraham? But what appears yet a ſtronger argument, is this, that the holy writings, to give a more exalted idea of Solomon's wiſdom, place it in oppoſition to the wiſdom of the wiſe men of the Eaſt; which is certainly Arabia. From this ſame Arabia came the queen of Sheba to admire the wiſdom of the philoſopher, inveſted with a diadem; this has been the conſtant opinion of all men of erudition. It is eaſy to prove that the Magi who came out of the Eaſt to worſhip our Saviour, were Arabians. In ſhort, Abulfaragius is obliged to agree, that, before the time of Iſſamim, to whom the revival of learning in that country is owing, they were perfect maſters of their own language, good poets, excellent orators; and able aſtronomers. Is not this enough to give them a right to the title of philoſophers"? No, it may be replied, the Arabians might have poliſhed their language, have ſucceeded in compoſition, have been ſkilful in the ſolution of riddles, and interpretation of dreams; nay, though it be admitted they had ſome knowledge of the courſes of the ſtars, it will not follow they were philoſophers; for all theſe arts, if they merit the name, tend more to increaſe and encourage ſuperſtition, than to diſcover truth, or diveſt the ſoul of the paſſions which enſlave it. As to what concerns Pythagoras, nothing is more uncertain, than whether he travelled into the Eaſt or no: but, admitting he did, what are we to conclude, but that he learned from the Arabians all thoſe ſuperſtitions and extravagant notions he was ſo extremely fond of. It is needleſs to quote Moſes here; if this great man went into that country, and ſettled there, by marrying one of Jethro's daughters; it certainly was not with a deſign of ſtudying and incouraging them in their fooliſh curioſity in philoſophical ſyſtems. Providence permitted this retreat of Moſes among the Arabians, to carry among them the knowledge of the true God, and his religion. The philoſophy of Abraham, from whom they boaſt their deſcent, by no means proves their having cultivated this ſcience. Abraham might have been their primogenitor, and a great philoſopher; but their philoſophy is no neceſſary conſequence of this. If they loſt the thread of thoſe moſt valuable truths they had learned from Abraham; if their religion degenerated into groſs idolatry; why might not their philoſophy, admitting Abraham to have taught it them, have been loſt alſo, in courſe of time? Beſides, it is not certain that theſe people deſcended from Abraham. This is a traditionary tale, that ſeems to have taken birth with Mahometaniſm. The Arabians, like the Mahometans, to give the ſanction of authority to their errors, have pretended to deduce their origin from the father of the faithful. Another thing that overturns Ludewig's hypotheſis, is, that Abraham's philoſophy is a mere device of the Jews, who would fain perſuade us that the origin of all arts and ſciences is to be found among them. What they ſay in ſupport of the queen of Sheba's coming to viſit Solomon on the fame of his wiſdom, or of the wiſe men who came out of the Eaſt to Jeruſalem, will prove nothing more than has been advanced before. Let it be granted this queen was born in Arabia; is it proved ſhe was of the ſect of the Sabians? No one will pretend to deny her to have been the moſt expert and ſagacious woman of her time, and that ſhe frequently puzzled all the kings of the Eaſt with her wiſe queſtions; becauſe the ſacred writings has given this account of her. But what has this to do with the philoſophy of the Arabians? We acknowledge very freely, that the Magi who came out of the Eaſt were Arabians; that they were not without ſome knowledge of the courſes of the ſtars; we do not abſolutely exclude the Arabians from this ſcience, but admit they ſpoke their native language well; ſucceeded in ſome works of invention, as oratory, and poetry; but we are not to infer from hence that they were philoſophers, and had applied themſelves ſtrongly to the cultivation of this part of literature.

A ſecond argument in favour of the philoſophy of the ancient Arabians, and which is urged as a very forcible argument too, is the hiſtory of Sabianiſm, which neceſſarily implies philoſophical knowledge, ſuppoſing all to be true which is ſaid about it. We cannot conclude any thing from thence in favour of this opinion: for Sabianiſm is in itſelf a mixture of ſhameful idolatry and ridiculous ſuperſtition; much more likely to ſubvert and extinguiſh reaſon, than propagate true philoſophy; beſides, it is not agreed in what age this ſect firſt appeared. Men of the greateſt eminence for learning, who have laboured to give light to this paſſage in hiſtory, as Hottinger, Hyde, Pocock, and eſpecially the learned Spencer, confeſs that there is no mention made of this ſect either by the Greeks or Romans.

We muſt take care not to confound theſe Sabians of Arabia with thoſe mentioned in the annals of the ancient eaſtern church, which were half Jews, half Chriſtians; and boaſted of being the diſciples of St. John the Baptiſt; great numbers of which, even to this day, inhabit the city of Baſſora, near the banks of the Tigris, and the neighbourhood of the Perſian ſea. The famous Moſes Maimonides has extracted a large account of this ſect from the Arabic writers, and by examining their extravagant and ſuperſtitious ceremonies with attention, has very ingeniouſly juſtified the laws of Moſes in general; which at firſt might give offence to delicacy, if the wiſdom of thoſe laws was not ſhewn by their oppoſition to the laws of the Sabians. A ſtronger barrier could not be put between the Jews and Arabians, who were their neighbours. On this ſubject conſult Spencer's Oeconomy of Moſes.

The name of this ſect is no leſs a point of controverſy than its age; Pocock aſſerts they were ſo called from צבא, which in Hebrew ſignifies the ſtars or hoſts of heaven; becauſe the religion of the Sabians conſiſted principally in the adoration of the ſtars. But Scaliger thinks, that this name was originally given to the Chaldeans, becauſe they were orientals.

He has been followed in this opinion by many men of learning, and, among others, by Spencer. This ſignification of the word Sabian ſeems ſo much more plauſible, becauſe the Sabians pretend to draw their origin from the Chaldeans, and make Seth the founder of their ſect. But it ſeems very indifferent which ſide of the queſtion is taken, in a matter of ſo little importance. If we mean, by the Sabians, all thoſe people of the Eaſt, who worſhipped the ſtars; which ſeems to be the opinion of ſome Arabian as well as Chriſtian writers; the name cannot properly be applied to any particular ſect, but to all thoſe who were guilty of idolatry. But it ſeems this name has always been thought to denote a particular ſect. We do not ſee it given to all the people who joined the worſhip of fire to the adoration of the ſtars. If we might venture to attempt removing this darkneſs diffuſed over the hiſtory of the Sabians in general, by the light of conjecture, it ſeems probable that Sabianiſm is nothing but a mixture of judaiſm and paganiſm; that among the Arabians it was a particular religion diſtinct from all others; that its profeſſors, to exalt themſelves above every other ſect that flouriſhed in their time, not only affected to be very ancient, but carried back their origin even as high as the ſon of Seth: in which they affected to excel the Jews, who pretended to go no farther back than Abraham. We cannot think them to have been called Sabians, on account of their being orientals; becauſe the Magi and Mahometans, who inhabit the eaſtern parts of Aſia, have never been called by this name. Whatever be the original of the Sabians, this is certain, it is by no means ſo ancient as the Arabians pretend. Nay, they are far from being agreed among themſelves, on this ſubject; ſome go back as far as Seth, others are contented to ſtop at Noah, and ſome even at Abraham. Eutycheus, an Arabian author, on the credit of the traditions of his country, maintains Zoroaſter to have been the author of this ſect, who was born in Perſia, or perhaps in Chaldea; though Eutycheus obſerves, ſome of his contemporaries gave Juvan the honour of having been their founder (he doubtleſs means Javan) that the Greeks very eagerly embraced this opinion, becauſe it flattered their pride, Javan having been of their kings; and that, in order to ſpread this doctrine, they had compoſed ſeveral books on the ſcience of the ſtars, and the motions of the celeſtial bodies. Some were even of opinion, that the founder of the ſect of the Sabians was one of thoſe employed in building the tower of Babel. But by what is all this ſupported? If the ſect of the Sabians be as ancient as they pretend, why have not the Greeks mentioned it? Why do we read nothing in ſcripture concerning it? To anſwer this objection, Spencer thinks it ſufficient to ſay, that Sabianiſm, conſidered as a religion which teaches the worſhip of the ſun and ſtars, took its origin from the ancient Chaldeans and Babylonians, and preceded the time of Abraham many ages. This he endeavours to prove from the teſtimonies of the Arabians, who all concur in the antiquity of Sabianiſm, and from the ſimilarity between the doctrines of the Sabians and Chaldeans. But the queſtion is not whether the worſhip of the ſun and ſtars be very ancient, no doubt it is; as we ſhall ſhew under the article CHALDEANS. The difficulty conſiſts in knowing whether the Sabians received this worſhip in ſuch a manner from the Chaldeans and Babylonians, that we may be aſſured Sabianiſm firſt took its birth among theſe people. If we obſerve ſtrictly, Sabianiſm will be found not only to conſiſt in the worſhip of the ſun, ſtars, and planets; but alſo to contain a form of ceremonies particular to itſelf, which diſtinguiſh it from any other religions; and, when we conſider this, its antiquity cannot be maintained. Spencer himſelf, ſubtil as he is, and refined in his reaſonings, has been forced to agree that Sabianiſm, conſidered religiouſly, that is, with regard to its forms and ceremonies, contains many things much more modern than the ancient Chaldeans and Babylonians. This, however, he ought to have proved at his firſt ſetting out, for if Sabianiſm, conſidered in this light, betrays a want of antiquity to carry it back beyond Abraham: how will he prove that ſeveral laws of Moſes were eſtabliſhed by divine authority in direct oppoſition to the ſuperſtitious ceremonies of Sabianiſm?

There is no ſect without books, to ſupport its particular opinions; and we find the Sabians had theirs, which were attributed to Hermes and Ariſtotle by ſome, to Seth and Abraham by others. Theſe books, according to the account of Maimonides, contained a heap of ridiculous ſtories relating to the old patriarchs, Adam, Seth, Noah, and Abraham; in a word, like the fables of the Alcoran. They treated at large of dæmons and idols, the ſtars and planets, the culture of the vine, the ſowing of corn, and every thing that concerned the worſhip paid to the ſun, the fire, the ſtars, and planets. Any one, curious of theſe matters, may conſult Maimonides. We ſhould tire the reader to trouble him with ſuch ridiculous fables. This reaſon is ſufficient for us to condemn theſe books as apocryphal, and unworthy of credit. Indeed, they ſeem to have been compoſed about the birth of Mahomet, and by authors who had a tincture of idolatry, and the follies of modern Platoniſm.

The abſurd notions of the Sabians will appear beſt by quoting ſome of their opinions; they held the ſtars were ſo many deities, whereof the ſun was chief. Theſe they celebrated with two kinds of worſhip, one performed every day, another every month; they worſhipped dæmons under the form of he-goats; fed on the blood of the ſacrifices which yet they held in abomination, thinking, by that means, they ſhould have a more intimate intercourſe or communication with the dæmons; they paid adoration to the riſing ſun, with a ſtrict obſervance of ceremonies; a moſt ſurpriſing contraſt of which we ſee, in general, throughout the whole law of Moſes; for God, according to ſome learned men, choſe to give the Jews laws directly oppoſite to thoſe of the Sabians, in order to turn the former from the extravagant ſuperſtitions of the latter.

The Arabian philoſophy, before Mahomet, was, therefore, entirely Sabian, and included the ſyſtem and ceremonies of that ſect of idolaters. This it was that Mahomet ſet himſelf to decry; and he is even ſaid by ſome to have carried his oppoſition ſo far, as to prohibit, if not puniſh, all ſtudy of philoſophy. But his followers, by degrees, got over this reſtraint; the love of learning increaſed; till, under the memorable caliphate of Al-Mamon, Ariſtotle's philoſophy was introduced and eſtabliſhed among them; and from them propagated, with their conqueſts, through Egypt, Africa, Spain, and other parts. Avicenna only flouriſhed in the eleventh century, and Averrhoes a hundred years after him; ſo that the honour of tranſlating the Greek philoſophy, by many attributed to theſe authors, is not juſtly due to them: though they were the chief propagators of it through the counties of Europe.

Their method of philoſophiſing was faulty; they followed Ariſtotle implicitly, and, in aſtrology, run into ſtrange ſuperſtitions. They founded ſchools and academies, gave themſelves much to ſubtilties and diſputation, and divided into ſeveral ſects.

As they choſe Ariſtotle for their maſter, they chiefly applied themſelves to that part of philoſophy called λογικη, and thus became proficients in the knowledge of words, rather than things. Whence they have been ſometimes denominated maſters of the wiſdom of words, ſometimes the talking ſect. Their philoſophy was involved in quaint arbitrary terms and notions, and their demonſtrations drawn from thence, as from certain principles, &c.

Arabian *Poetry*, may be divided into two ages. The antient, according to Voſſius, was no other than rhiming; was a ſtranger to all meaſure and rule; the verſes looſe and irregular, confined to no feet, number of ſyllables, or any thing elſe, ſo they rhimed at the end; oftentimes all the verſes in the poem ended in the ſame rhime. It is in ſuch verſe that the alcoran is ſaid to be written.

The modern Arabian poetry takes its date from the caliphate of Al-Raſchid, who lived towards the cloſe of the eighth century: under him poetry became an art, and laws of proſody were laid down: but in this there is no proper diſtinction of long and ſhort ſyllables, but the whole depends on rhime, a certain number of letters, and in the obſervation of certain cæſuræ, which are found, by carefully diſtinguiſhing the moveable conſonants from the quieſcent. A ſyllable to which a quieſcent letter is added at the end, becomes long by poſition, as that where this is wanting, becomes ſhort by poſition. *Bibl. Univ. t. 9. p. 231. & ſeq. Clark, Proſod. Arab. c. 1.*

Samuel Clark has publiſhed an expreſs treatiſe on the Arabic proſody.

Renaudot adds, that the Arab compoſitions in verſe are ſtill wild and irregular, being neither epic, dramatic, lyric, or reducible to any other kind. Their hymns to God, and their tales and jocular ſtories, are in the ſame ſtyle.

Their compariſons, in which they abound, are taken, with little choice, from tents, camels, hunting, and the antient manners of the Arabs.

Arabian *Logic*, was that of Ariſtotle, as explained by Avicenna and Averrhoes. Thoſe commentators had taken immenſe pains to illuſtrate their author; but the latter being born in Spain, and both of them utterly unacquainted with the Greek tongue, they had nothing but a faulty mutilated tranſlation to go by, which frequently miſrepreſented the author's real ſenſe, ſo that it is no wonder they made no greater advances in the art.

Arabian *Phyſic*, and *Phyſicians*, ſucceeded the Grecian, and handed down the art to us, having made conſiderable improvements, chiefly in the pharmaceutical and chemical parts.

Schelhammer obſerves, that, beſides a number of obſervations relating to the cauſes and hiſtory of diſeaſes, they greatly enlarged the liſt of ſimple medicines, adding much to the advantage of the practice of phyſic. It is certain, we owe to them moſt of our ſpices and aromatics, as nutmegs, cloves, mace, and other matters of the produce of India. We may add, that moſt of the gentler purgatives were unknown to the Greeks, and firſt introduced by the Arabs, as manna, ſena, rhubarb, tamarinds, caſſia, &c. It was they, likewiſe, who brought ſugar into uſe in phyſic, where, before, only honey was uſed. They alſo found the art of preparing waters and oils, of divers ſimples, by diſtillation and ſublimation.

The firſt notice of the ſmall-pox, and the meaſles, is, likewiſe, owing to them. Laſtly, the reſtoration of phyſic in Europe took its riſe from their writings.

ARACHNOI'DES, in natural hiſtory, the name of one of the genera of the echini marini, the diſtinguiſhing characters of which are, that it is of a circular circumference, but variouſly broken in at the edges. The mouth is round and placed in the center of the baſe, and the aperture for the anus is quadrangular, and ſituated in one of the ſides, on the upper ſuperficies, but near the edge. *Klein*, *Echin.* See *plate* IV. *fig.* 29.

ARA'CHIS, earth, or ground-nut, in botany, a genus of plants, whoſe characters are: it has a pea-bloom flower; the empalement is divided into two parts; the flower is ſucceeded by a rough cylindrical pod, containing one or two cylindrical ſeeds. We have but one ſpecies of this plant, viz. Arachis. Lin. The native country of this plant, I believe, is Africa, though, at preſent, all the ſettlements of America abound with it; but many perſons, who have reſided in that country, affirm, they were originally brought with the ſlaves from Africa there, where they have been ſpread all over the ſettlements.

It multiplies very faſt in a warm country; but, being impatient of cold, it cannot be propagated in the open air in England; therefore, whoever has an inclination to cultivate this plant, muſt plant the ſeeds on an hot-bed in the ſpring of the year, keeping it covered with glaſſes till the end of June; after which time, if the weather proves warm, they may be expoſed to the open air. The branches of this plant trail upon the ground; and the flowers (which are yellow) are produced ſingle upon long footſtalks; and, as ſoon as the flower begins to decay, the germen is thruſt under-ground, where the pod is formed and ripened; ſo that, unleſs the ground is opened, they never appear; the negroes keep this a ſecret among themſelves, therefore could ſupply themſelves with theſe nuts unknown to their maſters. The roots of theſe plants are annual; but the nuts under-ground ſufficiently ſtock the ground in a warm country, where they are not very carefully taken up. In South Carolina there are great plenty of theſe nuts, which the inhabitants roaſt, and make uſe of as chocolate.

This was, by former botaniſts, called arachidna; and by ſome it hath been ranged with the vetches. *Miller's Gard. Dict.*

ARBITRA'TION, in matters of the foreign exchange, is the moſt beneficial, as well as moſt delicate, branch of exchange, to be thoroughly informed of.

Before any one applies himſelf to the ſtudy of this ſubject, it is neceſſary that he ſhould be well ſkilled in all the practical operations, in regard to the reducing of the ſterling money of England into the foreign monies of exchange, and of account of all places throughout Europe, according to the direct courſes of exchange, eſtabliſhed for theſe purpoſes, and vice verſâ. Alſo,

2. That he ſhould be acquainted with the methods of converting ſterling money into the monies of exchange, and of account of all other places of commerce, wherewith England has no direct eſtabliſhed courſes of exchange, but is under the neceſſity of making uſe of the intermediate exchange of other places: together with the nature of the agios, and the manner of converting their bank monies into current, and the reverſe.

3. The manner of calculating all the foreign monies throughout Europe into thoſe of every other diſtinct country, either according to the direct, or intermediate exchange; which makes a much greater variety of caſes, than thoſe, who are not thoroughly acquainted with this extenſive ſubject, can imagine. See EXCHANGE, *Dict.* and *Sup.*

4. It is previouſly neceſſary, alſo, to the entering upon a knowledge of the Arbitration of exchanges, to know the intrinſic value of foreign monies, according to the moſt accurate aſſays, which have been made for that purpoſe.

5. Laſtly, It is requiſite to underſtand the general natural cauſes of the riſe and fall of the courſe of exchange between nation and nation, or between one trading city and another in the ſame nation.

That I may communicate my meaning with the greater perſpicuity, it may be proper, for the ſatisfaction of others, as well as practical merchants and remitters, to premiſe, that as the advantages to be made by underſtanding how to arbitrate the exchange at all times, and in reſpect to all places, depend on the general riſe and fall of the prices of exchange between one nation and another; ſo that riſe and fall depends on the balance of trade being either in favour, or againſt a nation.

That the courſe of exchange is the criterion of the balance of trade, has been allowed, not only by great ſtateſmen and ſpeculative politicians, but by the moſt ſkilful and ſagacious practical traders.

As this matter is put in a very rational and familiar light by thoſe able and diſtinguiſhed merchants of the city of London, who were inſtrumental, in conjunction with the late ever memorable earls of Halliſax and Stanhope, in defeating the French treaty of commerce, in the year 1712; I ſhall quote their reaſoning upon this point, from the Britiſh Merchant. In conſequence of which, the practical Application of the intricate ſubject under conſideration, will appear the more intelligible:

'Suppoſe, ſay they, the tenant in Wiltſhire is to pay for rent 100 l. to his landlord in London; and the woollen-draper in London is to pay the like ſum to his clothier in Wiltſhire: both theſe debts may be paid, without tranſmitting one farthing from one place to the other, by bills of exchange, or by exchanging one debtor for the other, thus: that is, the tenant may receive the landlord's order to pay 100 l. to the clothier in the country; and the woollen-draper may receive his clothier's order to pay the like ſum to the landlord in town.

Theſe two orders are properly called bills of exchange; the debts are exchanged by them; that is, the woollen-draper in town, inſtead of the tenant in the country, is become debtor to the landlord; and the tenant in the country, inſtead of the woollen-draper in town, is become debtor to the clothier: and, when theſe orders are complied with, the two debts between London and the country are diſcharged, without ſending one ſhilling in ſpecie from the one to the other.

In like manner, a warehouſe-man in London is indebted 100 pounds for ſtuffs to the weaver in Norwich; and the linen-draper in Norwich is indebted in the like ſum to the Hamburgh merchant in London; both theſe debts may be paid by bills of exchange; or by the exchange of one debtor for the other, by placing one debtor in the other's ſtead; that is, the warehouſe-man may receive the order of his weaver, to pay 100 l. to the Hamburgh merchant; and the linen-draper may receive the order of the Hamburgh merchant, to pay the like ſum to the weaver.

Theſe orders are bills of exchange; the debtor in one place is changed for the debtor in another: and thus both debts may be paid, without ſending one ſingle ſhilling in ſpecie, from the one city to the other.

But, if the debts due from both places are not equal, then only the ſame quantity of debts on both ſides can be paid by bills of exchange The balance muſt be ſent in money from the city, from whence the greateſt ſums are due. For example:

If, by the trade between London and Norwich, the former owes 10,000 l. to the latter, and the latter no more than 9000 l. to the former; it is manifeſt, that only the debts of 9000 l. on each ſide can be diſcharged by bills of exchange; the balance of 1000 l. muſt be ſent either from London, or ſome other place indebted to London, to even the account between both the cities.

Let us ſuppoſe then, that to ſend and inſure 1000 l. in ſpecie to Norwich would coſt 5 l. or 10 s. per cent. which of the debtors in London would be willing to be at this charge: it is natural to believe, that every one will endeavour to ſhift it off from himſelf, that every one will endeavour to pay his money by a bill of exchange; it is natural to believe that every one, rather than ſtand the coſt and hazard of ſending 100 l. in ſpecie, would pay 100 l. 5 s. in London for a debtor in Norwich, upon condition that the Norwich debtor ſhould pay an 100 l. for him in that city.

By which means the Norwich debtor would pay his debt of 100 l. in London with leſs than that ſum, while the London debtor would be obliged to give more than that ſum for the payment of an 100 l. in Norwich. And, if ſuch for years together were the courſes of exchange between London and Norwich, there could be no queſtion to which of the two cities a ſum muſt be ſent in ſpecie to pay the balance; that city undoubtedly pays the balance, that gives more than the par; that undoubtedly receives the balance, that gives leſs than the par for bills of exchange.

The courſe of exchange, in this caſe, would ſufficiently decide that the balance of trade is on the ſide of that city, that procures bills of exchange upon the moſt eaſy terms.

I have taken examples from two Engliſh cities, where the money is of the ſame denomination, and the ſame quantities are equally at par in both. But the caſe is the very ſame between two cities, where the denominations of the money are different, as long as any certain quantity of money in the one can be reduced to a par or equality with any certain quantity of money in the other.

For example, the old French crown was juſt equal or par to 54 pence Engliſh; and 444$\frac{4}{9}$ of theſe crowns were juſt par or equal to an 100 l. ſterling; every farthing given more or leſs than 54 d. for a crown, in a bill of exchange between London and Paris, amounts to 9 s. 3 d. upon 444 crowns, or upon ſo many times 54 pence.

Suppoſe then the courſe of exchange between London and Paris ſtood thus heretofore. If a man in Paris, indebted to London, paid a farthing leſs than the par for a bill of exchange upon London to pay 54 d. there; the Pariſian paid his debt to London of 100 l. by a bill of exchange that coſt him in Paris 9 s. 3 d. leſs than that ſum: and if a merchant in London gave a farthing more than the par for a bill of exchange upon Paris, to pay a French crown, the Londoner gave 9 s. 3 d. more than 100 l. for a bill of exchange, to pay that ſum in Paris.

If ſuch was the courſe of exchange between London and Paris; if the firſt gave above the par, and the ſecond leſs than par, for bills of exchange to pay their reſpective debts, there can be no doubt that bills of exchange were more eaſily to be had at Paris than at London; and, conſequently, that greater ſums were due from the latter than the former; and that we paid a balance upon our trade to that kingdom. And, as the price roſe here to a penny or two pence above the par, or fell there ſo much below it, it ſhewed ſo much the greater ſcarcity here, and the greater plenty there of bills of exchange; and that ſo much the greater balance of bullion was going hence, by means of our trade to that country'.

ARBU'TUS, *the Strawberry-tree*, in botany, a genus of trees, whoſe characters are theſe: it is ever green: the leaves are oblong, and ſerrated on the edges: the flower conſiſts of one leaf, and are ſhaped like a pitcher; the fruit is of a fleſhy ſubſtance, and, in its outward appearance, very like a ſtrawberry, but is divided into five cells, in which are contained many ſmall ſeeds. The ſpecies are:

There are three ſpecies, which are 1. The common ſtrawberry-tree. 2. The ſtrawberry-tree with longer flowers, and egg-ſhaped fruit, and 3. the ſtrawberry-tree with double flowers.

This tree has its name from the reſemblance the fruit bears to that of a ſtrawberry, but is of an auſtere ſour taſte; though I have been informed, that in Ireland, where this tree abounds, the fruit is ſold and eaten. In England they are chiefly brought to the markets with ſmall branches of the tree, having ſmall branches of flowers upon them, and made up into noſegays, with other flowers, and ſome ſprigs of the amomum Plinii, or winter-cherry; which, at that ſeaſon, is very acceptable, when there are few flowers to be had.

The time of this fruit being ripe is in the months of October and November; at which ſeaſon the flowers are blown for the next year's fruit; ſo that, from the time of flowering to the ripening of the fruit, is one whole year.

The beſt method of propagating theſe trees is by ſowing their ſeeds, which ſhould be preſerved in dry ſand till March: at which time you ſhould ſow them upon a very moderate hot-bed (which greatly promotes its vegetation) covering it about a quarter of an inch with light earth, and ſcreening it from froſts, or great rains. Towards the latter end of April your young plants will appear; you muſt therefore keep them clear from weeds, and give them frequent waterings, as the ſeaſon may require, and ſhade them in hot weather; and, if your plants have done well, they will be, by autumn, about five or ſix inches high: but as theſe trees are ſubject to receive damage from froſts, eſpecially while they are young, therefore you muſt hoop the bed over, that, when bad weather comes, you may cover it with mats and ſtraw to keep out the froſt.

The beginning of April following you may tranſplant theſe trees, each into a ſmall pot; but, in doing of this, be very careful to take them up with as much earth to their roots as poſſible; for they are bad rooting plants, and very ſubject to miſcarry on being removed; and it is for this reaſon I adviſe their being put into ſmall pots; for, when they have filled the pot with roots, they may be turned out into large pots, or the open ground, without any hazard of their dying.

When you have put your young plants into the ſmall pots, you ſhould plunge them into another very moderate hot-bed, to encourage their taking new root, ſhading them from the ſun in the middle of the day, and giving them water as they may require: in this bed it will be proper to let the pots remain moſt part of the ſummer; for if the pots are taken out, and ſet upon the ground, the ſmallneſs of their ſize will occaſion the earth to dry ſo faſt, that watering will ſcarcely preſerve your trees alive; but, if they are kept growing all the ſummer, they will be near a foot high by the next autumn: but it will be adviſeable to ſcreen them from the froſt, during their continuance in pots, by plunging them into the ground in a warm place, and covering them with matts in bad weather.

When your trees are grown to three or four feet high, you may ſhake them out of the pots into the open ground, where they are to remain: but this ſhould be done in April, that they may have taken good root before the winter; which would be apt to damage them, if newly planted. *Miller's Gard. Dict.*

ARCA'DIANS, the name of a ſociety of learned perſons, who formed themſelves into a body at Rome, in the year 1690, with a deſign to preſerve learning and carry Italian poetry to perfection.

They took the name of Arcadians partly from the rules of their ſociety, and partly, becauſe every new member, on his admiſſion into this academy, aſſumed the name of ſome ſhepherd of ancient Arcadia. Once in four years they elected a preſident, to whom they gave the title of guardian, and appointed him every year twelve fellows, who decided all affairs of the ſociety.

This ſociety was founded by fourteen men of eminent learning, whom a ſimilitude of ſentiments, taſte, and ſtudy, had drawn to the court of Chriſtina queen of Sweden, who became their patroneſs. After her death, M. Gravina, in 1696, reduced their laws to ten in number, and wrote them in the language and ſtile of the twelve tables, which are yet to be ſeen in the ſerbatojo, a room uſed as a repoſitory for the archives of the academy, on two fine pieces of marble. In this room are alſo the pictures of the moſt celebrated perſons who have been of this academy, at the head of which is pope Clement the Eleventh, with his paſtoral name Alnano Melleo. The ſociety had for its arms a flute crowned with pine and laurel. Branches from this ſociety, under different names, have ſpread themſelves, through the principal cities of Italy; thoſe of Aretio and Macerata call themſelves la Forzata, thoſe of Bologna, Venice, and Ferrara, l'Animoſa, that of Sienna la Phyſica Critica, that of Piſa l'Alphaia, that of Ravenna the members of which are all eccleſiaſtics, is called la Camaldunenſis. They have each a vice-guardian; they meet ſeven times in a year, either in a wood, a garden, or meadow, as is moſt convenient. Their firſt meetings were held on mount Palatine, but at preſent in the gardens of prince Salviati. At the ſix firſt meetings they read the performances of the Arcadians of Rome. The Roman ladies of the Arcadian ſociety have their works read by gentlemen of the ſame academy: the ſeventh meeting is entirely devoted to the reading of foreign aſſociated Arcadians. Every candidate muſt be eminent for accompliſhments and genius, or, as the Arcadians expreſs themſelves, be poſſeſſed of nobility either by merit or birth, and be twenty-four years of age complete. The talent of poetry only gave admiſſion to a lady into this ſociety. Candidates are admitted into this academy, either by acclamation, enrollment, recommendation, ſurrogation, or deſtination; acclamation is the univerſal concurrence of all the votes without any deliberation; this is a compliment paid to cardinals, princes, and ambaſſadors. Ladies and foreigners are admitted by enrollment; young noblemen by the recommendation of the colleges wherein they are educated. A man of letters who follows, an academician after his death, in the ſame province, is ſaid to be introduced by ſurrogation; what they mean by deſtination is this, if any perſon by his performances has merited the honour of being an Arcadian, the academy on his application engage to elect him on the firſt vacancy; they reckon by olympiads, and celebrate their feſtivals of wit every fourth year.

ARCH-*Angel* *, in theology, an intellectual being, or angel, of the ſecond order in the celeſtial hierarchy.

* The word is compounded of the Greek ἀρχὸς, chief or principal, and ἄγγελος, an angel.

St. Michael is conſidered as the prince of angels, and generally ſtiled St. Michael the Arch-angel.

ARCH-*Angel*, in botany, a medicinal plant, called, by botaniſts, lamium. It is of ſome uſe as a balſamic, &c.

There are two kinds of it, viz. the white Arch-angel, lamium album; and red, whoſe flowers are reputed ſoft and lubricating, and, as ſuch, adminiſtred in ſome female weakneſſes, as the whites, and difficulty of urine. A conſerve of them is alſo made in the ſhops, but ſeldom preſcribed. *Quinſ. Diſpenſ.*

ARDA'SSES, in commerce, the coarſeſt of all the ſilks of Perſia, and, as it were, the refuſe of each kind. In this ſenſe they ſay, the legis, the houſets, the choufs, and the payas Ardaſſes, to ſignify the worſt of thoſe four ſorts of Perſian ſilks.

ARDASSI'NES, a very fine ſort of Perſia ſilks, little inferior in fineneſs to the ſourbaſtis, or rather cherbaſſis. And yet it is little uſed in the European manufactures of ſilk, becauſe it will not bear hot water in the winding of it.

A'REB, a money of account uſed in the dominions of the great Mogul, particularly at Amadabat. Four Arebs make a crow. A crow is worth a hundred lacs, and a lac 100000 rupies.

ARE'CA, or ARECK, a famous fruit in the Eaſt-Indies, wherein they drive an incredible trade, and make a prodigious conſumption thereof, there being ſcarce any perſon, even from the richeſt to the pooreſt, who does not make uſe of it.

The tree which bears the areck is tall, ſtraight, thin, and round. It is of the palm kind, and has no branches; but its leaves are charming to the ſight; they form a round tuft at the top of the trunk, which is as ſtraight as an arrow. It grows to the height of 25 or 35 feet, and is a great ornament in gardens. The ſhell which contains the fruit is ſmooth without, but rough and hairy within, in which it pretty much reſembles the cocoa-nut. It is equal to that of a pretty large walnut. Its kernel is as big as a nutmeg, to which it bears a great reſemblance without, and has alſo the ſame whitiſh veins within, when cut in two.

In the center of the fruit, when it is ſoft, is contained a greyiſh and almoſt liquid ſubſtance, which grows hard in proportion as it ripens. The fruit, when ripe, is aſtringent, but not unpalatable, and the ſhell is yellowiſh.

The chief uſe that is made of areck, is to chew it with the leaves of betle, mixing with it a chalk in a red paſte, made of ſea-ſhells. In order to chew it, they cut the areck into four quarters, and take out one quarter of it, which they wrap up in a leaf of betle, over which they lay a little of that chalk: afterwards they tie it, by twiſting it round. This bit prepared for chewing, or maſtication, is called pinang, which is a Malayan word, uſed all over the Eaſt-Indies. The pinang provokes ſpitting very much, whether it be made with dried or freſh areck: the ſpittle is red, which colour the areck gives it. This maſtication cools the mouth, and faſtens the teeth and gums. When they have done chewing the pinang, they ſpit out the groſs ſubſtance that remains in the mouth. They are under a miſtake who imagine that freſh areck melts intirely in the mouth. Nor is it leſs a miſtake to think that the teeth continue always of a red hue. As ſoon as they have done chewing the pinang, they waſh their mouth with freſh water, and then their teeth are white again. The Europeans who live at Batavia, at Malacca, and in the Sunda and Molucca iſlands, uſe pinang as much as the Indians do; and, by waſhing their teeth, they preſerve them white.

Some pretend that areck ſtrengthens the ſtomach, when the juice of it is ſwallowed, as moſt of the Indians do. Another property, aſcribed to it, is its curing, or carrying off, all that might be unwholeſome or corrupt in the gums.

The Siameſe call areck plou, in their language.

The beſt areck of the Indies comes from the iſland of Ceylon.

The Dutch Eaſt-India company ſend a great deal of it in their ſhips into the kingdom of Bengal. There grows in Malabar a ſort of red areck, which is very proper for dying in that colour. The ſame company ſend ſome of it from time to time to Surat and Amadabat, for the uſe of the dyers in the dominions of the great Mogul. Under the ſpecies of areck are comprehended ſix different ſorts, two of which are the beſt for maſtication.

A'REM, or AL-AREM, a vaſt mound, or dam, which formed a ſtupendous reſervoir above the city Saba, whoſe rupture cauſed an inundation, famous in eaſtern writers.

The Arem was built by Abdſhems, ſurnamed Saba, who, having built the city of that name, built this wall, or mound, to ſerve as a baſon, or reſervoir, to receive the water which came down from the mountains, not only for the accomodations of the inhabitants of that city, and the watering their lands, but alſo to keep the country better in ſubjection, by being maſter of their water. The Arem ſtood like a mountain above their city, almoſt eighty fathoms high, and was built ſo ſtrong, that there were no apprehenſions of its ever falling: but it gave way, at length, in the night, and carried away the whole city, with all the towns and people in the country.

AREOPA'GUS (*Dict.*)—Authors are divided, as to the reaſon and origin of the name: ſome imagine Areopagus the proper name of the court of juſtice, which was ſituated on a hill, in Athens; and that in this court the ſenate of that illuſtrious city aſſembled.—Others ſay, that Areopagus was the name of the whole ſuburbs of Athens, wherein ſtood the hill on which the court was built: and the name Areopagus ſeems to countenance this laſt opinion; for it ſignifies literally, the hill or rock of Mars, from πάγος, hill, and Ἄρης, the god Mars. In effect, the denomination might either ariſe hence, that the Areopagus was built in a place where had been a temple of Mars; or, becauſe the firſt cauſe pleaded there was that of this god, who was accuſed of killing Halirorrothius, the ſon of Neptune, and tried here before twelve gods, being acquitted by a majority of ſix voices: or becauſe the Amazons, whom the poets feign to be the daughters of Mars, when they beſieged Athens, pitched their tents, and offered ſacrifices to the god of war in this place.

This tribunal was in great reputation among the Greeks; and the Romans themſelves had ſo high an opinion of it, that they truſted many of their difficult cauſes to its deciſion. Authors are not agreed about the number of the judges who compoſed this auguſt court.—Some reckon thirty-one, others fifty-one, and others five hundred: in effect, their number ſeems not to have been fixed, but was more or leſs every year.—By an inſcription quoted by Volaterranus, it appears they were then three hundred.

At firſt this tribunal only conſiſted of nine perſons, who had all diſcharged the office of archons, had acquitted themſelves with honour in that truſt, and had likewiſe given an account of their adminiſtration before the logiſtæ, and undergone a very rigorous examination.—Their ſalary was equal, and paid out of the treaſury of the republic: they had three oboli for each cauſe.

The Areopagites were judges for life.—They never ſat in judgment but in the open air, and in the night-time, to the intent that their minds might be more preſent and attentive, and that no object, either of pity or averſion, might make any impreſſion on them.—All pleadings before them were to be in the ſimpleſt and moſt naked terms, without exordium, epilogue, paſſions, &c.

At firſt they only took cognizance of criminal cauſes, but in courſe of time their juriſdiction became of greater extent.—Mr. Spon, who examined the antiquities of that illuſtrious city, found ſome remains of the Areopagus ſtill exiſting, in the middle of the temple of Theſeus, which was heretofore in the middle of the city, but is now without the walls.

The foundation of the Areopagus is a ſemicircle, with an eſplanade of 140 paces round it, which properly made the hall of the Areopagus. There is a tribunal cut in the middle of a rock, with ſeats on each ſide of it, where the Areopagites ſat, expoſed to the open air.

This court is ſaid by ſome to have been inſtituted by Solon; but others carry it much higher, and aſſert it to have been eſtabliſhed by Cecrops, about the time that Aaron died, viz. in the year of the world 2553, maintaining withal, that Solon only made ſome new regulations in it, increaſed its power and privileges, and made it ſuperior to the Ephetæ, another celebrated court inſtituted by Draco.—In effect, Demoſthenes himſelf, in his oration againſt Cteſiphon, owns himſelf at a loſs on the point: the inſtitutors of this tribunal, ſays he, whatever they were, whether gods or heroes.

ARETHU'SA, in mythology, a fountain in the iſland Ortygia.

They tell us that Arethuſa, before ſhe was a fountain, was a virgin and a follower of Diana; that the river god Alpheus ſaw her one day bathing, grew enamoured of her charms, and would have enjoyed her. She, to avoid his purſuit, implored the help of Diana, who transformed her into a fountain. Alpheus knew her under this diſguiſe, and immediately mixed his ſtreams with her's. Cicero tells us, that in his time the fountain was quite ſwallowed up by the ſea, and no traces of it left. Pliny, and many of the ancients, ſeem to have thought that the river Alpheus, continuing his courſe under the ſea roſe again in Sicily, and that what was thrown into this river in Arcadia, was found again ſwimming in the Ortygian river. But Strabo, far from believing ſo ridiculous a ſtory, takes the tale of a cup's being found in the Sicilian river, that was thrown into the Alpheus, for a fiction; and does not ſcruple to ſay, that this, like other rivers, loſes itſelf in the ſea. Pliny, however, is ſo fond of the fable as to tell us, that the waters of Arethuſa ſmelt of dung, being the time of the olympic games, as if it proceeded from a mixture of the waters of the Alpheus, into which was thrown the dung of the victims, and of the horſes which ran the races at the celebration of theſe games.

ARGEMO'NE, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roraceous kind, or compounded of ſeveral leaves, arranged in a circular form. From the center of the flower there ariſes a piſtil, which finally becomes an unicapſular ſeed-veſſel, of an oval figure, with ſeveral ribs running from its baſe to its apex, the intermediate ſpaces being occupied by valves, which finally open their tops; and from every rib there runs out a placenta, which is loaded with ſeeds, uſually of an orbicular figure. *Tourn. Inſt.*

There is only one known ſpecies of Argemone, which is the plant uſually called, by botanical writers, the thorny Mexican poppy.

The rough-headed poppies, called Argemones by ſome writers, are by no means of this genus, but properly of the corn-poppy kind.

ARGENTA'RIA *Creta*, ſilver chalk, in natural hiſtory, a name given to an earth, not properly a chalk, but a kind of tripela. It is a very beautiful earth, of a looſe friable texture, and perfectly pure white. While in the ſtratum, it is dry, friable, and duſty, and flies from the pickax in large irregular maſſes, of an obſcurely plated, or laminated ſtructure; and ſplits more readily into flat pieces, than in any other direction; but its laminæ are always very irregular; when dry, it becomes ſomething harder, and retains the ſame chalky whiteneſs, and is of a looſe, ſpongy texture, very light, and of a rough, uneven, duſty ſurface. It adheres very ſlightly to the tongue, is hard and harſh to the touch, breaks eaſily between the fingers, and a little ſtains the hands. It makes no efferveſcence with acids, and ſuffers very little change in the fire. It is dug in Pruſſia, and is much eſteemed for cleanſing plate. It has alſo been found in France, and of late in Ireland. *Hill's Hiſt. of Foſſ.*

ARGETE'NAR, in aſtronomy, a ſtar of the fourth magnitude, in the flexure of the conſtellation Eridanus.

Argetenar is repreſented, in Bayer, by the Greek letter ρ. Its longitude according to Hevelius, in 1700, was 5°. 53'. 22". and its latitude 38°. 28'. 47". ſouth.

A'RGIL, or ARGILLA, potter's-earth, a fat and gluiſh kind of earth, or clay, which potters uſe to make ſeveral ſorts of their works. Carvers and ſilver-ſmiths uſe it alſo for mouldings. It is alſo uſed by thoſe who make conduits, baſons, and reſervoirs: they lay over with this ſort of earth the bottom of the baſons, in order to make them hold water. This earth is commonly grey, and ſometimes red. It is to be met with almoſt every-where, and is of a barren nature, as being very fat and glutinous.

AR'GONAUTS (*Dict.*)—The number of the Argonauts is thought to have been about 54, beſides artendants. Jaſon was their chief; the others, of moſt note, were Hercules, Caſtor, and Pollux; Laertes, the father of Ulyſſes; Oileus, the father of Ajax; Peleus, the ſather of Achilles; Theſeus and his friend Pirithous. They ſet out from Cape-Magneſia, in Theſſaly; ſailed firſt to Lemnos, from thence to Samothracia, through the Helleſpont; and, coaſting Aſia Minor, arrived through the Euxine Sea, at Æa, the capital of Colchis; from whence, after having carried away the golden fleece, they returned into their own country, through a thouſand dangers, which they ſurmounted. This expedition, according to ſome, was thirty years before the Trojan war; according to others, ninety years before that event. See CHRONOLOGY in the Dictionary and Supplement.

Opinions are various concerning the object that drew the Argonauts to Colchis. Diodorus Siculus thinks this golden fleece, ſo much talked of, to have been only the ſkin of a ſheep, which had been ſacrificed by Phrixus; and was kept very carefully, on account of an oracle, which had foretold, that whoever ſtole it away, ſhould murder the king Strabo. And Juſtin thinks the fable of the fleece to have taken its riſe from this, that gold was found in the ſands of ſome rivers of Colchis, which they gathered up by the means of ſheep ſkins, with the wool on; and that a fleece, well filled with the duſt it had collected in this manner, might be called a golden fleece, with propriety. The ſame method is now in practice about Fort Louis, where gold duſt is collected in the ſame manner. Varro and Pliny think this ſtory proceeded from the fine wool of this country; and that a voyage ſome Greek merchants made thither, on this account, gave birth to the fiction. We may add, that, as it is notorious the Colchians were eminent for their merchandize in ſkins of all kinds, this might have been one motive why the Argonauts undertook this voyage.

Palæphatus has pretended, but nobody knows on what foundation, that, by the emblem of the golden fleece, was meant a fine golden ſtatue, which the mother of Pelops had cauſed to be made, and Phrixus carried with him to Colchis. Suidas apprehends this golden fleece to have been a velume book, which contained the ſecret of making gold. Tollius would fain have revived this opinion; and the alchymiſts have, in general, embraced it.

ARISA'RUM, *friars-cowl*, in botany, the name of a genus of plants, whoſe characters are: the fruit, and inner part of the flower are the ſame with thoſe of the arum and dragons; but the flower itſelf is hooded, or ſhaped like a friar's-cowl.

There are five ſpecies of Ariſarum, enumerated by Tournefort and Miller.

The leaves and flowers of Ariſarum are deterſive and vulnerary, and applied either in the form of ointment, or decoction, they cure malignant ulcers. Its root, taken in powder, is eſteemed againſt the plague; the doſe being from a ſcruple to a drachm. Of the root alſo are made collyria; which are effectual in curing fiſtula's of the eyes; by collyria, Diaſcorides does not mean what we call ſo, but tents made in the ſhape of a collyrium. It corrupts the pudendum of any animal whatever, if introduced into it. *Lemery des Drog.*

ARISTO'CRACY (*Dict.*)—With regard to the laws relative to Ariſtocracy, we cannot, poſſibly, attain a better idea of them, than by conſulting that excellent work of M. Monteſquieu; from whence the following were extracted:

1. As the body of the nobility give their votes in an Ariſtocracy, theſe votes cannot be very ſecret.

2. The ſuffrage muſt not be given by lot, for this would produce many inconveniencies. In ſhort, when diſtinctions, which raiſe one citizen above another, are once eſtabliſhed, were the choice determined by lot, the man would not become leſs odious; it is not the magiſtrate, but the nobleman, becomes the mark of envy.

3. When the nobility is numerous, there muſt be a ſenate to regulate affairs, which the body of the nobility could not determine, and prepare ſuch as it does determine, for the diſpatch of buſineſs. In this caſe, we may ſay the Ariſtocracy, in ſome meaſure, reſides in the ſenate; a democracy in the body of the nobility; and that the people are nothing.

4. It will be very happy, in an Ariſtocratical government, if the people, by ſome indirect method, are admitted to bear ſome degree of weight: as, at Genoa, the bank of St. George, which is directed by the people, gives them an influence over the ſtate; which makes all their happineſs.

5. The ſenators ought not to have the power of bringing in whom they pleaſe into their body, as members drop off; but this power ſhould be inveſted in cenſors, to prevent corruption.

6. That is the beſt Ariſtocracy, wherein the people have ſo ſmall a ſhare of riches, or power, as not to make it the intereſt of the ruling party to oppreſs them.

7. The moſt imperfect Ariſtocracy is where that part of the people, which obeys, is under the civil bondage of that which commands it.

8. If the people under an Ariſtocracy are virtuous, they will enjoy almoſt all the happineſs of a popular government; and the ſtate will become powerful.

9. A ſpirit of moderation is the virtue of an Ariſtocracy; and holds the ſame place, as equality in a popular ſtate.

10. Modeſty, and ſimplicity of manners, conſtitute the ſtrength of the nobility in an Ariſtocracy.

11. If any of the nobility had perſonal and particular prerogatives diſtinct from the body, it would ceaſe to be an Ariſtocracy; and the form of government would approach to a monarchy.

12. The two principal ſprings of confuſion, in an Ariſtocratical form of government, are the prodigious inequality between the governors and the governed; and the inequality between thoſe that govern.

13. The firſt of theſe inequalities will exiſt, if the privileges and prerogatives of the rulers are honourable, by being oppreſſive, and taxes be levied partially.

14. Trade is the profeſſion of people on a level, and therefore beneath the nobility in an Ariſtocracy.

15. The laws of an Ariſtocracy ought to oblige the nobility to do juſtice to the people.

16. The laws ought, in every reſpect, to curb the pride of tyrannizing.

17. There ought to be ſome authority, to counterbalance the power of the nobility.

18. The extreme poverty, or exorbitant riches of the nobility, are pernicious in an Ariſtocracy.

19. There ſhould be no right, by ſeniority, among the nobility, that, the eſtate of the family being divided among the children, all of the ſame rank and family might poſſeſs an equal fortune.

20. All diſputes among the nobility ought ſoon to be finally determined.

21. The laws ought, in particular, to tend to aboliſh the diſtinction which vanity makes among noble families.

22. If the laws are good, the nobility will rather think of the advantages which will reſult from obeying, than their own punctilio's.

23. Ariſtocracy degenerates, when, the power of the nobility becoming arbitrary, there is no more virtue in thoſe that govern, than in thoſe that are governed. M. Monteſquieu has ſupported theſe maxims by ſo many inſtances, both antient and modern, that he has left us no room to doubt of the truth of them.

ARISTOTE'LIAN *Philoſophy*—The philoſopher from whom the denomination ariſes, was the ſon of Nicomachus, phyſician of Amyntas, king of Macedonia, born in the year of the world 3566; before Chriſt, 348; at Stagira, a town of Macedonia; or, as others ſay, of Thrace; whence he is alſo called the Stagirite.

At ſeventeen years of age he entered himſelf a diſciple of Plato, and attended in the academy till the death of that philoſopher. Repairing afterwards to the court of king Philip, at his return, he found that Xenocrates, during his abſence, had put himſelf at the head of the Academic ſeat; upon which, he choſe the Lyceum for the ſcene of his future diſputations.

It being his practice to philoſophize walking, he got the appellation Peripateticus; whence his followers were alſo called Peripatetics. Though others will have him to have been thus named, from his attending on Alexander, at his recovery from an illneſs, and diſcourſing with him, as he walked about.

Ariſtotle was a perſon of admirable genius, and of great and various learning. Averrhoes makes no ſcruple to call him, 'The genius of nature, the limit of human underſtanding;' and declares him, 'ſent by providence, to teach us all that 'may be known.' He is accuſed of a too immoderate deſire of fame, which led him to deſtroy the writings of all the philoſophers before him, that he might ſtand ſingly, and without competitors. And hence, in the ſchools, Ariſtotle is called, The philoſopher. Laertius, in his life of Ariſtotle, enumerates his books to the number of 4000; of which ſcarce above 20 have ſurvived to our age.

This great philoſopher has been deified by ſome, and deſpiſed by others, but a ſhort view of his works will abundantly convince us, that both theſe extremes are ill founded. His firſt eſſays were on oratory and poetry; which, in all probability, he compoſed for the uſe of his royal pupil, Alexander the Great. Theſe books are maſter-pieces; and his ſtudy of Homer gave him ſo finiſhed a taſte in poetry and rhetoric, that whoever would now ſpeak, or write, elegantly, on thoſe ſubjects, muſt obſerve his precepts; and, perhaps, theſe performances do moſt honour to his memory.

His ethics are very dry, barren, and unfruitful; offer nothing to us, but general views, and metaphyſical propoſitions; fitter to adorn the mind, and lead the memory, than touch the heart, and correct the will: and this ſpirit prevails in all the moral writings of our philoſopher. A ſketch of his principal doctrines will ſufficiently prove this aſſertion. 1. The happineſs of man, ſays he, conſiſts not in riches, pleaſures, power, nobility, nor philoſophical ſpeculations; but rather in certain habits of the ſoul, which render him more or leſs perfect. 2. Virtue is full of charms; conſequently, a virtuous life muſt be happy. 3. Though virtue be ſufficient of itſelf, yet it cannot be denied, but that riches, honours, a noble birth, beauty of body, and things of this nature, greatly contribute to advance the happineſs of man. 4. Every virtue keeps the mean betwixt two extremes: thus courage is the mean betwixt fear and raſhneſs; liberality, betwixt avarice and extravagance, &c. from whence we may conclude, that the number of vices are twice the number of virtues; becauſe every virtue has on each ſide an oppoſite vice. 5. He diſtinguiſhes two ſorts of juſtice; the one he calls univerſal, the other particular. Univerſal juſtice tends to the preſervation of civil ſociety, by the reſpect and obedience it inſpires and enjoins for the laws. Particular juſtice conſiſts in rendering every man his due; and is of two ſorts, diſtributive and communicative. Diſtributive juſtice diſpenſes rewards and puniſhments to every citizen, according to his merit; and is founded on a geometrical proportion. Communicative juſtice has commerce for its object; conſiſts in rendering to every man his due; and muſt proceed according to arithmetical proportion. 6. Friendſhip ariſes either from the pleaſure we find in a perſon's converſation, the profit which may reſult from it, or from the merit of ſome eminent qualities, founded on virtue, we diſcover in the object: this laſt is true friendſhip; benevolence, properly ſpeaking, is not friendſhip, though it leads to it.

Ariſtotle has ſucceeded much better in his logic than in his ethics. His logic diſcovers all the principal ſprings of the art of reaſoning; he deſcends ſoon to the thoughts of man; diſtinguiſhes his ideas; ſhews their connection; purſues them through all their deviations and ſeeming contrarieties; and at laſt reduces them to a fixed point. If the extent of the mind could have been known, Ariſtotle would certainly have diſcovered it. Is it not ſurpriſing, that, by the different combinations he has made of all the forms the mind can put on in reaſoning, he has confined it in ſuch a manner, by the rules he has laid down, that it can never deviate from its object, nor reaſon abſurdly? But his method, though ſo much extolled by all philoſophers, is not free from faults. 1. He is too prolix; all his books of categories might be reduced to a few pages; the ſenſe is drowned in a ſuperfluity of words. 2. He is obſcure and intricate; he expects you to gueſs at his meaning; would have his reader, like himſelf, know what he intended. A man of the beſt capacity muſt often deſpair of having fully underſtood him in his doctrine of the analyſis and ſyllogiſm.

Let us now come to ſpeak of Ariſtotle's natural philoſophy; and here we ſhall principally follow the famous Lewis Viſis, who has proceeded very methodically on the ſubject, by taking notice of all this philoſopher's phyſical works; he begins with his eight books of natural principles; which ſeem rather ſo many different memoirs, than a book wrote on one and the ſame plan. Theſe eight books treat of bodies extended in general, which is the object of phyſics; and, in particular, of the principles of bodies, and all that is connected with theſe principles, as motion, place, time, &c. Nothing is more confuſed, than the long detail he gives us; his definitions render things, clear and evident in themſelves, obſcure and unintelligible. Ariſtotle begins with condemning all the philoſophers who went before him, and even in very harſh terms: ſome he blames for having admitted too many principles; others for having admitted only one. With regard to himſelf, he lays down three principles, which are matter, form, and privation. Matter, according to him, is the general ſubject on which nature operates: this matter is eternal; the parent of all things; which eagerly longs for motion, and deſires to be united to form. Ariſtotle's definition of his firſt matter is a kind of jargon; he defines it in theſe terms: 'That which has neither quality or quantity, or any thing by which its being can be determined'. If he only means, according to his method of conſidering things, firſt in a general view, and afterwards deſcending to particulars, that this firſt matter had no other foundation than his own conception, nor exiſtence, but in an arrangement of ideas, to reaſon on the ſubject, it may be granted him: but then this firſt matter is an imaginary being, a mere abſtract idea, which exiſts no more in general than a flower, or man, which are but parts of the univerſe. Some are of opinion, Ariſtotle meant, by his firſt matter, not only body in general, but a certain uniform paſte, which, like yielding wax, took any impreſſion; out of which all things were formed, and into which they return at their diſſolution; that all bodies were the ſame, and differed only with reſpect to their figure, quantity, motion, or reſt, which are all accidents. This opinion; which owes its origin to Ariſtotle, appeared ſo ſpecious to all philoſophers, both antient and modern, that it has been generally adopted; though nothing can be more falſe, as is abundantly proved by experiments; for, in conſequence of this doctrine, if motion produced out of this firſt matter, this original paſte or wax, an animal, a tree, or a maſs of gold; take away this motion, the animal, the tree, the gold, muſt return to their primeval paſte. Empedocles, Plato, Ariſtotle, and the ſchoolmen, aſſert this; but it is falſe. The organized body, on its diſſolution, ſeparates into different maſſes, ſkin, hair, fleſh, bone, &c. The mixed body reſolves itſelf into water, ſand, ſalt, and earth: but the moſt powerful diſſolvents, and the hotteſt fire, can never produce any change in theſe ſimple bodies. Sand remains ſand, iron remains iron, gold, purified, ſuffers no change; the caput mortuum will always remain a caput mortuum, though tried and tortured a thouſand ways. Chemical experiments have proved this paſt all doubt: we can go no further, the ſeparate elements are permanent, and incapable of change; for this reaſon, that the univerſe, which is compoſed of them, may receive different forms, by their being blended together; and yet be durable, as the principles which form its baſis. As to form, Ariſtotle's ſecond principle, he looks on it as a ſubſtance, an active, conſtituent principle of bodies, which operates on matter. It follows from this poſition, that there muſt be as many natural forms, which are born, and die by turns, as there are primitive and elementary bodies. As to privation, ſays Ariſtotle, it is not a ſubſtance; it is even, in ſome reſpects, a ſort of nothing: in ſhort, bodies which receive ſuch a form, are ſuch as could never have had that form before, but muſt even have had one abſolutely contrary to it. Thus the dead and living are directly oppoſite.

Theſe three principles premiſed, Ariſtotle proceeds to the explanation of cauſes, which he treats of diſtinctly enough; but almoſt always without mentioning the firſt cauſe, which is God. Some have taken occaſion from hence to accuſe him of atheiſm; but we are of a different opinion. Ariſtotle aſſerts, nature is an effective principle, a plenary cauſe, which renders all bodies, wherein it reſides, capable of motion or reſt in themſelves: all bodies which have this power, that cannot in one ſenſe be annihilated, and this tendency to motion, which is always equal, are properly called ſubſtances: nature, conſequently, is another principle of Ariſtotle; and nature is a term by which he could mean nothing but the Deity; wherefore he did not miſtake the firſt cauſe; but his commentators puzzled themſelves, and the ſchoolmen ran into ſo many abſurdities, by miſunderſtanding him.

After having explained the efficient cauſe of all power diſtributed throughout the univerſe, Ariſtotle proceeds to define motion; but, though the efforts of a great genius are conſpicuous, his definition is very lame and imperfect. The farther he advances, his reaſoning becomes more clear; finite and infinite, the vacuum and atoms, ſpace and time, place and the bodies contained in it, preſent themſelves to his view; he makes no confuſion; one propoſition leads to another; and, though the progreſs be extremely rapid, the connection is very plain.

The doctrine, contained in his two books of generation and corruption, neceſſarily depends on his principles which we have already explained. Before Socrates, the prevailing opinion was, that nothing abſolutely died or periſhed, but ſomething was again produced from it; that all the changes which happen in bodies were only another arrangement, a different diſtribution of the parts of matter which compoſed theſe ſame bodies: they aſſerted, that increaſe and diminution, diviſion and re-union, ſeparation and mixture, accounted for all the changes viſible in the univerſe. Ariſtotle rejected all theſe notions, though very ſimple in themſelves, and therefore probable; and eſtabliſhed the doctrine of generation and corruption, properly ſo called. He obſerved new beings produced from the womb of nature continually, which periſhed in their turns. Two things led him into this way of thinking: 1. He imagined the matter of all bodies the ſame; that they only differed in form, which he looked on as their eſſence 2. This doctrine of privation teaches, that contraries are produced by their contraries, as white by black; whence it follows, that white muſt be annihilated before black can ſucceed. To clear up this ſyſtem, we ſhall make two remarks: 1. That generation and corruption have no connection with the other modifications of bodies, as increaſe, decreaſe, tranſparence, conſiſtence, &c. under all theſe modifications. The firſt form is not effaced, though infinitely diverſified. The ſecond remark, which naturally reſults from the firſt, is, that, as all the diverſity of nature conſiſts in generation and corruption, ſimple and primitive beings only can be ſubject to them; all other bodies are only mixtures, and various combinations of theſe firſt. Though nothing can be more chimerical than this part of Ariſtotle's ſyſtem, yet it has perplexed the ſchoolmen, who have multiplied a number of nonſenſical terms, ſuch as forma ſubſtantialis, modalitas, &c. and continually diſputed about it, without any meaning.

Ariſtotle does not content himſelf with exhibiting a general theory in phyſics, but deſcends to particulars; his meteorology is held by father Rapin to be more clear than all that has been advanced by the moderns on the ſubject. It, indeed, muſt be owned, he accounts for rain, hail, dew, &c. in an extraordinary manner, conſidering his ignorance of the experiments the moderns have made, and ſome diſcoveries, owing to time and chance. His account of the rainbow is ingenious, and really differs but little from that of Deſcartes. His definition of the wind is this, that it is a current of the air; and he ſhews, that its direction depends on an infinity of cauſes, extraneous and little known; which, ſays he, hinders me from giving a general ſyſtem of it. With regard to his hiſtory of animals, it will be ſufficient to ſay, it is highly approved of by M. de Buffon.

Thus we have given ſome account of all his works. Let us now take a ſhort view of his doctrines. The matter, according to Ariſtotle, which compoſes all bodies, is the ſame, and only owes its different forms to the different combination of its parts. He admits of four elements, fire, air, water, and earth; which, according to him, are ſufficient to form all ſublunary bodies, but the beauty of the heavens made him ſuſpect them to be formed of finer materials; and, therefore, he ſuppoſed a ſort of fifth element, the quinteſſence of the other four, for the conſtruction of the heavens: and perhaps, when he had invented a new word, thought, like ſome moderns, he had made a diſcovery of ſomething new; and that what ſubſiſted in his imagination, muſt conſequently alſo ſubſiſt in the univerſe. But neither the authority of Ariſtotle or any other philoſopher, nor the pretended evidence of their arguments, can convince us of the reality of what they imagined. From theſe five principles, fire, air, water, earth, and a quinteſſence of theſe, Ariſtotle ſuppoſed the whole univerſe to be formed. Of this quinteſſence, or fifth body, being, or eſſence for (literally the term ſignifies no more, though taken in a metaphorical acceptance, it is generally underſtood to convey another idea) he ſuppoſes, the celeſtial bodies formed; and to this he aſcribes a circular motion. To the four elements, of which he ſuppoſes all ſublunary bodies compoſed, he aſſigns only a rectilinear motion. The fifth eſſence has neither gravity nor levity, is incorruptible and eternal; always continues an equal and uniform motion, whereas, of the four elements, two deſcend and gravitate towards the center, two aſcend and ſeek the circumference; yet they may change their places, and indeed often do ſo, becauſe of the facility they have of transforming themſelves by rarefaction, condenſation, &c.

This premiſed, Ariſtotle aſſerts the univerſe is not equally under the government of God; notwithſtanding he is the general cauſe of all, the celeſtial bodies only are worthy his care and attention, but the earth and ſublunary beings are below his notice. Diogenes Laertius tells us, it was the opinion of Ariſtotle, that the heavenly bodies were regulated by the Deity; that the earth and ſublunary beings were governed by a kind of ſympathy with the celeſtial bodies, and influenced by them. This chain of reaſoning infers the mortality of the ſoul, and excludes free agency. A prevailing notion among all the ancient philoſophers, that the ſoul was a particle of the divine Being, and ſhould return to the Being from whence it proceeded after certain revolutions, contributed not a little to confirm Ariſtotle in this notion.

The falſe Ideas this philoſopher had conceived of motion, had led him into an opinion that the world was eternal. Motion, ſays he, muſt have been eternal, conſequently the world wherein it ſubſiſts muſt have been ſo too.

We have now ſeen enough of the doctrine of Ariſtotle to be convinced he is no more to be charged with atheiſm than almoſt all the other ancient philoſophers, who were infected with the ſame errors. Ariſtotle repreſents God, as an immaterial and intelligent Being; the firſt mover of all things, who could not be moved himſelf: ſhould it be aſked, what can be thought of Ariſtotle's creation? The anſwer is eaſy; for he admits, if there had been nothing in the univerſe but matter, it could not have been formed without ſome original firſt cauſe. This plainly infers a Deity, and wipes off the imputation of atheiſm, which ſome would have fixed on him. He only differs in opinion from his maſter Plato in this; Ariſtotle thought the world a natural and powerful emanation from the Deity, like light from the ſun: whereas Plato thought the world was not an eternal and neceſſary but voluntary and deliberate choice of the Deity. The doctrine of the creation in both makes the world eternal, and is very different from that of Moſes, in which God is left ſo free with regard to creating the world, that he might have left it eternally in its original chaos.

But if Ariſtotle be acquitted of atheiſm, becauſe he admits a firſt cauſe and makes God the author and firſt mover of all things; yet his notions tend indirectly to ſubvert and deſtroy the liberty of his agency: becauſe, ſays he, motion impreſſed on matter did not proceed from his will, but the neceſſity of his nature; ſo that his god is diveſted of all the attributes we juſtly aſcribe to the divine Being. Notwithſtanding theſe abſurdities, which ſtrike at the root of the Chriſtian religion, ſome eminent men of the Romiſh perſuaſion have been ſo prejudiced in favour of his philoſophy, that his picture has been drawn in the ſame piece of painting with that of our Saviour: nay, have been wicked and weak enough to place his writings on the level of holy writ. In latter ages, even after the revival of learning in Italy, ſome have not ſcrupled to place him among the number of the bleſſed. We have two books yet extant, written expreſsly on this ſubject, one intitled 'The ſalvation of Ariſtotle', which the divines of Cologne are ſaid to have publiſhed; the other, by Lambert Dumont profeſſor of philoſophy, intitled 'What may moſt probably be advanced concerning the ſalvation of Ariſtotle, drawn from the proofs of holy ſcripture, and borrowed from the teſtimonies of the ſoundeſt body of divines'. Strange infatuation!

We cannot conclude this article without giving an abſtract of the ingenious parallel father Rapin has drawn between Ariſtotle and Plato. They both, ſays he, poſſeſſed an uncommon and elevated genius. The mind of Plato was, it is true, more refined, but Ariſtotle's more penetrating and profound. Plato's imagination is lively, copious, fruitful in invention, idea, and expreſſion: he gives every ſubject he treats of a thouſand different turns, ſets it in a thouſand lights, and all are pleaſing. But, after all, this is nothing but imagination. Ariſtotle is crabbed and dry, but what he ſays, carries the force of reaſon with it. His diction, though pure, is harſh, and his natural or affected obſcurities perplex and tire his readers. Plato has a delicacy in his thought and expreſſion; Ariſtotle ſeems to avoid this, in order to be more natural: his ſtile is ſimple and even, but cloſe and nervous; that of Plato pompous and elevated, but looſe and diffuſive. In ſhort Plato's principal intention ſeems to have been elegance of diction: Ariſtotle's ſolid Reaſoning.

Of the Reſtorers of ARISTOTLE's *Philoſophy*.—Philoſophy was never ſo much cultivated as under the Roman emperors, yet the hiſtory of thoſe times ſhews us, it by no means made ſo great a progreſs as might have been expected from the encouragement it met with from them. An inundation of Barbarians deſtroyed the Roman empire and philoſophy too. Ignorance ſucceeded, and the only ſtudy in reputation, for ſome time, was a kind of logic, which conſiſted in quirks and deſtinctions which ſignified nothing. On the revival of learning, ſome men of letters undertook to give a correct tranſlation of Ariſtotle's works into Latin; former tranſlators had given his diſciples a mean opinion of this great philoſopher, and had rather exhibited their own Gothic taſte, than Ariſtotle's genius. But the reſtoration of learning was too great a work for perſons in a private ſtation; princes intereſted themſelves in it, procured manuſcripts out of the Eaſt, and cauſed them to be tranſlated and publiſhed. Pope Paul V. acquired immortal honour by the encouragement he gave to all undertakings of this kind. He was paſſionately fond of all ſorts of literature, but eſpecially of Ariſtotle's philoſophy. Men of learning increaſed, and tranſlations of courſe. Averroïs, till then, had been thought Ariſtotle's beſt commentator, but, as learning improved, taſte refined; they thought Averroïs retained ſomewhat of barbariſm, and therefore choſe Alexander to explain Ariſtotle in the Lycæum, as a man of more elegance and politeneſs. Averroïs and he, were without compariſon the moſt eminent in the Peripatetic philoſophy, but their opinions about the ſoul were not orthodox. For Alexander thought it mortal, and Averroïs, though he acknowledged the ſoul immortal, yet meant only an univerſal ſoul of which all men partook. Theſe opinions ſpread very much in the time of Thomas Aquinas, who refuted them very fully. The ſect of Averroïs prevailed in Italy, inſomuch that Pope Leo X. thought proper to put a ſtop to the propagation of doctrines ſo oppoſite to Chriſtianity, and condemned the opinion of Averroïs as impious in the ſecond Lateran council. Some profeſſors, thinking the fulminations of the church inſufficient to make men of learning lay aſide theſe dangerous opinions, oppoſed the Platonic philoſophy as the beſt remedy to this growing evil; others, finding many beauties in the philoſophy of Ariſtotle, and highly reverencing the doctrines of the goſpel, were for reconciling him with Plato; others, again, ſoftened the expreſſions of Ariſtotle and gave them a religious turn.—It may not be diſagreeable to mention ſome of thoſe who diſtinguiſhed themſelves in theſe controverſies.

Among the Greeks who left their own country and came to tranſplant learning into Italy, Theodorus Gaza was one of the moſt eminent; he underſtood the opinions of every ſect of philoſophy, was a great phyſician, a profound divine, and remarkable for his ſkill in polite literature. He was of Theſſalonica; the victorious arms of Amurath that ravaged all the Eaſt, drove him to ſeek refuge in Italy. Cardinal Beſſarion received him with friendſhip, and gave him prieſt's orders. He tranſlated Ariſtotle's Hiſtory of Animals, and the Problems of Theophraſtus on Plants. His tranſlations pleaſed him ſo much, that he boaſted of them as equal to the original. But though he is eſteemed one of the beſt tranſlators, yet, as Eraſmus juſtly obſerves, his Latin phraſe has a tincture of Greek, and his opinions the tincture of the age he lived in. Coſmo of Medicis joined with cardinal Beſſarion in doing him ſervices and advancing his fortune, but Greek and Brutian ſycophants and his own want of œconomy reduced him to extreme poverty; under theſe circumſtances he ſet about the tranſlation of Ariſtotle's Animal Hiſtory, which he dedicated to Sixtus IV. from whom he only received a preſent of a hundred piſtoles, which he threw with indignation into the Tiber, and withdrew himſelf from Rome into the country of Brutii, where he would have ſtarved, had not the duke of Ferrara taken notice of him. He died of vexation ſoon after, a remarkable example of the changes of fortune.

George of Trebizond, as well as Gaza, applied himſelf to the Peripatetic philoſophy; gave himſelf this title, becauſe it was the country of his anceſtors; for he was a Cretan by birth. He went into Italy, while the council ſat about reuniting the Latin and Greek churches. He was at Venice firſt, from whence he went to Rome where he taught rhetoric and philoſophy. He was ſo zealouſly fond of Ariſtotle as to defend him in every point; and wrote the bittereſt invectives againſt the followers of Plato; which created him many enemies. Nicholas V, his patron, notwithſtanding his inclination to the Ariſtotelian philoſophy, diſapproved of his conduct. Cardinal Beſſarion was the moſt powerful antagoniſt that took up the pen againſt him; he refuted him under the title of the ſlanderer of Plato. But he had a more formidable enemy than the cardinal, neceſſitous poverty; for this diſpute unhappily deprived him of all ſupport. Poſterity will more eaſily pardon his prejudices againſt the followers of Plato in his age, than the incorrectneſs of his tranſlations. His tranſlations of the Laws of Plato and Ariſtotle's Hiſtory of Animals are deficient in many reſpects; inattention, want of erudition and honeſty, manifeſt themſelves very frequently. For he took the liberty of altering the text, leaving out many things of conſequence, and changing others; as may be ſeen by the tranſlation Euſebius has given us. Thus we ſee, on the revival of learning, men of letters were divided between Plato and Ariſtotle; both ſides caſt the ſevereſt reflections on each other, which is the caſe of all parties; but neither are to be regarded more than reaſon decides in their favour.

The Ariſtotelian philoſophy, however, was continued in vogue till Des Cartes demoliſhed it; though he did not ſubſtitute any thing more rational in its ſtead; as we have obſerved in the preface to the Dictionary.

Univerſal ARITHMETIC, a name given by Sir Iſaac Newton to algebra, or the calculation of quantities in general. Nor is it without reaſon that this great man, whoſe elevated genius and profound penetration ſeem to have traced all the ſciences to their true metaphyſical principles, gave it this title.

In ſhort, in common Arithmetic are two kinds of principles; the firſt are general rules independent of the characters made uſe of to expreſs numbers: the ſecond are rules which depend on the characters; and theſe are more properly called rules of Arithmetic. The firſt principles contain only the general properties of proportions, and take place, however theſe proportions are ſtated: ſuch, for example, are theſe rules, take one number from another, and the remainder, added to that number, will give the firſt number; if you divide one number by another, the quotient multiplied by the diviſor will give the dividend; if the ſum of ſeveral numbers be multiplied by the ſum of ſeveral other numbers, the product will be equal to the ſum of the products of each part multiplied by all the others, &c.

From whence it follows, that by noting numbers by general expreſſions, though they no more denote one number than another, we may form certain rules relative to operations which may be performed on numbers ſo expreſſed. Theſe rules ſhew the reſult of one or more operations performed on numbers expreſſed in a general manner, by the moſt ſimple method; and this reſult ſo expreſſed is properly nothing more than an arithmetical operation expreſſed in characters, which will vary according to the different arithmetical values we aſſign the quantities ſubſtituted for numbers.

To ſet this idea of algebra in a clearer light, it may not be amiſs juſt to mention the four common rules in Arithmetic.

To begin with addition, which conſiſts in adding any numbers propoſed into one total, without any other operation. If it were propoſed to add two diſſimilar quantities together a, b; I would write ſimply $a + b$; the reſult is only an indication that if I mean a certain number by a, and another by b, theſe numbers muſt be added together; thus, $a + b$ is nothing but the indication of an arithmetical addition, the ſum of which will be different, according to the different numerical values aſſigned to a and b. Suppoſe it were required to add $5\,a$ to $3\,a$, I might write $5\,a + 3\,a$, but it is plain, this may be expreſſed in a more ſimple manner; for $5\,a + 3\,a$, $= 8\,a$, and, therefore, the arithmetical operation may be expreſſed in a conciſer method than $5\,a + 3\,a$, by writing ſimply $8\,a$.

The general rule of addition in algebra for ſimilar quantities is performed by adding together their numerical co-efficients, and adjoining the literal quantities.

Whence it follows, that addition in algebra expreſſes the ſum or aggregate of ſeveral numbers, generally in the moſt ſimple manner, and ſaves the arithmetician as much labour as poſſible.

In ſubtraction the thing is the ſame; for, if I would ſubtract b from a, I write ſimply $a - b$; becauſe I cannot repreſent this operation in a more ſimple manner: but, were I to ſubtract $3\,a$ from $5\,a$, I would not write $5\,a - 3\,a$, becauſe that would give me the trouble of ſeveral arithmetical operations, if a had any numerical value, but ſimply $2\,a$, which is more convenient in calculation.

The ſame thing is true in multiplication and diviſion; if I would multiply $a + b$, by $c + d$, I might write indifferently $\overline{a + b} \times \overline{c + d}$, or $a\,c + b\,c + a\,d + b\,d$, though I ſhould prefer the firſt method, becauſe it ſeems to require fewer arithmetical operations; in the firſt, there are only wanted two additions and one multiplication; in the ſecond, three additions and four multiplications. But, were I to multiply $5\,a$ by $3\,a$, inſtead of writing $5\,a \times 3\,a$, I would write $15\,a\,a$, becauſe in the firſt caſe I ſhould have three arithmetical operations to perform, in the ſecond only two; one to find $a\,a$, the other to multiply $a\,a$ by 15. In like manner, were I to multiply $a + b$ by $a - b$, I ſhould write $a\,a - b\,b$; becauſe this reſult would often prove more commodious than the other in arithmetical calculations. Beſides, a theorem reſults from it, namely, that the product of the ſum of two numbers by the difference of the ſame numbers, is equal to the difference of the ſquares of the two numbers. Thus we find the product of $a + b$ by $a + b$, that is, the ſquare of $a + b$ is $a\,a + 2\,a\,b + b\,b$, and, conſequently, contains the ſquare of both quantities, plus twice the product of one by the other; which is of uſe in extracting the ſquare root.

In diviſion, inſtead of writing $\frac{20\,a\,b}{5\,b}$ I would write $4\,a$ ſimply, and inſtead of $\frac{a\,a - x\,x}{a + x}$, $a - x$: but, were I to divide $b\,c$ by $b\,d$, I would write $\frac{b\,c}{b\,d}$, becauſe I could not find a more ſimple manner of expreſſion.

Hence it is evident, that Sir Iſaac Newton was in the right to call algebra univerſal Arithmetic; becauſe it conſiſts in exhibiting all the general and common rules of every kind of Arithmetic, in a more clear, conciſe, and ſimple method.

But it may be aſked why all this perplexity? In all arithmetical queſtions the numbers are expreſſed; of what uſe is it then to give them a literal expreſſion?

It is eaſy to ſee the advantage of this expreſſion; every queſtion, that may be propoſed in Arithmetic, is not ſo ſimple as that of adding a number given to another, ſubtracting one from another, or multiplying or dividing one by another. There are queſtions much more complicated; for the ſolution of which we are obliged to form combinations of which the number or numbers muſt make a part. We muſt therefore be poſſeſſed of an art whereby we may repreſent theſe combinations, without knowing the number ſought; and, conſequently, expreſs theſe numbers by characters not numerical: becauſe it would be very improper and inconvenient to expreſs an unknown number by a numerical character, which we had no reaſon to expect would be its real value. To render this ſtill more plain by an example: let us ſuppoſe two numbers were required, whoſe ſum is 100, and their difference 60. It is eaſy to ſee that by ſetting down two unknown numbers at pleaſure in figures, as, for example, 25 and 50, the expreſſion would be falſe; becauſe theſe two numbers do not anſwer the conditions of the queſtion. The ſame inconvenience would ariſe in a multitude of other numerical expreſſions. To avoid this inconvenience, let us call the greater number x, the leſſer y, and, by this algebraic expreſſion, the conditions of the queſtion will be eaſily repreſented; thus x plus y is equal to 100, and x minus y is equal to 60; or, in algebraic characters,

$$x + y = 100$$
$$x - y = \ \ 60.$$

As $x + y$ is equal to 100, and $x - y$ equal to 60, it is evident that 100 added to 60 muſt be equal to $x + y$ added to $x - y$. But to add $x + y$ to $x - y$, by the rule of addition in algebra, we muſt write $2\,x$, and conſequently $2\,x$ is equal to 160; that is, 160 is equal to twice the greater number ſought; and conſequently x, or the greater number, is equal to 80. From whence it is eaſy to find the other y, for if $x + y$ be equal to 100, and x equal to 80, then 80 plus y is equal to 100; therefore y is equal to 100 minus 80; that is, the two numbers, therefore, are 80 and 20; for their ſum is 100, and their difference 60.

In other caſes we do not inſiſt on the neceſſity of algebra; nay, if queſtions, more complicated than this were not propoſed, it would not be neceſſary; we only mean to ſhew, by this plain example, which is obvious at firſt ſight, how we arrive at a diſcovery of unknown quantities by the help of algebra.

The algebraic expreſſion of a queſtion, as Sir Iſaac Newton has well obſerved, is only a tranſlation of the ſame queſtion into algebraic characters; which has this advantage, and eſſentiality in its nature, that it confines itſelf to what is abſolutely neceſſary in the queſtion, and contracts the work by baniſhing ſuperfluous terms. See EQUATION, in the Dictionary and Supplement.

ARK, *Arca*, in the ſcripture language, denotes a kind of floating veſſel built by Noah, for the preſervation of the ſeveral ſpecies of animals from the deluge.

The Ark has afforded ſeveral points of curious enquiry among the critics and naturaliſts, relating to its form, capacity, materials, time of building, place of reſting after the flood, &c. Noah is computed to have been an hundred years in building the Ark, viz. from the year of the world 1557, to the flood, which happened in the year 1656: at leaſt, this is the common opinion of the learned. Origen and St. Auſtin aſſert as much; and are followed by Salian, Torniel, Spondeus, Pelletier, &c.

Yet Beroſus affirms, that Noah only began to build the Ark ſeventy-eight years before the flood: Solomon Jarchi, on the other hand, will have it an hundred and twenty years in building, and Tanchuma only fifty-two.

Father Fournier, in his Hydrography, embraces the opinion of the fathers; noting, that the only hands employed in it were Noah and his three ſons. To this purpoſe he alledges the inſtance of Archias of Corinth, who, with the help of three-hundred workmen, built Hiero's great ſhip in one year. Add, that Noah's eldeſt ſon was not born till about the time when the Ark was begun, and the younger, after; ſo that it was a long time before they could do their father any ſervice. However, for ſo large a building, a prodigious number of trees muſt have been required, and, conſequently, a great number of workmen employed to fell and hew them, beſides thoſe who built the Ark.

The wood whereof the ark was built, is called, in ſcripture, עציגפר, etſe gopher, gopher wood: and in the LXX. ξύλα τετράγωνα, ſquare timbers. Onkelos and Jonathan render gopher by קדרום, kedros, cedar: St. Jerom, in the vulgate, by ligna lævigata, planed wood; and, elſewhere, ligna bituminata, q. d. pitched wood. Kimchi tranſlates it, wood proper to float; Vatable, light wood, which ſwims in the water without corrupting: Junius, Tremellius, and Buxtorf, a kind of cedar, by the Greeks called κεδρελατὴ; Avenarius and Munſter, pine; Fuller and Bochart, cypreſs; others box; others fir; Caſtalio, turpentine, &c. Pelletier prefers the opinion of thoſe who hold the Ark made of cedar: his reaſons are, the incorruptibility of that wood; the great plenty thereof in Aſia, whence Herodotus and Theophraſtus relate, that the kings of Egypt and Syria built whole fleets of it; and the common tradition, throughout the Eaſt, imports, that the Ark is preſerved intire to this day on mount Ararat.

The dimenſions of the Ark, as delivered by Moſes, are three hundred cubits in length, fifty in breadth, and thirty in height; which, compared with the great number of things it was to contain, ſeems, at firſt ſight, too ſmall. And hence an argument has been drawn againſt the authority of the relation. Celſus long ago laughed at it, calling it κιβωτὸν ἀλλόκοτον, the abſurd Ark. To ſolve this difficulty, many both of the ancient fathers and later critics have been put to miſerable ſhifts. Origen, St. Auguſtin, and others, maintain, that, by the cubits here ſpoke of, we are to underſtand the Egyptian geometrical cubit, equal, according to them, to ſix vulgar cubits, or nine feet. But the truth is, it does not appear there ever was any ſuch meaſure as a geometrical cubit either among the Egyptians or Jews. Others account for it, by aſſerting the ſtature of mankind, in the firſt ages, to have been much greater than in our days; and, conſequently, the cubit, which is taken from a part of a human body, proportionably larger. But this does not avail, ſince the ſame reaſon will infer an equal augmentation of other animals. Others ſuppoſe the ſacred cubit here ſpoken of, which was a hand's-breadth longer than the civil one: but this only affords a ſmall ſupply; beſides, that the ſacred cubit does not appear to have been ever uſed, except in ſacred edifices, as the temple and tabernacle.

This difficulty is much better ſolved by Buteo and Kircher, wherein, ſuppoſing the common cubit of a foot and a half, they prove geometrically, that the Ark was abundantly ſufficient for all the animals ſuppoſed to be lodged therein. Snellius computes the Ark to have been above half an acre in area: Cuneus, Buteo, and others, have alſo calculated the capacity of the Ark.—Dr. Arbuthnot computes it to have been 81062 tons. Father Lamy ſhews that it was an hundred and ten feet longer than the church of St. Mary at Paris, and ſixty-four feet narrower; to which his Engliſh tranſlator adds, that it muſt have been longer than St. Paul's church at London, from weſt to eaſt; broader than that church is high in the inſide, and about fifty-four feet in height, our meaſure.

The things contained in it were, beſides eight perſons of Noah's family, one pair of every ſpecies of unclean animals, and ſeven pair of every ſpecies of clean animals, with proviſions for them all, during the whole year. The former at firſt view ſeems almoſt infinite, but if we come to a calculation, the number of ſpecies of animals will be found much ſmaller than was imagined, not amounting to an hundred ſpecies of quadrupeds, nor two hundred of birds; out of which, in this caſe, are to be excepted ſuch animals as can live in the water. Zoologiſts uſually reckon but an hundred and ſeventy ſpecies in all; but biſhop Wilkins ſhews, that only ſeventy-two of the quadrupede kind needed a place in the Ark.

By the deſcription Moſes gives of the Ark, it appears to have been divided into three ſtories, each ten cubits, or fifteen feet high: and it is agreed on, as moſt probable, that the loweſt ſtory was deſtined for the beaſts, the middle for the food, and the upper for the birds, with Noah and his family; each ſtory being ſubdivided into different apartments, ſtalls, &c. Though Joſephus, Philo, and other commentators add a kind of fourth ſtory, under all the reſt, being, as it were, the hold of the veſſel, to contain the ballaſt, and receive the filth and fæces of ſo many animals.

Drexelius makes three hundred apartments; father Fournier, three hundred and thirty-three; the anonymous author of the queſtions on Geneſis, four hundred; Buteo Temporarius, Arias Montanus, Hoſtus, Wilkins, Lamy, and others, ſuppoſe as many partitions as there were different ſorts of animals. Pelletier only makes ſeventy-two, viz. thirty-ſix, of the birds, and as many for the beaſts: his reaſon is, that if we ſuppoſe a greater number, as three hundred thirty-three or four hundred, each of the eight perſons in the Ark muſt have had thirty-ſeven, forty-one, or fifty ſtalls to attend and cleanſing daily, which he thinks impoſſible. But there is not much in this; to diminiſh the number of ſtalls, without a diminution of the animals, is vain; it being, perhaps more difficult to take care of three hundred animals in ſeventy-two ſtalls, than in three hundred.

Buteo computes that all the animals contained in the Ark could not be equal to five hundred horſes; he even reduces the whole to the dimenſions of fifty-ſix pair of oxen. Father Lamy enlarges to ſixty-four pair, or an hundred and twenty-eight oxen; ſo that, ſuppoſing one ox equal to two horſes, if the Ark had room for two hundred and fifty-ſix horſes, there muſt have been room for all the animals. But the ſame author demonſtrates, that one floor would ſuffice for five hundred horſes, allowing nine ſquare feet to an horſe.

As to the food in the ſecond ſtory, it is obſerved by Buteo from Columella, that thirty or forty pounds of hay ordinarily ſuffice an ox for a day; and that a ſolid cubit of hay, as uſually preſſed down in our hay-ricks, weighs about forty pounds; ſo that a ſquare cubit of hay is more than enough for one ox for one day. Now it appears that the ſecond ſtory contained 150000 ſolid cubits, which, divided between two hundred and ſix oxen, will afford each more hay by two thirds, than he can eat in a year.

Biſhop Wilkins computes all the carnivorous animals equivalent, as to the bulk of their bodies and their food, to twenty-ſeven wolves, and all the reſt to two hundred and eighty beeves. For the former he allows 1825 ſheep, and for the latter 109500 cubits of hay: all which will be eaſily contained in the two firſt ſtories, and a deal of room to ſpare. As to the third ſtory, no-body doubts its being ſufficient for the fowls, with Noah, his ſons and daughters.

Upon the whole, the learned biſhop remarks, that, of the two, it appears much more difficult to aſſign a number and bulk of neceſſary things to anſwer the capacity of the Ark, than to find ſufficient room for the ſeveral ſpecies of animals already known. This he attributes to the imperfection of our liſts of animals, eſpecially thoſe of the unknown parts of the earth; adding, that the moſt expert mathematician at this day could not aſſign the proportions of a veſſel better accommodated to the purpoſe, than is here done; and hence, finally, concludes, that 'the capacity of the Ark, which had been made an objection againſt ſcripture, ought to be eſteemed a confirmation of its divine authority; ſince, in thoſe ruder ages, men, being leſs verſed in arts and philoſophy, were not ſo obnoxious to vulgar prejudices as now; ſo that, had it been an human invention, it would have been contrived according to thoſe wild apprehenſions which ariſe from a confuſed and general view of things; as much too big, as it has been repreſented too little.'

ARMA'DA, or **ARMATA**, a naval army, or a fleet equipped for war.

ARMADI'LLA, in the Spaniſh America, denotes a ſquadron of men of war, to the number of ſix or eight, from twenty-four to fifty pieces of cannon, which the king maintains, to prevent foreigners from trading with the Spaniards and the Indians, both in time of war and peace.

The veſſels of this Armadilla are thoſe that have made ſo much noiſe, under the name of Guarda-coſta's.

ARMENI'ACA, *Apricock*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of ſeveral petals, arranged in a circular form. The piſtil ariſes from the cup, and finally becomes a fleſhy fruit, of a roundiſh figure, but uſually a little compreſſed ſideways, and having a furrow down its middle. This fruit contains a flatted ſtone, which includes a kernel of the ſame figure.

We have in Engliſh gardens about ſeven ſorts of this fruit cultivated; which are,

1. The maſculine apricock. 2. The orange apricock. 3. The Algier apricock. 4. The Roman apricock. 5. The Turkey apricock. 6. The Breda apricock. 7. The Bruſſels apricock.

The maſculine is the firſt ripe of all the apricocks; it is a ſmall, roundiſh fruit, of a red colour towards the ſun; as it ripens, the colour fades to a greeniſh yellow on the other ſide. It is only preſerved for being the firſt ripe, having little flavour: the tree is very apt to be covered with flowers; but, as they come out early in the ſpring, are frequently deſtroyed by the cold, unleſs the trees are covered to protect them.

The orange is the next ripe apricock; this fruit is much larger than the former; and, as it ripens, changes to a deep yellow colour. The fleſh of this is dry, and not high-flavoured; it is better for tarts than for the table.

The Algier is the next in ſeaſon; this is of an oval ſhape, a little compreſſed on the ſides; it turns to a pale-yellow, or ſtraw-colour, when ripe; the fleſh is dry, and not high-flavoured: this, and what is by ſome perſons called the common apricock, are often confounded.

The Roman is the next ripe apricock; this is a larger fruit than the former, and not compreſſed on the ſides; the colour is deeper, and not ſo dry as the former.

The Turkey apricock is yet larger than either of the former, and of a globular figure; they turn to a deeper yellow than the former; the fleſh is firmer, and of an higher flavour than either of the former.

The Breda apricock (as it is called from its being brought from thence into England) was originally brought from Africa: this is a large, roundiſh fruit, changing into a deep-yellow, when ripe; the fleſh is ſoft, full of juice, and of a deep orange-colour with inſide; the ſtone is rounder and larger than of the other ſorts: this is the beſt apricock we have; and, when ripened on a ſtandard, is preferable to all other kinds.

The Bruſſels is the lateſt ripe of all the apricocks; for, when it is planted againſt a wall, it is generally the beginning of Auguſt before it is ripe, unleſs when it is planted to a full ſouth aſpect; which is what ſhould not be practiſed, becauſe the fruit is never well-taſted which grows in a warm expoſure. This fruit is of a middling ſize, rather inclining to an oval figure; red on the ſide next the ſun, with many dark ſpots, and of a greeniſh-yellow on the other ſide; the fleſh is firm, and of an high flavour; the fruit often cracks before it is ripe. This is commonly preferred to the former ſort by moſt people; but, when the other is planted as a ſtandard, the fruit is fuller of juice, and of a richer flavour than this.

Moſt people train theſe trees up to ſtems of ſix or ſeven feet high, or bud them upon ſtocks of that height; but this is a practice I would not recommend, becauſe, the higher the heads of theſe trees are, the more they are expoſed to the cutting winds in the ſpring, which too frequently deſtroy the bloſſoms; and the fruit is alſo more liable to be blown down in ſummer, eſpecially if there ſhould happen to be much wind at the time they are ripe; which, by falling from a great height, will be bruiſed and ſpoiled; therefore I prefer half-ſtandards, of about two and a half, or three feet in the ſtem, to thoſe which are much taller; or to plant them as dwarfs againſt an eſpalier, where, if they are ſkilfully managed, they will produce a large quantity of good fruit; and the trees in eſpalier may be more conveniently covered in the ſpring, when the ſeaſon proves bad; whereby there will be a certainty of fruit every year.

Theſe fruits are all propagated by budding them on plum-ſtocks, and will readily take upon almoſt any ſort of plum, provided the ſtock be free and thriving (except the Bruſſels kind, which is uſually budded on a ſort of ſtock, commonly called the St. Julian, which better ſuits the tree, as being generally planted for ſtandards, than any other ſort of plum will.) The manner of raiſing the ſtocks, and budding theſe trees, are treated of under their particular articles, to which I refer the reader, and ſhall proceed to their planting and management.

Theſe trees are all (except the two laſt ſorts) planted againſt walls, and ſhould have an eaſt or weſt aſpect; for, if they are planted full ſouth, the great heat cauſes them to be mealy before they are well eatable. The borders under theſe walls ſhould be ſix feet wide at leaſt, and, if it were more, the better; but I would never adviſe the making of them ſo deep, as is the general cuſtom; for, if the earth be two feet deep, or two and an half at moſt, it is enough.

If your ground is a wet cold loam or clay, you ſhould raiſe your borders as much above the level of the ſurface as it will admit, laying ſome ſtones or rubbiſh in the bottom, to prevent the roots from running downwards; but, if you plant upon a chalk or gravel, you muſt remove it to a conſiderable width, to make room for a good ſoil to be put in; but you need not go above two feet and an half deep at moſt.

The ſoil I would in general adviſe to be uſed for theſe and all other ſorts of fruit-trees, is freſh untried earth, from a paſture-ground, taken about ten inches deep, with the turf, and laid to rot and mellow at leaſt twelve months before it is uſed; and this muſt be kept often turned, to ſweeten and imbibe the nitrous particles of the air.

When the former ſoil of the border is taken away, this freſh earth ſhould be carried in the place; and, if the borders are filled with it two months before the trees are planted, the ground will be better ſettled, and not ſo liable to ſink after the trees are planted: in filling of the borders, the ground ſhould be raiſed four or five inches above the level they are deſigned, to allow for the ſettling.

Your borders being thus prepared, make choice of ſuch trees as are but of one year's growth from budding; and, if your ſoil is dry, or of a middling temper, you ſhould prefer October for the beſt ſeaſon for planting, eſpecially having, at that time, a greater choice of trees from the nurſeries, before they have been picked and drawn over by other people. The manner of preparing theſe trees for planting being the ſame in common as other fruit-trees, we refer the reader to the article of PEACHES, where he will find it largely treated of. But do not cut off any part of the head at that time, unleſs there are any ſtrong fore-right ſhoots which will not come to the wall, which may be taken quite away.

Your trees being thus prepared, you muſt mark out the diſtances they are to ſtand, which, in a good ſtrong ſoil, or againſt a low wall, ſhould be twenty feet, or more; but, in a moderate one, eighteen feet is a good reaſonable diſtance; then make an hole where each tree is to ſtand, and place its ſtem about four inches from the wall, inclining the head thereto: and, after having fixed the tree in the ground, nail the branches to the wall, to prevent their ſhaking, and cover the ſurface of the ground round the root with rotten dung, to keep out the froſt: in this ſtate let it remain till February, when, if the weather is good, you muſt un-nail the branches of your trees, ſo as not to diſturb the roots, and, being provided with a ſharp knife, put your foot cloſe to the ſtem of the tree; and, having placed your left-hand to the bottom of the tree, to prevent its being diſturbed, with your right-hand cut off the head of the tree, to about four or five eyes above the bud, ſo that the ſloping ſide may be towards the wall.

In the ſpring, if the weather proves dry, you muſt, now-and-then, give your trees a gentle refreſhing with water; in the doing of which, if you obſerve to water them with a roſe to the watering-pot, all over their heads, it will greatly help them; and alſo lay ſome turf, in the manner directed for apples, or ſome other mulch, round the roots, to prevent their drying during the ſummer-ſeaſon: as new branches are produced, obſerve to nail them to the wall in an horizontal poſition; and ſuch ſhoots as are produced fore-right, muſt be intirely diſplaced. This muſt be repeated, as often as is neceſſary, to prevent their hanging from the wall; but by no means ſtop any of their ſhoots in ſummer.

At Michaelmas, when the trees have done growing, you muſt un-nail their branches, and ſhorten them in proportion to their ſtrength; a vigorous branch may be left eight or nine inches long, but a weak one ſhould not be left above five or ſix. I ſuppoſe many people will wonder at this direction, eſpecially having allowed ſuch a diſtance between the trees, as believing, by this management, the wall will never be filled; but my reaſon for it is, that I would have no part of the wall left unfurniſhed with bearing-wood; which muſt conſequently be the caſe, if the branches are left to a great length at firſt; for it ſeldom happens, that more buds than two or three ſhoot for branches; and theſe are, for the moſt part, ſuch as are at the extreme part of the laſt year's wood; ſo that all the lower part of the ſhoots become naked, nor will they ever after produce ſhoots; and this is the reaſon we ſee ſo many trees which have their bearing-wood ſituated only in the extreme part of the tree.

When you have ſhortened the ſhoots, be ſure to nail them as horizontally as poſſible; for upon this it is that the future good of the tree chiefly depends.

The ſecond ſummer obſerve, as in the firſt, to diſplace all fore-right ſhoots, as they are produced, nailing-in the other cloſe to the wall horizontally, ſo that the middle of the tree may be kept open; and never ſhorten any of the ſhoots in ſummer, unleſs to furniſh branches to fill vacant places on the wall; and never do this later than April, for reaſons hereafter given in the article of PEACHES. At Michaelmas ſhorten theſe ſhoots, as was directed for the firſt year; the ſtrong ones may be left nine or ten inches, and the weak, ſix or ſeven at moſt.

The following year's management will be nearly the ſame with this; but only obſerve, that apricocks produce their bloſſom-buds, not only upon the laſt year's wood, but alſo upon the curſons or ſpurs, which are produced from the two years wood: great care ſhould therefore be had in the ſummer-management, not to hurt or diſplace theſe: obſerve alſo, to ſhorten your branches at the winter-pruning, ſo as to furniſh freſh wood in every part of the tree; and be ſure to cut out intirely all the luxuriant branches, or diſplace them, as ſoon as they are produced; which, if left to grow, would exhauſt the nouriſhment from the bearing branches, which, in my opinion, cannot be too ſtrong, provided they are kindly; for the more vigorous your tree is, the more likely it is to reſiſt the injuries of the weather: and I have often ſeen trees brought to ſo weak a condition, as to be able only faintly to blow their bloſſoms, and then moſt or all of the bearing branches have died; which has given occaſion to the owner to imagine it was the effect of a blight, when, in reality, it was only for want of right management. And, I am fully perſuaded, half the blights we here complained of, proceed from nothing elſe but this.

Theſe few rules, well executed, together with a little obſervation and care, will be ſufficient; and, to pretend to preſcribe particular directions for all the different accidents, or manners of treating fruits, would be impoſſible; but I believe the reader will find what has been ſaid, if duly attended to, will anſwer his deſign; for, without diligent obſervation, there can be no ſuch thing as a ſkilful manager, let him have ever ſo many or good inſtructions laid down to him.

The Bruſſels and Breda apricocks, being, for the moſt part, planted for ſtandards, will require very little pruning or management; only obſerve to take out all dead wood, or ſuch branches as croſs each other; this muſt be done early in autumn, or in the ſpring, after the cold weather is paſt, that the part may not canker where the inciſion is made. *Miller's Gard. Dict.*

ARME'NUS *Lapis*, Armenian ſtone, in natural hiſtory, a mineral ſubſtance, which is but improperly called a ſtone, being no other than ochreous earth, and properly called blue ochre. It is a very valuable ſubſtance in painting, being a bright and florid blue. It was in ſo high eſteem as a paint, among the ancients, that counterfeits were continually attempted to ſerve in its place: and Theophraſtus has recorded it as a thing judged worthy a place in the Egyptian annals, which of their kings had the honour of inventing the factitious kind; and he tells us the genuine native ſubſtance was a thing of that value, that preſents were made of it to great perſons; and that the Phœnicians paid their tribute in it. *Hill's Theophraſtus.* It is a very beautiful earth, of an even and regular texture, and of a fine blue; ſometimes deeper, ſometims paler, and ſometimes mixt with green. It is ſoft, tender, and light; of an even, but ſomewhat duſty, ſurface; it adheres firmly to the tongue, and is dry, but not harſh to the touch. It eaſily breaks between the fingers, and does not ſtain the hands. It is of a brackiſh diſagreeable taſte, and does not ferment with acids. It is a very ſcarce foſſil, but is found very pure, though in but ſmall quantities, in the mines at Goſſelaer in Saxony. It is frequently found ſpotted with green, and ſometimes with black; and very often is mixed among the green ochre, called berggruen by the Germans, which has thence, by ſome, been erroneouſly called by its name. *Hill's Hiſt. of Foſſils.*

ARMOI'SIN, a ſilk-ſtuff, or kind of taffety, of an indifferent goodneſs. It is made at Lyons, and in ſeveral places in Italy. There are half-Armoiſins (demi-Armoiſins) made at Avignon, which are of an inferior quality, and leſs price than the others. They manufacture alſo Armoiſins with three threads. Armoiſins of all colours are imported from the Eaſt-Indies, and particularly from Caſembaſar, by the way of Bengal. See the next article. Some pretend that the word Armoiſin comes from the Italian armeſino; or that thoſe ſilks were thus called, becauſe there were coats of arms delineated upon the cloth in which they were wrapped up.

ARMOISIN *of the Indians.* It is a taffety manufactured in the Eaſt-Indies, but ſlighter than thoſe that are made in Europe, and of an inferior quality. Their colours, and particularly their crimſon and red, are commonly falſe, and they have but little gloſs, and no brightneſs at all.

There are two ſorts of them, the arains, which are taffeties, either ſtriped or chequered; and the damaras, or flowered taffeties. Their length is from 7 French ells to 24, and their breadth from $\frac{7}{16}$ to $\frac{5}{6}$ of an ell.

The Indian Armoiſins have ſold at Amſterdam from 18 to 20 guilders per piece. When you do not buy them of the company, that is to ſay, at ſecond-hand, you may ſtipulate to pay for them either in current or bank-money, or to deduct the difference.

The Armoiſins of Lucca have ſold at Amſterdam from 7 to 9 ſols de groſs per ell. They who ſell them again, buy them by deducting the intereſt of the money for 18 months, they not being obliged to pay for them, but after thoſe months are elapſed: they alſo deduct 1 per cent. for prompt payment. But, when they ſell them to retailers, they deduct but 2 per cent. upon the whole for prompt payment; that is, they allow ſo much diſcount for the payment of ready money.

It muſt be obſerved that all the ſilks of Italy are ſold after the ſame manner.

A'RMORIC, or AREMORIC, ſomething that belongs to the province of Bretagne or Britanny in France.

Armoric, abſolutely uſed, denotes the language in uſe among the inhabitants of Britanny.

The French uſually call this language bas Breton.

The Armoric is a dialect of the Welch, and ſiſter of the Corniſh language.

The inhabitants of Britanny, of Cornwal, and of Wales, ſtill underſtand each other's ſpeech; though conſiderable diverſities have crept in between theſe languages, ſince their ſeparation from each other.

A'RMOURERS *Company, in London.* The arms and creſt of the brothers and ſiſters of the fraternity, or guild, of St. George, of the myſtery of the Armourers of the city of London (as they were ſtiled in their charter) were antiently borne by the ſaid corporation, but afterwards declared and confirmed to them by Thomas Hawley, Clarencieux, by patent under the ſeal of his arms and office, in the third and fourth years of Philip and Mary, 1556.

Their arms are argent on a cheveron, gules; a gantlet, between four ſwords in ſaltier, on a chief, ſable; a buckler, argent, charged with a croſs, gules, between two helmets of the firſt.

Their creſt is a man demi-armed at all points, ſurmounting a torce and a helmet. Their motto, Make all ſure. Their hall is in Coleman-ſtreet.

ARMS, or ARMORIES, are uſed in heraldry, for marks of dignity and honour, regularly compoſed of figures and colours, given or authorized by ſovereigns, and borne in banners, ſhields, coats, &c. for the diſtinction of perſons, families, and ſtates, and paſſing by deſcent to poſterity.

They are called Arms, in regard they are borne principally on the buckler, cuiraſſe, banners, and other apparatus of war. They are alſo called coats of Arms, coat-armour, &c. becauſe antiently embroidered on ſur-coats, &c. Some will have the name to have been firſt occaſioned by the antient knights, who, in their juſts and tournaments, bore certain marks (which were frequently their miſtreſs's favours) in their armour, i. e. their helms or ſhield, to diſtinguiſh them from each other.

Three flowers-de-lys, in a field azure, are the Arms of France. The Arms of England are three lions. In the Arms of Great-Britain are quartered the Arms of France, England, Scotland, and Ireland.

There has been a great diſpute among the learned about the origin of Arms. Tavyn will have them to have been from the beginning of the world: Segoin, from the time of Noah; others, from that of Oſiris, which is ſupported by ſome paſſages in Diodorus Siculus; others from the times of the Hebrews, in regard Arms were given to Moſes, Joſhua, the twelve tribes, David, &c.

Others will have them to have taken their riſe in the heroical age, and under the empire of the Aſſyrians, Medes, and Perſians; building upon Philoſtratus, Xenophon, and Quintus Curtius.

Some pretend that the uſe of Arms, and the rules of blazon, were regulated by Alexander. Others will have them to have had their original under the empire of Auguſtus; others, during the inundations of the Goths; and others, under the empire of Charlemaign.

Chorier obſerves, that, among the antient Gauls, each man bore a mark on his buckler, by the ſight whereof he might be known to his fellows; and hence he refers the original of the Arms of noble families. Cambden has obſerved ſomething like this of the ancient Picts and Britons, who, going naked to the wars, painted their bodies with blazons, and figures of divers colours, which he ſuppoſes to have been different in different families, as they fought divided by kindreds. Yet, Spelman ſays, that the Saxons, Danes, and Normans, firſt brought Arms from the north into England, and thence into France.

Upon the whole, it is certain, that, from time immemorial, there have been ſymbolical marks in uſe among men, to diſtinguiſh them in armies, and to ſerve as ornaments of ſhields and enſigns; but theſe were uſed as arbitrarily as devices, emblems, hieroglyphics, &c. and were not regular armories, like ours, which are hereditary marks of the nobility of a houſe, regulated according to the rules of heraldry, and authorized by princes.

Before Marius, even the eagle was not the conſtant enſign of the Roman army; but they bore in their ſtandard a wolf, leopard, or eagle, indifferently, according to the fancy of the generals.

The ſame diverſity has been obſerved with regard to the French and Engliſh; on which account, authors are divided, when they ſpeak of the antient Arms of thoſe countries. In effect, it appears from all the beſt authors, that the armories of houſes, as well as the double names of families, were not known before the year 1000. And ſeveral have even endeavoured to prove, that the uſe of Arms did not begin till the time of the firſt croiſades. See HERALDRY in the Dict.

ARO'BE, which ſome ſpell and pronounce arrobe, in Spaniſh Arroba, and, in the language of Peru, arroue, a weight uſed in Spain, in Portugal, at Goa, and throughout all Spaniſh America. The Portugueſe uſe it alſo in Brazil, where, as well as at Goa, it is ſometimes called arate. All theſe Arobes are ſcarce any otherways alike each other but in name, being very different in weight, and in their proportion to the weights of other countries.

The Arobe of Madrid, and almoſt over all Spain, except Seville and Cadiz, weighs 25 Spaniſh pounds, which do not quite make 23 pounds and one-quarter Paris weight: ſo that the common quintal, which is of 4 Arobes, makes but 93 pounds Paris weight.

The Arobe of Seville and Cadiz is alſo of 25 pounds, but theſe make 26 pounds and a half at Paris, Amſterdam, Straſburgh, and Beſancon, where the pound is equal; 4 Arobes make the common quintal, that is to ſay, 100 pounds; but there muſt be 6 Arobes to make the quintal of Macho, which amounts to 150 pounds Seville and Cadiz weights, which may be reduced to the Paris weights upon the foot of the reduction of the Arobe of thoſe two cities, made above.

The aroue, or Arobe, of Peru, weighs 25 pounds French weight. It is chiefly uſed to weigh the herb paraguay, of which the Spaniards and the Indians, who uſe it like tea, make ſo great a conſumption, that there are wanted for Peru alone above 75,000 Arobes yearly.

The arate, or Portugueſe Arobe, weighs much more than the Spaniſh Arobe; it being 32 pounds of Liſbon, which amount to near 29 pounds Paris weight. *Sav. Dict. de Com.*

A'ROPH, a term uſed by Paracelſus, to denote a medicine endued with a power of breaking or diſſolving the ſtone in the human body.

Aroph Paracelſi is alſo a name given to a kind of chemical flowers, elegantly prepared by ſublimation, from equal quantities of lapis hæmatitis and ſal armoniac; ſaid to be of great efficacy in quartan agues, the plica Polonica, and hypochonriac diſeaſes.

A'ROUGHCAIN, an animal found in Virginia, which entirely reſembles the beaver, except that it feeds and leaps upon trees like the ſquirrel.

The Engliſh value its furr pretty much, which makes a branch of their trade with the Indians who live near their colony.

A'RPENT, a certain meaſure of land, which is greater or leſſer, according to different countries and provinces. But, as to the ſurveying, or meaſuring, of foreſts and coppices ſold in France, the Arpent muſt be the ſame throughout the whole kingdom, according to the king's ordonnance of Auguſt the 13th, 1669, article 14 of the title, which relates to the policy and preſervation of foreſts, of which here follows an extract: no meaſure ſhall be admitted, nor uſed, in the king's woods and foreſts, nor in thoſe held in coparcenery, in eyre, in appennage, mortgage, uſucaption, or held by eccleſiaſtical community, or private perſons, without exception, but that of 12 lines per inch, 12 inches per foot, 22 feet per perch, and 100 perches per Arpent, upon pain of a fine of 1000 livres, notwithſtanding all cuſtoms and poſſeſſions to the contrary.

It muſt be obſerved that the ordonnance, mentioning 100 perches per Arpent, muſt be underſtood of 100 ſquare perches.

The Arpent is commonly divided two ways; the one into an half, a quarter, and half a quarter; and the other into a third, half a third, &c. of an Arpent.

A'RQUEBUSE, or HARQUEBUSE, a fire-arm, of the ſame length with a fuſee, or muſquet, which is commonly cocked with a ſpring-lock. This kind of arms was formerly very much uſed both in war and for hunting; but, at preſent, it is hardly any otherwiſe uſed than for the defence of beſieged places; but it has given name to a conſiderable company of tradeſmen at Paris, called arquebuſiers, that is, gun-ſmiths.

A'RSCHIN, a long meaſure, uſed in China, to meaſure ſtuffs. It is of the ſame length with the Dutch ell, which is of 2 feet 11 lines, which amounts to four-ſevenths of a French ell. So that 7 Arſchins of China make 4 ells of France.

The ell of Amſterdam makes three-fourths of a yard of London, ſo that 4 ells of Amſterdam, or 4 Arſchins of China, make 3 yards of London. So that, to reduce the Arſchins to the yard of London, you muſt ſay, if your Archins make three yards, ſo many Arſchins (thirty for inſtance) how many yards will they make? Anſwer, $22\frac{1}{2}$. And, in order to reduce the yards into Arſchins, ſay, if 3 yards make 4 Arſchins, ſo many yards (as 35 for inſtance) how many Arſchins will they make? Anſwer, $46\frac{2}{3}$.

A'RSMART, in the botanic pharmacy, a medicinal plant, of a hot, pungent, penetrative taſte, whence it is alſo called hydropiper, or water-pepper. Botaniſts call this plant perſicaria, and, ſometimes, perſicaria non maculoſa, by way of diſtinction from another ſpecies of that plant, called perſicaria mitis, or maculoſa.

Arſmart, by its heat and pungency, becomes almoſt intolerable to the tongue; and hence it obtains in ſcorbutic, hypochondriac, and other diſorders, ariſing from a ſluggiſh circulation of the fluids.

Several value its diſtilled water for its efficacy in the ſtone in the kidnies or bladder. Some, alſo, uſe the plant in external applications, particularly to diſſipate bruiſed blood; others for the tooth-ach, &c.

ARRACHEE', in heraldry, is underſtood of repreſentations of plants forcibly torn up by the roots, with their roots hanging at them. *Niſb. Herald.*

ARRE'ST, ARRESTS, or ARRETS, among farriers, denote a ſort of mangy tumors on the ſinews of the hind legs of a horſe, between the ham and the paſtern; called alſo rat-tails. *Guill. Gent. Dict.*

The name of it is taken from the reſemblance they bear to the arretes or back-bones of fiſhes.

Arrets bear a near reſemblance to ſcratches.

ART. See MECHANICS.

ART *and part*, in the law of Scotland, is uſed for being an accomplice of a crime, either by aiding or adviſing.

The facts, inferring Art and part, need not be particularly laid in the libel or indictment, for theſe general words, as terms of ſtated ſignification, are ſufficient. Yet theſe facts may be ſet forth, and it is proper ſo to do, if the proſecutor chuſes to confide in the court rather than in the jury. *Mackenz. Crim. Law.*

ARTA'BA, an antient meaſure of capacity uſed by the Perſians, Medes, and Egyptians.

The Perſian Artaba is repreſented by Herodotus as bigger than the Attic medimnus by three Attic chœnixes; from which it appears, that it was equal to $6\frac{3}{4}$ Roman modii; conſequently, that it contained $166\frac{2}{3}$ pounds of wine or water, or $126\frac{4}{5}$ pounds of wheat. *Beverin. de Pond et Menſ. P. 2. p. 125.*

The Egyptian Artaba contained five Roman modii, and fell ſhort of the Attic medimnus by one modius; conſequently, held $133\frac{1}{3}$ pounds of water or wine, 100 pounds of wheat, or 60 of flour.

ARTEMI'SIA, in the botanical pharmacy, a medicinal herb of great efficacy as an uterine, and promoter of the menſes.

Artemiſia is the ſame with what is popularly called mugwort; among botaniſts it is alſo under the denomination of Artemiſia vulgaris major, Artemiſia rubra, and Artemiſia officinarum. It is much uſed in female complaints, both internally and externally: it is held an opener and diſcutient, a cleanſer of the uterus, promoter of the menſes, and of delivery. But it is more eſteemed among midwives and nurſes than among phyſicians. Its chief uſe in the ſhops is in a compound ſyrup, which takes its name from it. *Quinſ. Diſpenſ.*

A'RTICHOKE, in gardening.—There are ſeveral ſpecies of this plant; but only one is at preſent generally cultivated, which is the red kind.

The manner of propagating this plant is from ſlips or ſuckers taken from the old roots, in February or March, which, if planted in a good ſoil, will produce large fair fruit the autumn following: but as this is a plant which few gardeners, that have not been inſtructed in the kitchen-gardens near London, underſtand to manage well, I ſhall be the more particular in my directions about it.

At the latter end of February, or in March, according to the goodneſs of the ſeaſon, or forwardneſs of the old Artichoke-ſtocks, will be the proper time of dreſſing them, which muſt be thus performed: with your ſpade remove all the earth from about your ſtock, down below the part from whence the young ſhoots are produced, clearing the earth from between the ſhoots, ſo as to be able to judge of the goodneſs of each, with their proper poſition upon the ſtock; then make choice of two of the cleareſt, ſtraighteſt, and moſt promiſing plants that are produced from the under-part of the ſtock, which you are to let remain for a crop; then with your thumb force off all the other plants and buds, cloſe to the head of the ſtock, from whence they are produced, and with your ſpade draw the earth about the two plants which are left, and with your hands cloſe it faſt to each of them, ſeparating them as far aſunder as they can conveniently be placed without breaking them, obſerving to crop off the tops of the leaves, which hang down, with your hands: your ground being levelled between the ſtocks, you may ſow thereon a ſmall crop of ſpinage, which will be taken off before the Artichokes will cover the ground; and be ſure to keep them clear from weeds; and towards the latter end of April, or the beginning of May, when your plants begin to ſhew their fruit, you muſt carefully look over your ſtocks, and draw up all young plants from them, which may have been produced ſince their dreſſing, and cut off all ſuckers which are produced from the ſtems of the Artichokes, leaving only the principal head, by which means your fruit will be larger: when your Artichokes are fit to gather, you muſt break, or cut them down cloſe to the ſurface of the ground, that your ſtocks may make ſtrong freſh ſhoots before the end of October, which is the ſeaſon for earthing, or, as the gardeners term it, landing them up: which is thus done:

Cut off all the young ſhoots quite cloſe to the ſurface of the ground; then dig between every ſtock, raiſing all the earth between each row of ſtocks into a ridge, as is done in the common method of trenching ground, ſo as that the row of Artichokes may be exactly in the middle of each ridge; this will be ſufficient to guard them againſt froſt: and I would here recommend it to the public, as infinitely preferrable to long dung, which is by the unſkilful often uſed, and is the occaſion of their fruit being ſmall, and almoſt without any bottoms to them. Obſerve, that, although I have mentioned October as the ſeaſon for earthing them, yet, if the weather proves mild, it may be deferred till any time in November.

When you have thus earthed them up, you have nothing more to do till February or March, by which time they will have grown through the ridge of the earth; and, when the weather is proper, muſt be dreſſed as was before directed *Miller's Gard. Dict.*

The Artichoke is a pleaſant, wholeſome, and very nouriſhing food; the roots are reckoned to be aperitive, cleanſing, and diuretic; good for the jaundice, and to provoke urine.

The French and Germans eat not only the heads, but alſo the young ſtalks boiled, and ſeaſoned with butter and vinegar.

The Italians ſeldom boil the heads, but eat them raw, when young, with ſalt, oil, and pepper.

Artichokes have the reputation of promoting venereal inclinations to a very great degree; the ſtalks, preſerved in honey, are ſaid to be an excellent pectoral; but they ſhould firſt be blanched, like celery.

The common leaves, boiled in white-wine whey, are much commended in the jaundice, as is alſo the juice of theſe leaves. *James's Dict. Med.*

Jeruſalem ARTICHOKE, is the root of a ſpecies of ſun-flower of the perennial kind, which is propagated in many gardens for the uſe of the kitchen; it is a very agreeably taſted root, but watery and windy, and therefore, at preſent, generally diſregarded.

It is propagated by planting out the ſmaller roots, or even pieces of the larger, which have buds to them in the ſpring or autumn; they muſt be allowed a very conſiderable diſtance, for they ſpread immoderately, and multiply very quick. The autumn following when their ſtems decay, the roots may be taken up for uſe. They are but an unſightly plant, though very tall, and are commonly placed in obſcure corners of a garden. *Miller's Gard. Dict.*

ARTI'FICERS, thoſe who work with the hands, and ſell things faſhioned by them into other forms.

Artificers amount to the ſame with what we otherwiſe call handicrafts and mechanics; ſuch as ſmiths, carpenters, taylors, ſhoemakers, weavers, and the like. See MECHANICS.

By the Engliſh laws, Artificers in wool, iron, ſteel, braſs, or other metal, going out of the kingdom into any foreign country without licence, are to be impriſoned three months, and fined in a ſum not exceeding one hundred pounds. And ſuch as going abroad and not returning on warning given by our ambaſſadors, &c. ſhall be diſabled from holding lands by deſcent or device, from receiving any legacy, &c. and be deemed aliens. *Stat.* 5. *Geo.* I. c. 27.

ARTI'LLERY (*Dict.*)— The larger pieces of Artillery depend upon the buſineſs of foundery, the other upon ſmithery. The former is commonly called ordnance, the other ſmall arms, &c.

To carry on manufactures or ordnance with ſucceſs, there are various circumſtances which are requiſite to be well weighed and conſidered, or the undertakers may be ſoon undone.

1. The ſituation of the place for caſting of ordnance of iron ſhould be very near ore and fuel, and water, not only for ſafe carriage, but for the conveniency of working of bellows for their caſting part, and forging hammers for the working up the heads of their cannon, and other ſuperfluous caſt iron, which is ſeparated therefrom.

2. The price of labour, as well as that of fuel, ore, and carriage, ſhould alſo be calculated, in order to be able to judge of the profits of the manufactory, according to the views and expectations of vent for the ſame.

3. Theſe things conſidered, the next is that of hiring, or erecting furnaces, forges, and water-mills, and all other conveniences neceſſary for the purpoſe.

If hiring, or building, be the intention, due regard ſhould be had to the ſtructure of furnaces, not only that they may be properly built for the occaſion, but adapted to the quantity of ore deſigned to be melted at a time; and that the bellows be ſo hung as to give the neceſſary continued blaſt. Theſe things depend on the care and ſkill of able and experienced workmen, or rather upon the maſter-founder himſelf, who has the conduct of the whole.

4. But, let his judgment and experience be ever ſo great, yet if the ſeveral workmen, the operators in the various claſſes, are not equal to their reſpective parts, the undertakers may ſoon be ruined; for there is ſuch a delicacy in the caſting of large pieces of ordnance, that I have known ſeventeen pieces out of thirty not ſtand proof upon trial, though caſt at one of the beſt founderies in the kingdom; which proved a great loſs to the proprietors.

5. There is much in this art that depends upon a careful and ingenious mould-maker; and more on the method of preparing the ore, and ſmelting it with ſuch fluxes as will render the metal conſtantly ſo tough as is neceſſary to ſtand all proof. When this is ſkilfully done, thoſe accidents before mentioned can very rarely happen; as no little defect in the moulds could change the general texture, compactneſs, and toughneſs of the metal; little exuberances in the moulds could never have that effect as to prevent ſuch metal ſtanding proof, if that itſelf was as good as it ought to be.

Theſe accidents to which our iron founderies are liable in caſting of ordnance, ſeem to indicate that this art is not yet brought to its laſt perfection.

Under the articles IRON and FOUNDERY, we ſhall ſhew the method of ſmelting the various ſpecies of ores for ordnance, and other matters, which are made of caſt iron; and endeavour to point out the cauſes of thoſe miſcarriages; which may in ſome meaſure, poſſibly, contribute to prevent their frequency.

And, in regard to the making of braſs ordnance, that will be repreſented under the articles BRASS and FOUNDERY.

A'RUM, *wake-robin*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, of a very ſtrange figure, repreſenting, in ſome degree, a hare's ear; from the bottom of the flower ariſes a piſtil, which, at its baſe, is ſurrounded by a great number of embryo's, each of which finally ripens into a roundiſh or oval berry, containing one or two ſeeds. To theſe marks it may be added, that the leaves are not divided.

The ſpecies of Arum, enumerated by Mr. Tournefort, are thirty-four.

The root of Arum is extremely pungent and volatile, which quality makes it recommended in all viſcidities, phlegmatic and ſcorbutic caſes; becauſe it penetrates and rarifies tough concretions and infarctions of the glands and capillary veſſels. It has alſo been preſcribed in humerous aſthma's and obſtructions of the bronchia. Van Helmont commends it greatly with vinegar, in bruiſes and falls, as ſerving to prevent the blood from ſtagnating, and falling into grumes, upon the injured parts. Some have affirmed, a drachm of this root, freſh powdered, and taken in any proper vehicle, to be an infallible remedy againſt poiſon, and the plague. Matthiolus commends, with great reaſon, a cataplaſm of it, freſh bruiſed, and cow-dung, to be applied hot, in arthritic pains. As this root, kept dry, ſoon loſes its efficacy, the compound powder of the ſhops, which takes its name from it, muſt be of little or no ſignification. *Quinſ. Pharm.*

ASH, *fraxinus*, in botany, a genus of trees, whoſe characters are: it hath pinnated leaves, which moſtly end in an odd lobe: the male flowers (which grow at a remote diſtance from the fruit) have no petals, but conſiſt in many ſtamina: the ovary becomes a ſeed-veſſel, containing one ſeed at the bottom, which is ſhaped like a bird's tongue.

There are ſix ſpecies of this tree; all which may be propagated by budding them into common Aſh; upon which they will all take very well, and become hardier than upon their own ſtock: but theſe budded trees never grow ſo large as thoſe which are raiſed from ſeeds; nor will the ſtock and bud keep pace in their growth; ſo that there will be a remarkable difference in the ſize of the ſtem, and above the place where they are budded: but few of theſe foreign kinds have yet arrived at an age to produce ſeeds in England, the nurſery-gardeners having been obliged to propagate theſe ſorts by budding and grafting.

The common Aſh is propagated by ſowing the keys in October or November, on a bed of freſh earth, which ſhould be well dug, and cleanſed from roots and noxious weeds. A ſmall bed will be ſufficient to raiſe a great quantity of theſe trees. The ſeeds ſhould be ſown pretty thick, and covered about half an inch thick with earth.

Theſe ſeeds, many times, continue until the ſecond ſpring before they come up; you ſhould, therefore, let the bed remain undiſturbed, and keep it clean from weeds. When your plants come up, you muſt alſo keep them very clear from weeds, and, if the ſeaſon ſhould prove very dry, if you give them, now-and-then, a little water, it will greatly promote their growth: in this bed they ſhould remain no longer than the autumn following, provided they have grown well; at which time you ſhould prepare a nurſery, which ſhould be well dug and cleared, as before; then with your ſpade looſen the roots of the plants before you draw them up; otherwiſe you will endanger the breaking of them. When you have drawn them out of the ground, ſhorten the downright tap-root; but do not cut off any of the lateral fibres; then, having prepared your ground, plant them in rows, three feet diſtance row from row, and a foot aſunder in the rows, cloſing the earth to their roots with your feet.

In this nurſery they may remain two or three years, obſerving to keep them clear from weeds, as alſo to trim up the ſide-branches every winter, and dig the ground between the rows; after which time you may remove them where they are to remain for good. This tree will grow upon almoſt any ſoil; but, the better the ſoil is, the more the tree will increaſe in bulk. Notwithſtanding which, it ſhould not, by any means, be planted too near the other trees or plants; for it will exhauſt all the goodneſs of the ſoil from them; and the ſhade of this tree is malignant to moſt other plants. The diſtance they ſhould be planted is eight feet ſquare; and, after they have been planted one year, you may cut down every other tree, chuſing ſuch of them as are crooked, within ſix or eight inches of the ground; this will cauſe them to make many ſtrong, vigorous ſhoots; which, in ſeven or eight years time, will be fit for arbour-poles, or to make hoops; and the other ſtraight trees may be ſuffered to grow, for other timber; the number of which trees may be leſſened, as they increaſe in bulk, leaving ſtill the moſt promiſing ones to grow for larger timber.

If a wood of theſe trees is rightly managed, it will turn greatly to the advantage of its owner; for, by the underwood, which will be fit to cut every ſeven or eight years, for the uſes abovementioned, there will be a continual income, more than ſufficient to pay the rent of the ground, and all other charges; and ſtill there will be a ſtock preſerved for timber; which, in a few years, will be worth forty or fifty ſhillings per tree.

This timber is of excellent uſe to the wheelwrights and cartwrights, for plows, axle-trees, wheel-rings, harrows, bulls, oars, blocks for pullies, and many other purpoſes.

The beſt ſeaſon for felling of theſe trees is from November to February; for if it be done either too early in autumn, or too late in the ſpring, the timber will be ſubject to be infeſted with worms, and other inſects: but, for lopping of pollards, the ſpring is preferable for all ſoft woods.

ASP, in natural hiſtory, a ſmall poiſonous kind of ſerpent, whoſe bite gives a ſpeedy, but eaſy death. It is ſaid to be thus denominated from the Greek ἀσπὶς ſhield, in regard to its manner of lying involved in a circle; in the center of which is the head, which it exerts, or raiſes, like the umbo, or umbilicus, of a buckler.

This ſpecies of ſerpent is very frequently mentioned by authors; but ſo careleſsly deſcribed, that it is not eaſy to determine which, if any of the ſpecies known at preſent, may properly be called by this name. It is ſaid to be common in Africa, and about the banks of the Nile: and Bellonius mentions a ſmall ſpecies of ſerpent he had met with in Italy, and which had a ſort of callous excreſcence on the forehead; which he takes to have been the Aſpis of the antients. *Ray's Syn. Anim.*

ASPA'RAGUS, in botany, the name of a genus of plants; the characters of which are theſe: the flower is of the roſaceous kind, being uſually compoſed of ſix leaves, arranged in a circular form; from the center of the flower ariſes a piſtil, which finally becomes a ſoft fruit, or a roundiſh berry, containing a number of hard ſeeds. To this it may be added, that the leaves are always fine and ſlender.

The garden Aſparagus is propagated by ſowing of the ſeeds; in the procuring of which, you ſhould be particularly careful, ſince the goodneſs of your future crop, in a great meaſure, depends thereon: you ſhould, therefore, get it from ſome perſon of integrity; or, if you have any opportunity, ſave it yourſelf; or in ſome other neighbouring garden. You muſt look over the Aſparagus-beds in the beginning of the ſeaſon, and mark ſome of the largeſt and faireſt buds with a piece of ſtick; which buds, when they have branched out, may be faſtened to ſtakes thruſt into the ground, to preſerve them from breaking. Theſe buds will, many of them, produce great numbers of red berries; which ſhould be ſuffered to remain upon the branches until the latter end of September, when the haulm will begin to decay; then cut off the branches, and ſtrip the berries into a tub, where they may lie in an heap to ſweat for three weeks; by which means the outer huſks will be rotten: then fill the tub with water, and with your hands break all the huſks, by ſqueezing them between your hands. Theſe huſks will all ſwim upon the water, but the ſeed will ſink to the bottom; ſo that, by pouring off the water gently, the huſks will be carried along with it; and by puting freſh water two or three times, and ſtirring your ſeed about, you will make it entirely clean; then ſpread your ſeed upon a matt, and expoſe it to the ſun and air in dry weather, until it is perfectly dry; when you may put it into a bag, and hang it up in a dry place till the beginning of February; at which time, you muſt prepare a bed of good, rich earth, whereon you muſt ſow your ſeed (but not too thick, which will cauſe your plants to be ſmall) and, having trod your ſeed into the ground, rake it over ſmooth.

In the following ſummer keep it diligently cleared from weeds, which will greatly add to the ſtrength of your plants; and, toward the latter end of October, when the haulm is quite withered, you may ſpread a little rotten dung over the ſurface of the ground, about an inch thick; which will preſerve the young buds from being hurt by the froſts, &c.

The ſpring following your plants will be fit to plant out for good (for I would never chuſe plants of more than one year's growth, having very often experienced them to take much better than older, and to produce finer roots) you muſt therefore prepare your ground by trenching it well, burying therein a good quantity of rotten dung at the bottom of each trench, that it may lie at leaſt ſix inches below the ſurface of the ground: then level your whole plot very exactly, taking out all large ſtones; but this ſhould be done not long before you intend to plant your Aſparagus; in which you muſt be governed according to the nature of your ſoil, or the ſeaſon; for if your ſoil is dry, and the ſeaſon forward, you may plant early in March; but, in a very wet ſoil, it is better to wait till the end of that month, or the beginning of April; which is about the ſeaſon that the plants are beginning to ſhoot. I know many people have adviſed the planting of Aſparagus at Michaelmas; but this I have experienced to be very wrong, for in two different years I was obliged to tranſplant large quantities at that ſeaſon; but I had better thrown away the plants; for, upon examination, in the ſpring, I found moſt of the roots were grown mouldy, and decaying; and, I am ſure, not one in five of them ſucceeded; and thoſe which did, were ſo weak, as not to be worth their ſtanding.

The ſeaſon being now come, you muſt, with a narrow-pronged dung-fork, carefully fork up your roots, ſhaking them out of the earth, and ſeparating them from each other; obſerving to lay their heads even, for the more convenient planting them; which muſt be performed in this manner: your plot of ground being levelled, you muſt begin at one ſide thereof, ranging a line very tight croſs the piece; by which you muſt throw out a trench exactly ſtraight, and about ſix inches deep; into which you muſt lay your roots, ſpreading them with your fingers, and placing them upright againſt the back of the trench, that the buds may ſtand forward, and be about two inches below the ſurface of the ground, and at twelve inches diſtance from each other; then, with a rake, draw the earth into the trench again, laying it very level, which will preſerve the roots in their right poſition: then remove your line a foot farther back, and make another trench in like manner, laying therein your plants, as before directed, and continuing the ſame diſtance row from row; only obſerving, between every four rows, to leave the diſtance of two feet four inches, for an alley to go between the beds, to cut the Aſparagus, &c.

Your plot of ground being finiſhed and levelled, you may ſow thereon a ſmall crop of onions, which will not hurt your Aſparagus; and tread in your ſeeds, raking your ground level. There are ſome perſons who plant the ſeed of Aſparagus in the place where the roots are to remain; which is a very good method, if it be performed with care. The way is this: after the ground has been well trenched and dunged, they lay it level, and draw a line acroſs the ground (in the ſame manner as is practiſed for planting of the young plants) then, with a dibble, make holes at a foot diſtance; into each of which you muſt drop two ſeeds, for fear one ſhould miſcarry: theſe holes ſhould not be more than half an inch deep; then cover the ſeeds, by ſtriking the earth in upon it; and go on, removing the line a foot back for another row; and, after four rows are finiſhed, leave a ſpace for an alley between the beds, if it is deſigned to ſtand for the natural ſeaſon of cutting; but, if it is to be taken up for hot-beds, there may be ſix rows planted in each bed; and the diſtance in the rows need not be more than nine inches. This ſhould be performed by the middle of February, becauſe the ſeeds lie long in the ground: but, if onions are intended to be ſown upon the ground, that may be performed a fortnight or three weeks after, provided the ground is not ſtirred ſo deep as to diſturb the Aſparagus-ſeeds, in raking the onion-ſeed into the ground.

As the roots of Aſparagus always ſend forth many long fibres, which run deep into the ground; ſo, when the ſeeds are ſown where they are to remain, theſe roots will not be broken or injured, as thoſe muſt which are tranſplanted; therefore they will ſhoot deeper into the ground, and make much greater progreſs; and the fibres will puſh out on every ſide; which will cauſe the crown of the root to be in the center; whereas, in tranſplanting, the roots are made flat againſt the ſide of the trench.

When your Aſparagus is come up (which will be in three weeks or a month after planting) you muſt, with a ſmall hoe, cut up the weeds, and thin your crop of onions, where they may have come up in bunches; but this muſt be done carefully, and in dry weather, that the weeds may die as faſt as they are cut up. This work muſt be repeated about three times; which, if well done, and the ſeaſon not too wet, will keep the ground clear from weeds, until the onions are fit to be pulled up; which is commonly Auguſt; and is known, when their greens fall down. When you have drawn off your onions, you muſt clean your ground well from weeds; which will keep it clean till you earth your beds, which muſt be done in October, when the haulm begins to decay; for if you cut off the haulm, while green, the roots will ſhoot freſh again, which will greatly weaken them. This young haulm ſhould be cut off with a knife, leaving the ſtems two or three inches above-ground; which will be a guide to you to diſtinguiſh the beds from the alleys; then, with an hoe, clear off the weeds into the alleys, and dig up the alleys, burying the weeds in the bottom; and throw the earth upon the beds, ſo that the beds may be about five inches above the level of the alleys: then you may plant a row of colworts in the middle of the alleys; but do not ſow or plant any thing upon the beds, which would greatly weaken the roots: nor would I ever adviſe the planting of beans in the alleys (as is the practice of many) for it greatly damages the two outſide rows of the Aſparagus. In this manner it muſt remain till ſpring, when you muſt hoe over the beds, to deſtroy all young weeds; then rake them ſmooth, and obſerve, all the ſucceeding ſummer, to keep them clear from weeds; and in October dig up the alleys again, as was before directed, earthing the beds, &c. The ſecond ſpring after planting, you may begin to cut ſome of your Aſparagus, though it will be much better to ſtay until the third; therefore now you muſt fork up your beds with a flat-pronged fork, made on purpoſe, which is commonly called an Aſparagus-fork: this muſt be done before the buds ſhoot in the ſpring, and with care, leſt you fork too deep, and bruiſe the head of the root; then rake the beds over ſmooth, juſt before the buds appear above-ground; which will deſtroy all young weeds, and keep your beds clean much longer, than if left unraked, or done ſo ſoon as forked: and, when your buds appear about four or five inches above-ground, you may then cut them; but it ſhould be done ſparingly, only taking the large buds, and ſuffering the ſmall to run up to ſtrengthen the roots; for, the more you cut, the more the roots will produce; but they will be ſmaller, and ſooner decay. When you cut a bud, you muſt open the ground with your knife (which ſhould be very narrow and long in the blade, and filled with teeth like a ſaw) to ſee whether any more young buds are coming up cloſe by it, which might be either broken or bruiſed in cutting the other; then, with your knife, ſaw it off about three inches under-ground. This may appear a troubleſome affair, to people unacquainted with the practical part; but thoſe who are employed in cutting Aſparagus, will perform a great deal of this work in a ſhort time; but care in doing it is abſolutely neceſſary to be obſerved by all who cut Aſparagus.

The manner of dreſſing your Aſparagus-beds is every year the ſame as directed for the ſecond; viz. keeping them from weeds, digging the alleys in October, and forking the beds towards the latter end of March, &c. only obſerve, every other year, to lay a little rotten dung (from a melon or cucumber-cumber-bed) all over your beds, burying ſome in the alleys alſo, at the time for digging them up. This will preſerve your ground in heart, to maintain your roots in vigour; and, by this management, a plot of good Aſparagus may be continued for ten or twelve years in cutting, and will produce good buds. *Miller's Gard. Dict.*

Aſparagus is a medicinal plant, which furniſhes one of thoſe called the five opening-roots.

It is a known diuretic; its top, or head, taken in the way of food, readily diſcovers itſelf in the ſmell of the urine: but its root is ſtill more ſtrongly endued with that quality, as containing more of the ſalt from which it is derived. Hence it becomes, among us, an ingredient in all compoſitions, intended to cleanſe the viſcera, and guard againſt jaundices, dropſies, &c. It is alſo of ſome uſe as a pectoral; and makes a chief ingredient in the ſyrup of marſhmallows, againſt the ſtone: though foreign phyſicians ſpeak more ſparingly of the uſe and virtues of this medicine.

ASPHODE′LUS, *aſphodel*, in botany, the name of a genus of plants; the characters of which are theſe: the flowers are of the liliaceous kind, but conſiſt of only one petal, divided into ſix ſegments. The piſtil ariſes from the center of the flower, and finally becomes a fruit of a ſomewhat roundiſh, yet three-cornered form, and of a fleſhy texture. This, when ripe, opens at the point, and ſhews that it is compoſed of three cells, each of which contains a number of triangular ſeeds.

The ſpecies of aſphodel, enumerated by M. Tournefort, are ten.

All the ſorts of aſphodel are very pretty ornaments for a flower-garden, and, requiring very little trouble to cultivate them, are rendered more acceptable. They may be all propagated by ſeeds, which ſhould be ſown, ſoon after they are ripe, on a warm border of freſh light earth: in the ſpring the plants will appear, when you ſhould carefully clear them from weeds; and, in dry weather, they muſt be frequently watered: if this be duly obſerved, the plants will have acquired ſtrength enough to be tranſplanted by the Michaelmas following; at which time you muſt prepare a bed of freſh earth in the flower-nurſery, into which you ſhould plant the roots, at about ſix inches diſtance every way; obſerving to plant them ſo low, as that the top of the roots may be three or four inches under the ſurface of the bed: in this bed they may remain one year; during which time, they ſhould be frequently refreſhed with water in dry weather, and muſt be kept very clear from weeds. In this time, the roots, having acquired ſtrength enough to produce flowers the following year, they ſhould at Michaelmas, when their leaves are decayed, be carefully taken up, and tranſplanted into the flower-garden; obſerving to place them in the middle of the borders, among other hardy kinds of flowers, where, being properly intermixed, they will make an agreeable variety, and continue a long time in flower.

Theſe plants may alſo be propagated by parting their roots; but this muſt not be too often repeated, leſt it weaken the roots, and prevent their flowering ſo ſtrong as they otherwiſe would do. Once in three years will be often enough to tranſplant the roots; at which times you may ſeparate thoſe which are grown large, ſo as to make two or three roots of each: but do not part them too ſmall; for that will ſo weaken them, as to prevent their flowering the following ſummer. The beſt time to tranſplant theſe roots is at Michaelmas, juſt when their leaves begin to decay. *Miller's Gard. Dict.*

The roots of aſphodel are of an acrimonious taſte, and heating quality; being drank, they promote urine, and the menſes; and the weight of a drachm, taken in wine, is uſed with ſucceſs in pains in the ſide, coughs, convulſions, and ruptures. It is good againſt bites of ſerpents, and makes a good cataplaſm for foul ſpreading ulcers, inflammations, &c. The aſhes of the burnt root, rubbed on an alopecia, cauſe new hair to ſpring. *Lemery, des Drog.*

A′SSA, or Asa, among naturaliſts. The writers of the latter ages have formed the word aſa from the laſar of the antients, and attributed it to a gum very different from that antiently known by the name they have thus corrupted.

The aſa of the antients was an odoriferous and fragrant gum; and the aſa of after ages had ſo little right to this epithet, that they diſtinguiſhed it by one, expreſſing its being of an offenſive or ſtinking ſmell.

The Arabian writers, according to this diſtinction, deſcribe two ſorts of aſa, one ſtinking, the other aromatic; and the modern Greeks preſerved the name aſa, or laſar, to the ſtinking gum, the Latins called by this name; but added a diſtinctive epithet, to expreſs its ill ſmell; and called it ſcordolaſarum. Thus Myrepſus always calls the ſame gum ſcordolaſarum, that the Latin writers call aſſafœtida.

ASSAFOE′TIDA *(Dict.)*—The plant which produces it is one of the pentandria digynia of Linnæus, and one of the herbæ umbelliferæ ſemine foliaceo, ſeu ala foliacea cincto of Ray. We had a multitude of various and falſe accounts of it for a long time; Garcias telling us it had leaves like the hazel; and Bontius making two plants of it, one like a willow, and the other with a root like a turnep; others have given it leaves like the fig-tree, others like thoſe of rice; and, finally, others have made it a ſhrub of the phylleræa kind. Kæmpfer is the author to whom we owe the true account of it. This is given in his Amœnitates exoticæ, where he deſcribes it fully and accurately, under the name of umbellifera leviſtico affinis foliis inſtar pæoniæ ramoſis, caule pleno maximo, ſemine foliaceo nudo ſolitario brancæ urſinæ ſive paſtinachæ ſimili radice Aſſamfœtidam fundente. The Perſians call both the plant and the juice hingeſch; and the Indians, hiing; but the more accurate in both countries call the plant hingeſch, and the juice or gum hiing.

The root of this plant is perennial, and very large. It is covered with a thick black rind, which eaſily comes off from the reſt, when freſh. Within it is perfectly white, and full of a white, milky, and ſtinking juice, which, when collected and dried, is what the Perſians call hiing, and the Europians, Aſſafœtida. The top of this root is furniſhed with a large tuft of hairy or filamentous matter, like that on the crown of the meum or ſpignel. The leaves are very large, and like thoſe of the piony.

The ſtalk is as thick as a man's arm, and grows to eight or nine feet high. It gradually becomes taper toward the top, whence it is divided into a ſmall number of branches. The leaves ſtand alternately on theſe ſtalks, and that at no great diſtances from one another. The flowers are ſmall, and diſpoſed in umbels. The ſeeds are flattiſh and ſtriated, and of an oval figure; they have ſomewhat of the Aſſafœtida ſmell, but much leſs than might be expected. It grows in Perſia, but there only in two places, at leaſt in thoſe only in any great plenty. Theſe are the mountains about Heraat, and the province of Laar. In theſe places it abounds with juice, and yields the gum in great plenty; when found elſewhere, it yields very little. The leaves in theſe places are of a horrible, offenſive ſmell, and no animal will touch them: but the people of the town of Diſguum affirm, that, in the country beyond them, the plant loſes much of its bad ſavour, and that the goats feed very greedily on the leaves, and grow fat upon the diet. Some have pretended to diſtinguiſh two ſpecies of this plant, the one yielding a ſmaller quantity of juice, and that of a leſs fetid ſmell; the other yielding more of it, and that more ſtinking: but Kæmpfer, who was upon the ſpot, declares the plants to be the ſame, and all the difference to be in the ſoil that produces them. If what the Perſians of Diſguum ſay be true, however, it very well accounts for the difference of the Cyrenaic and Perſian kinds of ſilphium; for the plant, in the firſt of theſe places, might be as mild as beyond Diſguum, or even more ſo.

It is very ſingular in this plant, that it ſeldom flowers, ſometimes not till its twentieth, thirtieth, or even fortieth year; during all this time the root is increaſing in ſize, and, conſequently, it ſometimes grows to an enormous bulk: roots of it have been ſeen of the thickneſs of a man's thigh, and of a yard and a half in length; thoſe of the thickneſs of one's arm are frequent. When it ſends forth a ſtalk, and has ripened its ſeed, it periſhes. The ancients made a diſtinction in their ſilphium, as it was produced from the ſtalk, or from the root of the plant; but, at this time, all that we have is obtained from the root. They never make inciſions in roots of leſs than four or five years ſtanding; and they always find, that, the older and larger the root, the more plentifully the juice flows.

The gum or juice, as it flows from the root, is white, and perfectly reſembles cream, and has no viſcidity: on the contact of the air it dries or hardens, and becomes viſcous and coloured. The moſt ſtrongly ſcented Aſſafœtida is always eſteemed the beſt; and Kæmpfer obſerves, that it is ſo much ſtronger, when freſh, than when kept and imported into Europe, that a drachm of it has more ſcent, than an hundred weight of what our druggiſts keep.

The leaves of the plant appear in autumn, and appear green the whole winter; in ſpring they wither. About the end of April, when their leaves are in their decaying ſtate, the Perſians aſcend the mountains in ſearch of the plants. They clear away the earth about the root for ſix or ſeven inches deep; they then twiſt off the leaves, and the fibrous ſubſtance at the top of the root. They next cover up the root again to its top, which is now perfectly bare; and this they cover with a bundle of weeds, to keep off the heat of the ſun, which would otherwiſe deſtroy it. They lay a ſtone over all this, to keep it firm, that the wind may not blow it off; and in this condition they leave the roots for a month or ſix weeks. At the end of this time they take off the covering, bear away the earth a little from the crown of the root, and, with a ſharp knife, cut it tranſverſly off, taking off about an inch, or a little more, of the top. They then cover this wounded root with the weeds again, making them ſtand hollow from the wounded part, and thus leave them for two days; at the end of which time they return, and find the top of the root, where they had cut it off, covered with exſudated juice, or Aſſafœtida: this they collect, and put up in proper veſſels; and, clearing away the earth a little lower, they cut off another ſlice off the top of the root, but this not thicker than a crown-piece, and cover it up again, for another gathering. As they take a large compaſs of ground for their ſearch, they are kept in conſtant employment; the roots of their firſt day's cutting being ready for their taking the gum from, by that time they have cut the more diſtant ones, which they are regularly to return to afterwards. After they have gone through this ſecond operation with all the roots, and collected the ſecond quantity of gum from them, they cover them up for eight or ten days; and, after having ſpread their gum in the ſun to harden it, they carry it home. Four or five men generally go out in a company, on theſe expeditions; and it is a common thing for them to bring home fifty pounds weight of it from this firſt gathering; this, however, is eſteemed but an inferior kind of Aſſafœtida; after the roots have remained covered theſe eight or ten days, they viſit them again, take off the covering of weeds, and collect the gum. They then cut off another ſlice of the root, and after that another, and then a third; this is done at the diſtance of two days between each operation, and the earth is every time cleared away to a proper depth, and the whole proceſs managed as before.

After the third collection in this ſecond expedition, they cover up the roots again, and return home with their ſtores, leaving them covered for three days. After this they return to their work, and cut them again three ſeveral times at the ſame diſtances of time; and, after the third collection of this laſt expedition, they leave them to periſh; for they never recover this terrible operation. *Kæmp. Amœn. Exot.*

Aſſafœtida, diſtilled in a retort, yields a large quantity of whitiſh or milky looking phlegm, ſmelling ſtrongly, like garlic; there come over near three ounces of this from the pound; after this there riſes near an ounce of a reddiſh phlegm, partly of an acid, partly of an urinous kind; this is followed by ſomewhat more than an ounce of a thin limpid yellowiſh oil, of an extremely fœtid ſmell, and, finally, there come over near ſix ounces of a reddiſh, ſtinking, and empyreumatic oil of the conſiſtence of butter. The remainder in the retort, calcined in an open fire and lixiviated, yields about ſix grains of a fixed ſalt, but this not of the alkaline, but ſal ſalſus kind.

In Perſia and the Indies there is no drug at this time ſo much in uſe both in medicine and in ſauces. They rub the veſſels they are to dreſs their food in with it, and they give it in large doſes againſt the rheumatiſm, the gout, and pains of all kinds. With us, Aſſafœtida is ſcarce at all uſed about our foods, and its unpleaſant ſmell has in a great meaſure baniſhed it from extemporaneous practice in phyſic, though it is undoubtedly a very great medicine.

The Aſſa fœtida plant is recommended by Mr. Lawrence to be cultivated in our fields, for the food of cattle, inſtead of clover, ſaintfoin, or ſuch herbs as we ſow among corn, and make into hay, in the ſucceeding ſummers, and uſe as food for cattle at other ſeaſons.

This gentleman is of opinion, that the ſheep, fed on this plant, would afford mutton of a much finer flavour than any that we are at preſent acquainted with. But it ſeems ſtrange, that this ſhould be the effect of theſe creatures feeding on a plant of ſo ſtrong a ſcent, that, as the ſame author obſerves, one drachm of the freſh root ſmells more than a hundred weight of the drug, as kept by the druggiſts, and that the whole air is ſtrongly and diſagreeably ſcented with it, wherever it grows. Upon the whole, it ſeems probable, that though this plant, or the cytiſus, or ſeveral others, might be cultivated in England for the food of cattle, yet not any one would be ſo eaſily raiſed, or make ſo great an advantage to the farmer, as the ſaintfoin. *Tull's Huſbandry.*

A'SSES *Milk*, the milk of an animal too well known to need deſcription.

When we examine more minutely into the medicinal virtue and diſpoſition of Aſſes milk, it will appear to be fraught with an abundance of peculiar excellencies, which render it ſo exceedingly wholeſome. In the firſt place, it is thinner than all other milks, and abounds with watery and ſerous ingredients.

Since it is known that many diſeaſes are cauſed by a groſſneſs and tenacity of the juices, which, as they paſs ſlowly through the finer veſſels, of which the principal emunctories and ſtrainers of the glands conſiſt, are apt to ſtop in thoſe narrow paſſages, to fill them up, and occaſion obſtructions, it is very obvious and natural to conclude, that the uſe of Aſſes milk, which abounds with ſerous and fluid particles, muſt be extremely proper to open the obſtructed veſſels, to attenuate the groſs and viſcid juices, and ſet them in an eaſy and free motion. Again, when we know that multitudes of diſtempers proceed from an acrid, ſalt, and corroſive ſtate of the fluids, we cannot but be aſſured that the thin ſerum of Aſſes milk will not fail of diluting, ſoftening, and ſubduing them: although it muſt be allowed, at the ſame time, that the ſweet oily ſubſtance contributes much towards this effect, which embraces and involves the pointed particles of ſalt, and by this means the crude ill-digeſted juices, being properly corrected, are, by the plentiful aſſiſtance of ſerum, conveyed in their due courſe through the veſſels appointed for ſecretion.

It is another extraordinary excellence of Aſſes milk, that it contains but a ſmall proportion of the groſſer curdling ſubſtance. Out of eight ounces of Aſſes milk, which I ſet over hot coals in a broad veſſel, after all the ſerum was evaporated, I could ſcarce gather ſo much as ſix drachms of a whitiſh ſweet matter. I then took twelve ounces of the ſame milk, and ſet it by to curdle in a cloſe veſſel, filled about half way. In three days time a very white and thin curd ſettled at the bottom, which, when ſeparated from the whey by ſtraining through filtrating paper, and afterwards dried, ſcarce amounted to two drachms; all the reſt of its ſolid parts, having in general paſſed with the whey through the ſtrainer, adhered to the ſides of the veſſels, or loſt themſelves in the operation. On the contrary, the ſame weight of cows milk, treated in the ſame manner, thickened into a groſſer and heavier curd, which, when cleared from the whey, ſpread out in a broad plate, and, dried in the ſun, weighed ten drachms. From theſe experiments it is evident, that the quantity of the groſs curdling ſubſtance is very ſmall in Aſſes milk, when compared with other ſorts. For this reaſon it eaſily diffuſes itſelf into the minuteſt extremities of the blood-veſſels, thoroughly dilutes the vital juices, liquifies the ſluggiſh humours, and, when it has thus diſſolved them, conveys them off. A third circumſtance that more ſtrongly evinces the ſalubrious quality of Aſſes milk, is, that the ſhare of cheeſe-like ſubſtance which it contains is extremely ſoft and tender, and never makes a groſs or firm curd. To make this evident, I warmed ſome Aſſes milk, and ſprinkled it with vinegar, expecting to ſee it contract a thick conſiſtence; but nothing appeared of that ſort, except a few light thin flakes, floating here and there on the ſerum: when, on the contrary, cows milk, the inſtant it was mixed with an acid, condenſed into lumps of a conſiderable hardneſs, and fell to the bottom. Now, in all cures which are ſought by milk, nothing can be ſo hurtful and dangerous as to have it curdle in the ſtomach, to prevent which accident ought to be the phyſician's principal care and concern. For the miſchiefs occaſioned by a coagulation of milk in the ſtomach are very pernicious, and have been obſerved and cautioned againſt by the beſt authors. It is paſt diſpute therefore, that the milk is the moſt wholeſome and propereſt for medicinal uſes, which has leaſt tendency to curdle, which is the caſe with Aſſes milk in the moſt remarkable degree.

A fourth, and the moſt valuable excellence in Aſſes milk, is its exquiſite ſweetneſs, in which it exceeds all other ſpecies of milk, except the human: for you may extract from it by much the greateſt quantity of delicate taſted ſugar, or rather a thick ſubſtance reſembling manna. To try the experiment, I boiled twelve ounces of Aſſes milk, in the month of July, over a gentle fire, and immediately it produced a thick concretion very ſweet, weighing one ounce. Upon this, I poured it into a glaſs with a pint of rain water, which, when frequently ſhaken, almoſt diſſolved the maſs, leaving only a ſmall ſediment. The liquor was then poured through filtrating paper, and ſet to evaporate, and yielded half an ounce of an honey-like ſubſtance, extremely ſweet, and white. As Aſſes milk therefore contains ſo plentiful a proportion of ſweet ſalts, we cannot doubt, but it has for that reaſon a very ſingular medicinal quality which cannot be expected in other kinds of milk. For this honey-like ſalt greatly ſoftens, checks, and moderates the acrimony of humours, whether acid or bilious, and, by gently irritating the fibres of the bowels, urges them to their office and operations. Hippocrates very juſtly obſerves, that Aſſes milk diſpoſes to purging more than any other; and in another place adviſes, as a remedy for the flour albus, firſt to occaſion a gentle purging by drinking Aſſes milk, and then to change it for cows milk.

From theſe enlarged obſervations which we have made on the excellencies of Aſſes milk, it muſt be evident to all that judge ſenſibly, that it has an admirable efficacy towards curing many diſtempers. The firſt and moſt remarkable inſtance we ſhall give, is by proving that no ſurer or more ſucceſsful remedy can be invented or recommended againſt conſumptions.

Yet, although milk of all kinds be a wholeſome medicine in conſumptive and decaying conſtitutions, yet Aſſes milk excels the others in a greater degree, becauſe it fully anſwers every requiſite that can conduce to the cure of conſumptions.

Yet we muſt take notice, that though this be ſuch a ſovereign remedy for conſumptions, and when given in a judicious manner, ſcarce ever fails of ſucceſs, yet it will not cure every ſort of conſumption; but muſt be applied in the beginning of the diſtemper, and is moſt likely to take effect, before the ulcers be grown callous, or the corroded cavity be too deep and large, or the fever become continued and without intermiſſion.

I likewiſe judge Aſſes milk to be very efficacious againſt an empyema, which is often cauſed by a pleuriſy improperly treated, eſpecially in bodies of a ſpongy habit, and ſhews itſelf by a conſtant and copious ſpitting of matter.

As Aſſes milk proves ſo very uſeful in relieving the pains that ſeize the outward parts of the body, ſo it is likewiſe no leſs ſerviceable againſt thoſe that affect the inward nervous parts, the ſtomach and inteſtines, as is the caſe in convulſive cholics, When cramps and convulſions ſeize the nervous parts, which is the common ſymptom in hypochondraic and hyſteric fits, I have always obſerved milk, eſpecially that of Aſſes, do great good; provided there be no coſtiveneſs, nor obſtruction in the bowels, and the firſt paſſages be not clogged with ſharp and viſcid phlegm.

Since, therefore, it is ſo evident that Aſſes milk is beneficial to the nerves, and heals their ſeveral forementioned diſorders by means of its ſoftening and lubricating quality, we cannot doubt but it may properly be adminiſtered in other complaints, where the nervous parts are likewiſe afflicted and diſordered with violent motions, as in epilepſies and convulſive fits.

When ſcorbutic people and old men, who are naturally ſubject to a ſalt and foul corruption of the humours, and likewiſe ſuch as are infected with a venereal taint, are afflicted with dangerous ulcers, that ſeem to reſemble cancers; even in theſe terrible ſymptoms a very ſpeedy and ſure relief may be had from Aſſes milk, and the whey of it.

And, while we are enumerating the many noble virtues of Aſſes milk, we muſt not omit its peculiar excellence, not only as a remedy to the diſtempers of old men, but as a ſort of food of great efficacy in reſtoring their decayed ſtrength.

Having now explained the properties of Aſſes milk, and its excellence in ſeveral diſorders, I ſhall proceed to the proper method of giving it, and then ſhew what is neceſſary to be obſerved, in order to expect ſucceſs from it. But it will firſt be proper to ſay ſomewhat of the animal itſelf. A milch Aſs ought to be quite free from any diſorder, not very old, but of a middling age, neither too fat nor too lean, and may be eſteemed the better, if ſhe bring her foal in the month of May. She ought not to be fed in a houſe, but kept in meadows which produce plenty of medicinal herbs; ſhe ſhould drink river water, which, as it is lighter and more diluting than ſpring water, paſſes off quicker by the proper diſcharges, and, mixing more thoroughly with the humours, cleanſes them more effectually. Helmont has an ingenious remark on this ſubject: he adviſes that the Aſs ſhould be combed or curried every morning as horſes are, for that it may eaſily be known from the milk, whether ſhe has been dreſſed that morning or not. Without doubt there may be ſome reaſon for this, becauſe the uſe of the curry-comb increaſes perſpiration, and cleanſes the humours, by paſſing off a great many ſaline particles that way.

It ought to be conſidered too, what the Aſs is fed with, becauſe the nature and properties of the milk of animals are altered by their diet, ſo as to be more or leſs wholeſome, or even adapted to ſome particular diſorders. For as it is a common practice to make a purging or alterative medicine, given to the nurſe, communicate its properties to her milk, and take effect on the child, ſo, no doubt the ſame will hold good with regard to the animals whoſe milk we uſe. Galen proves this by the inſtance of goats, who are fed with ſcammony or ſpurge, whoſe milk is purging. Dioſcorides and Hippocrates are of the ſame opinion, and in the Acta Haffnienſia it is aſſerted, that wormwood eaten in large quantities makes the milk bitter. From hence it is that Cœlius Aurelianus commends milk in the cœliac paſſion or flux, which is taken from goats that feed on willows, vine leaves, oaks, or ſallows, plantain, and plants of the ſame nature; giving this reaſon for it, "becauſe the aſtringent quality of the herbs communicates itſelf to the milk." But there is a remarkable difference between the milk which is produced in ſpring from green paſture, and that in winter from dry food. Varro, who was very well acquainted with what belongs to country affairs, was of this opinion, and ſays, "that milk from barley and ſtubble, and all kinds of hard and dry food, is nouriſhing; but that is more cleanſing which comes from green paſture." And Dioſcorides thinks that the milk in ſpring is thinner, and, becauſe it comes from green paſture, more laxative and ſoftening.

From whence it plainly appears, that milk of all ſorts, but more eſpecially Aſſes, is not only moſt ſerviceable in the ſpring, but that its virtues may, by a regulation of food, be ſo prepared, as to be particularly effective againſt any one diſtemper. Wherefore, I would adviſe that a milch Aſs be fed with ſuch herbs as in themſelves are known proper for the diſeaſe you would relieve. In a conſumption, and diſeaſes of the lungs and breaſt, let her be ſupplied with veronica, ground ivy, the blind or dead-nettle, colts-foot, and ſcurvy-graſs; or, if you want to reſtore the vigour of the ſolids, with ſanicula, tanſey, nummularia, conſolida major, flowers of St. John's wort, alchimilla, polygonum, and the like; or let the creature be drove to places where theſe plants abound. In pains and ſpaſms, both inward and external, it may be uſeful to mix in her food yarrow, chamomile flowers, acacia, mead-wort, tilia, melilot, ſpurge, mallows, marſh-mallows, and others of this nature. In ſlow and hectic fevers (beſides thoſe we named as good for the lungs) we may add plantane, prunella, and ſcurvy-graſs mixed with germander. If the hypochondria are obſtructed, and cauſe a ſcorbutic foulneſs in the juices, chuſe out ſome herbs of the opening or laxative kind; ſuch are fumitory, the leſſer centaury, abſinthium, ſcurvy-graſs, trefoil, water-creſs, naſturtium, and the leſſer houſe-leek. In the ſame manner may milk be rendered medicinal, and fit for almoſt any complaints, by adminiſtering ſuch herbs and flowers as the phyſician ſhall eſteem moſt proper and effectual.

As to the method of uſing it, theſe following rules may be obſerved.

1. In caſes of neceſſity, Aſſes milk may be drank at all times; but it is by far the moſt ſerviceable in the ſpring and ſummer, when all the herbs are full of juices, and greatly enrich the milk. 2. The milk ſhould be milked into a pail ſet over hot water, and immediately put into a veſſel that has a narrow mouth, and ſhuts cloſe, and ſo drank directly when it is warm; for milk, like all other liquors, has a ſubtile ſpirit, of a ſtrengthening and invigorating quality, which by no means ought to be allowed to fly off with its warmth. Hence, Galen orders that milk be drank inſtantly, and the animal brought to the patient's bed-ſide; for that its nature, like that of the ſemen, is at once altered by the open air. 3. The morning is the beſt time of day to drink it, as it will operate the eaſier in an empty ſtomach, and therefore no other food ought to be taken in four or five hours after it. Yet, if circumſtances require a frequent repetition of it, it may be drank in the afternoon; but it ſhould be about four hours after dinner has been digeſted, and in but half the quantity that is drank in the morning. 4. It is impoſſible to preſcribe in general any fixed quantity that ſhould be uſed, becauſe of the difference of ages, conſtitutions, and diſtempers; but thus far may be ſaid, that you ought never to exceed the quantity of three common pints. 5. The time of continuing it muſt be directed by the degree and ſtrength of the diſtemper: if that be very obſtinate, it were well to continue drinking it for three months, or longer; eſpecially if a favourable proſpect appears of ſucceſs, and the violence of the ſymptoms abate very diſcernably.

Yet a prudent and experienced phyſician will ſo order, regulate, and methodize the uſe of this medicine, as almoſt to inſure ſucceſs, and avoid any hurtful conſequences. I ſhall therefore conclude with a few cautions that ſhould be obſerved very accurately.

1. Before a courſe of milk is begun, the ſtate and condition of the ſtomach muſt be carefully inquired into: whether it will bear milk, and have a ſufficient degree of ſtrength to concoct, digeſt, and then diſcharge it. For, if that be weak and infirm, if it be troubled with wind and phlegm, or be loaded with a croud of acid humours, milk muſt not be taken; becauſe, until theſe things are remedied, that will curdle and ſtagnate, and corrupt, and increaſe the flatulence and uneaſineſs. It will be proper therefore to cleanſe and relieve the ſtomach firſt, either downwards, by a gentle doſe of manna, or, where the caſe will allow, by a vomit with a grain or two of emetic tartar. 2. Great care muſt be had that the milk be not turned into curd. And, therefore, where the food is apt to grow acid in the ſtomach, as is the caſe with old and hypochondraic people, it is adviſeable to give abſorbent, earthy, and alcaline medicines, mixed with the milk, adding likewiſe ſome ſtomachic carminative eſſence, or volatile oily ſalt. 3. When the patient has drank milk for ſix or eight days, a gentle doſe of manna ſhould be given, to purge the bowels, and carry off whatever foulneſs the ſtomach may have contracted, that the farther efficacy of the milk be not retarded. 4. It is beſt to drink it at firſt, ſparingly, three or four ounces, and then, to increaſe the draught gradually, that the ſtomach be not too ſuddenly oppreſſed, and conceive a diſlike and loathing to the remedy. 5. A proper regulation of diet muſt be obſerved during the courſe of milk. The lightneſs of food muſt be chiefly conſulted; avoiding not only meats hard of digeſtion, but alſo thoſe that are reckoned to afford little nouriſhment, and likewiſe all flatulent victuals, ſummer fruits, and acids of all kinds; abſtaining from all malt-liquors, and wines, except a ſmall quantity of the ſoundeſt Spaniſh wines. Nor ſhould any bread be uſed that is lumpiſh and fermented, but what is made of the cleaneſt and fineſt wheat flour. *Hoffman.*

A'STAROTH, an idol of the Philiſtines, which Samuel commanded the Jews to pull down. It was alſo the name of the falſe deity of the Sidonians, adored by Solomon, when he turned idolater. The word ſignifies a flock of ſheep and riches: and ſome ſay, that, as Jupiter Ammon was adored under the ſhape of a ram, ſo Juno Ammon, or the moon, was worſhipped under the form of an ewe. But others believe, that Aſtaroth was king of Syria, thus called for his great wealth. Tho. Goodwin de Ritibus Hebræorum.

ASTA'RTE, a certain heathen divinity, called in ſcripture the goddeſs of the Sidonians. Solomon, in complaiſance to his concubines, built altars, to this idol. It is generally thought that Aſtarte is the ſame with Atergati, or Derceto, ſo much worſhipped by the Syrians. Tully believes this goddeſs to be one of the four Venus's, and the ſame that married Adonis. *Ælian. Tertul. in Apologet. Cic. de Nat. Deor. l.* 3.

ASTE'RISCUS, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind; its diſk is compoſed of ſeveral floſcules, and its outer edge of ſemi-floſcules. Theſe are all placed on the embryo ſeeds, and are incloſed in a cup of a ſtellated form, the parts of which ſtand out beyond the flower. The embryo's finally become flat and marginated ſeeds.

The ſpecies of Aſteriſcus, enumerated by M. Tournefort, are ſeven.

ASTEROPO'DIUM, in natural hiſtory, the name given by authors to a kind of extraneous foſſil, of an imbricated texture, compoſed of a number of ſmall convex or concave plates, and ſerving, when intire, as a baſe, or root, to the aſteria, or ſtar-ſtone.

It is very plain, that this is the remains of ſome animal body, probably of the ſtar-fiſh kind, to which the aſteriæ have alſo once belonged; but our imperfect knowledge in the animal hiſtory has not yet aſcertained us of the particular creature; the moſt probable conjecture is, that it is the Magellanic ſtar-fiſh, the rays of which nicely and exactly repreſent ſome of the more perfect Aſteropodia.

ASTRÆ'A, in mythology, the daughter of Aſtræus and Themis. She was accounted the mother of natural juſtice, or that with which we are born; not that which is enforced by the fear of human laws. She lived on earth, as long as the golden age laſted; but, when mankind, blackened with enormous crimes, became deaf to her repreſentations, ſhe flew away to heaven, where ſhe placed herſelf, according to the poets, in the ſign Virgo. She ſeems to have forſaken the earth with regret, and would willingly have ſtaid, but an univerſal depravity drove her away. Baniſhed from cities, ſhe retreated into the country and reſided among the ſhepherds and huſbandmen, till vice prevailed and drove her alſo from this aſylum. She is repreſented, according to Aulus Gellius, by the figure of a virgin; her aſpect ſtern, her air mournful; which does not, however, leſſen her dignity: ſhe holds a pair of ſcales in one hand and a ſword in the other.

ASTRAGALOI'DES, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind, and its piſtil, which ariſes from the cup, ſomewhat reſembles at its extremity a ſmall boat in ſhape, and contains ſeveral kidney-ſhaped ſeeds. See *Plate* IV. *fig.* 30.

There is only one known ſpecies of this genus, which is the Portugal Aſtragaloides, called by ſome the wool aſtragalus, with thick roots. *Tourn. Inſt. p.* 398.

ASTRA'GALUS, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind, and its piſtil, which ariſes from the cup, covered with a membraneous ſheath, finally becomes a bicapſular pod, containing kidney-ſhaped ſeeds. To this it may be added, that the leaves ſtand in pairs on the middle ribs, the end of each of which is terminated by a ſingle leaf. *Tourn. Inſt.*

The root of this plant, drank in wine, ſtops a looſeneſs, and provokes urine. Dried to a powder, it is, with good effect, ſprinkled on old ulcers, and ſtops bleeding. *Lemery, des Drog.*

ASTRA'NTIA, in botany, the name of a genus of umbelliferous plants, the characters of which are theſe: the flower is of the roraceous kind, conſiſting of ſeveral petals, the ends of which are uſually bent backwards, and which are diſpoſed in a circular form, on a cup which afterwards becomes a fruit, compoſed of two ſeeds, involved in a curled calyptra. The flowers of this genus are collected into a ſort of head, and ſurrounded with a leafy crown. Some of the flowers of this genus of plants are barren, and the cups of theſe are wider. See *Plate* IV. *fig.* 31.

This plant is cultivated in the gardens of botaniſts, and flowers in July. Its black and fibrous roots are only uſed in medicine, which are ſaid to purge melancholic humours. Hildanus preſcribes it alſo for the cure of a ſchirrous ſpleen. *James's Med. Dict.*

ASTRI'NGENTS (*Dict.*)—Among the ſeveral claſſes of corroborative medicines, that of Aſtringents is none of the leaſt conſiderable and important. The ſeveral ſubſtances which come under this denomination, are alſo by the Latins ſtiled vulnerary, and by the Greeks, traumatic medicines. Their virtues, in general, conſiſt in a certain fixed and gently conſtrictive principle; by means of which, they brace up the parts and fibres that are too much relaxed, corroborate thoſe which are weakened, and conſolidate and agglutinate ſuch as are corroded and wounded.

Aſtringent medicines operate by means of a conſiderably fixed terreſtrial principle, in conjunction with an acid; and as, by conſtructing the too much relaxed fibres, they free them from a congeſtion and ſtagnation of humours; ſo, by bringing them into a nearer contract with each other, they promote their conſolidation and coaleſcence. But this conſtrictive virtue is not equally ſtrong and powerful in all medicines of this claſs.

If ſkill and uncommon caution are requiſite in the uſe of any medicines whatever, they are certainly ſo in the adminiſtration of Aſtringents; for ſince not only the ſoundneſs of the body in general, and of its ſeveral parts, but alſo life itſelf, is maintained and preſerved by the perpetual, progreſſive, and circulatory motion of ſufficiently attenuated and fluid humours, through the compages of the body, which is almoſt quite vaſcular, and compoſed of inconceivably minute and ſlender ducts; and ſince, at the ſame time, ſuch are the natures and properties of Aſtringents, as to inſpiſſate our fluids, when mixed with them, and brace up the pores and ducts of our ſolids; it is therefore obvious to every one, that remedies of this claſs muſt be unfriendly to the very natures, and vital motions, of animal bodies; for which reaſon they are not ſo ſafe and ſecure as ſome may imagine, unleſs when uſed with the utmoſt care and circumſpection: for daily experience convinces us, that medicines of an aſtringent quality, raſhly and unſkilfully applied, for ſtopping hæmorrhages or fluxes, produce numberleſs fatal conſequences, and generally bring on ſlow fevers, cachexies, œdematous ſwellings, ſpaſmodic diſorders, cholics, and hypochondriacal indiſpoſitions: for this very reaſon we are carefully to guard againſt the imprudent and immoderate uſe of the Peruvian bark, for carrying off the paroxyſms of intermitting fevers; ſince, by its violent aſtringency, the viſcid bilious, and ſalival ſordes, lodged in the primæ viæ, and which ought to be diſcharged, are ſo much the longer ſhut up and retained; by which means, a ſtill more formidable diſorder is ſometimes brought on.

If neceſſity ſhould, at any time, call for the uſe of Aſtringents of this nature, they are not to be adminiſtered all at once, but ſucceſſively, in gentle doſes, and in conjunction with a ſufficient quantity of ſome proper liquid; preſcribing, at the ſame time, a due degree of exerciſe for the patient, which I always do, when I either preſcribe the Peruvian bark, or any medicines whatever of the chalybeate kind.

It is highly unſafe and dangerous to repreſs exceſſive vomitings, diſcharges of bloody urine, hæmorrhages of the noſe, uterus, or anus, and ſpittings of blood, by means of Aſtringents; ſince the patients are always ſure to ſuffer by ſuch a practice, unleſs the ſpaſms, on which the diſcharges of blood, for the moſt part, depend, as much as effects do upon their immediate cauſes, are firſt ſoothed, the violent and impetuous motions of the fluids checked, and the exorbitant affluence of humours derived to other parts.

The traumatic, or vulnerary herbs, and decoctions of them, are of very ſingular and uncommon ſervice, not only in wounds, eroſions, and ſolutions of continuity, but alſo in ſome diſeaſes of a chronical and violent nature, ſuch as a phthiſis, ſcurvy, cachexy, and diſorders ariſing from the ſtone, when theſe indiſpoſitions draw their origin from the tone of the viſcera and glands being weakened, or from a preternatural ſtagnation of the juices. But we ought, at all times, carefully to avoid uſing them in caſes where there is too great an obſtruction of the veſſels, a conſtriction of the fibres, or in a phthiſis, when the lungs are full of hard tumors and tubercles: however, in other caſes, infuſions of vulnerary and gently aſtringent medicines are of ſingular ſervice, and produce excellent effects; eſpecially in preventing ſabulous and ſtony concretions in the kidneys, which, for the moſt part, ariſe from theſe organs being too much relaxed or ulcerated. Upon this ſubject, I would recommend Hencherus's Diſſertation, concerning the uſe of Aſtringents in the ſtone. This intention is alſo very well anſwered by infuſions of yarrow and its tops, of Paul's betony, ground-ivy, ſtrawberries, agrimony, and the bark of the Egyptian thorn-root. In involuntary diſcharges of the urine, ariſing from too great a relaxation of the ſphincter muſcle of the bladder, whether in children or in adults, I have found infuſions of this nature produce very happy effects, applying externally, at the ſame time, rectified ſpirits of wine.

In caſes where the external parts are hurt or wounded, well rectified ſpirit of wine proves by itſelf, a noble and efficacious vulnerary; ſince it puts a ſpeedy ſtop to defluxions of the blood and humours; and is of ſingular ſervice, where the more ſenſible nervous and tendinous parts have ſuffered by too great an effuſion of blood; for ſpirituous liquors not only coagulate the juices of the human body, as we find by making the experiment upon blood and lymph, but alſo, by removing the ſuperfluous humidity, render the fibres tenſe and rigid, and, by bracing them more ſtrongly up, prevent ſtagnations of the blood, and carry off pains and inflammations. *Hoffman.*

ASTROMETEOROLO'GIA, the art of foretelling the weather, and its changes, from the aſpects and configurations of the moon and planets.

This makes a ſpecies of aſtrology, diſtinguiſhed by ſome under the denomination of meteorological aſtrology.

Dr. Goad publiſhed a large work, in folio, expreſs on this ſubject, in 1686, which he afterwards tranſlated from Engliſh into Latin, and publiſhed it in London, 1690, quarto, containing a ſort of ſyſtem of prognoſtications of the weather. To the ſame head alſo belongs Coke's Meteorologia, firſt publiſhed in Engliſh, and ſince in High Dutch, at Hamburgh, 1691, octavo.

ASTRONO'MICAL *Sector*, a very uſeful mathematical inſtrument, made by the late ingenious Mr. Graham.

It is allowed that a micrometer is the moſt accurate and convenient inſtrument for obſerving the place of a planet or comet, when it happens to be near enough to any known ſtar, by taking the differences of its right aſcenſion and declination from thoſe of the ſtar. But this being frequently impracticable, by reaſon that many large places in the heavens are void of ſtars, whoſe places are known; it is neceſſary to have recourſe to moveable quadrants, or ſextants, furniſhed with teleſcopic ſights, for taking larger diſtances. But, beſides the difficulty and charge of procuring good inſtruments of this kind, the great trouble and uncertainties, in obſerving with them, are very notorious, ariſing chiefly from the difficulty the obſervers find in making their obſervations, as each teleſcope correſpond together at the ſame inſtant, while the inſtrument is following the diurnal motion of the heavens. The lovers of aſtronomy are therefore much obliged to the ingenious Mr. George Graham, F. R. S. not only for many uſeful improvements in the mechaniſm of ſeveral aſtronomical inſtruments, but alſo for contriving a very commodious and accurate one for the purpoſe aforeſaid; that is, for taking ſuch differences of right aſcenſion and declination as are too large to be obſerved through a fixed teleſcope; and yet with equal facility and exactneſs too in proportion to the radius of the inſtrument. I will firſt give an idea of it, and then deſcribe the particulars of the mechaniſm.

Let AB (*plate* V. *fig.* 1.) repreſent an arch of a circle, containing ten or twelve degrees well divided, having a long plate CD for its radius, fixed to the middle of the arch at D. Let this radius be applied to the ſide of an axis HFI, and be moveable about a joint fixed to it at F, ſo that the plane of the ſector may be always parallel to the axis HI; which being parallel to the axis of the earth, the plane of the ſector will always be parallel to the plane of ſome hour circle. Let a teleſcope CE be moveable about the center C of the arch AB, from one end of it to the other, by turning a ſkrew at G; and let the line of ſight be parallel to the plane of the ſector. Now, by turning the whole inſtrument about the axis HI, till the plane of it be ſucceſſively directed, firſt to one of the ſtars, and then to another, it is eaſy to move the ſector about the joint F into ſuch a poſition, that the arch AB, when fixed, ſhall take in both the ſtars in their paſſage, by the plane of it, provided the difference of their declinations does not exceed the arch AB. Then, having fixed the plane of the ſector a little to the weſtward of both the ſtars, move the teleſcope CE by the ſkrew G; and obſerve, by a clock, the time of each tranſit over the croſs hairs, and alſo the degrees and minutes upon the arch AB, cut by the index at each tranſit; then, in the difference of the arches, the difference of the declinations, and by the difference of the times, we have the difference of the right aſcenſions of the ſtars.

The mechaniſm of the principal parts of the inſtrument is this: upon the ſide of an iron axis HIT (*fig.* 2.) wrought ſquare, and near the top of it, there is fixed a broad circular plate, abc, of ſolid braſs; upon which there lies a braſs croſs, KLMN, which turns about a joint at the center F: at the end of the croſs plate MN are erected two equal perpendicular arms O and P, whoſe extremities are fixed by the ſkrew de to the backſide of the radius CD; which is ſtrengthened by a long braſs rib on its backſide, placed edgways from one end to the other, as repreſented in *fig.* 4. The arms OP are no longer than is neceſſary for the ſector ABC to turn about the joint F quite clear of another circular plate QR; which is fixed to the upper baſis of a braſs cylinder I, the iron axis HF being put through a ſquare hole in the middle of them both, and immoveably fixed in it. ST repreſents a long ſubſtantial plate of braſs, having two ſhort plates, VX and YZ, fixed perpendicular to the ends of it. Let us ſuppoſe the length of the plate TS to be parallel to the earth's axis, and to be firmly fixed in this poſition upon a pedeſtal, or otherwiſe, with its flat ſides facing the north and ſouth. Remove the axis HI, and place the conical hole, made in the end H, upon a conical point of a ſkrew-pin at Y; and the cylinder I into the ſlit VZX, whoſe parallel ſides VX embrace, while it reſts againſt two points of an angular notch in the bottom of the ſlit at Z. By this means, the whole inſtrument will always turn true about one and the ſame imaginary line. When the ſector is turned about the joint F (*fig.* 2.) till the radius CD becomes parallel to the axis HI, *fig.* 4. repreſents a ſection of the whole inſtrument, made by a plane paſſing at right angles through the radius CD, and through the rib on the backſide of it, and through the axis HI, and through the ſupporter ST. The ſeveral parts of the inſtrument are here denoted by the ſame letters in both figures. The arms O and P have two ſlits through the middle of their ends, to receive the edge of the rib CD. The circular plate ac is fixed to the axis by the ſkrews hi. The braſs rod gk is ſkrewed into the axis HI, and carries a braſs ball, lm, that ſlides along it, and is fixed by a ſkrew m, at a proper place for ballancing the weight of the ſector and teleſcope placed on the oppoſite ſide of the axis. At the top of the ſupporter ST there is an hold-faſt $nopqrstv$, whoſe cavity $nopq$ receives the circular plate QR. The end q, of a ſpringing-plate pq, is fixed by a ſkrew r to the inſide of the upper plate rs, while its other end p may be preſſed down upon the circle Q, by twiſting the knob of a ſkrew t, which works in a ſocket v. And to prevent this preſſure from diſlocating the plane of the circle QR, and, conſequently, the poſition of the axis HI, the hold-faſt $nopq$ has liberty of yielding or turning upon the ends of two ſkrew-pins, that go into two conical holes, in the oppoſite edges of the under plate nq: one of theſe ſkrews is ſeen at n; and the fixed piece that they ſkrew into, is repreſented ſeparately at full view at $nxyz$, nz being the point that the hold-faſt turns upon. By this means, the ſame ſkrew at t cauſes the upper and under plates of the hold-faſt $nopq$ to compreſs the circle Q with equal forces. To the arm O there is faſtened ſuch another hold-faſt, which ſo compreſſes the circle ac, and the croſs plate MN, as to ſtay the ſector and teleſcope in any given poſition, from turning about the joint F. This joint is nothing elſe but a cylindrical pin, paſſing through the plates MN, ac. The flat head of the pin is fixed by three ſmall ſkrews to the plate MN; and to the oppoſite end of this pin a circular ſpringing-plate is fixed by a ſkrew, that ſkrews into the end of the pin. And the joint C, at the center of the ſector ABC, is made in the ſame manner.

Fig. 3. repreſents the ſkrew-work upon the backſide of the limb AB, contrived for moving the teleſcope, by twiſting the knob g. Here gab is a long ſtraight ſkrew, which works through a ſkrew-hole in a braſs head c; whoſe neck is moved in a long circular ſlit de, cut through the limb: the other end of this neck turns round in a hole in the nonius-plate (one end of which is fixed to the teleſcope) and draws it along the limb; h and i are the heads of two ſkrews, whoſe ſhanks go through a ſpringing-plate, to make the motion ſteady, and through the ſlit de; and are ſkrewed into the nonius-plate on the other ſide of the limb. Since the length of the ſkrew ab muſt have a ſmall angular motion, while it carries the head c along the arch de, the ſhank of it, near the end a, turns round in a hole made in a ſhort flat axis mn, placed perpendicular to the limb, and held ſo by an arm no, while the other end b moves in a ſlit p, parallel to the limb, being cut in a ſmall plate fixed perpendicular to the limb. The long ſkrew gab is kept from ſlipping backwards and forwards through the hole in the axis mn, by ſhoulders or nuts fixed on each ſide.

The dimenſions of this inſtrument are theſe: the length of the teleſcope, or the radius of the ſector, is $2\frac{1}{2}$ feet; the breadth of the radius, near the end C, *fig.* 2. is $1\frac{1}{2}$ inch; and, at the end D, two inches. The breadth of the limb AB is $1\frac{1}{2}$ inch; and its length ſix inches, containing ten degrees divided into quarters, and numbered from either end to the other. The teleſcope carries a nonius or ſubdividing plate, whoſe length, being equal to ſixteen quarters of a degree, is divided into fifteen equal parts; which, in effect, divides the limb into minutes, and, by eſtimation, into ſmaller parts. The length of the ſquare axis HIF is eighteen inches, and of the part HI twelve inches; and its thickneſs is about a quarter of an inch; the diameters of the circles QR and abc are each five inches: the thickneſs of the plates, and the other meaſures, may be taken at the direction of a workman.

This inſtrument may be rectified, for making obſervations, in this manner: by placing the interſection of the croſs hairs at the ſame diſtance from the plane of the ſector the plane deſcribed by the line of ſight, during the circular motion of the teleſcope upon the limb, will be ſufficiently true, or free from conical curvity; which may be examined by ſuſpending a long plumb-line at a convenient diſtance from the inſtrument; and, by fixing the plane of the ſector in a vertical poſition, and then by obſerving, while the teleſcope is moved by the ſkrew along the limb, whether the croſs hairs appear to move along the plumb-line.

The iron axis hfo (*fig.* 5.) may be elevated nearly parallel to the axis of the earth, by means of a ſmall common quadrant; and its error may be corrected, by making the line of ſight follow the circular motion of any of the circum-polar ſtars, while the whole inſtrument is moved about its axis hfo, the teleſcope being fixed to the limb. For this purpoſe, let the teleſcope kl be directed to the ſtar a, when it paſſes over the higheſt point of its diurnal circle, and let the diviſion, cut by the nonius, be then noted: then, after twelve hours, when the ſtar comes to the loweſt point of its circle, having turned the inſtrument half round its axis, to bring the teleſcope into the poſition mn; if the croſs hairs cover the ſame ſtar ſuppoſed at b, the elevation of the axis hfo is exactly right; but if it be neceſſary to move the teleſcope into the poſition $\mu\nu$, in order to point to this ſtar at c, the arch $m\mu$ which meaſures the angle $mf\mu$ or bfc, will be known; and then the axis hfo muſt be depreſſed half the quantity of this given angle, if the ſtar paſſed below b; or muſt be raiſed ſo much higher, if above it; and then the trial muſt be repeated, till the true elevation of the axis be obtained. By making the like obſervations upon the ſame ſtar on each ſide the pole, in the ſix o'clock hour-circle, the error of the axis, toward the eaſt or weſt, may alſo be found and corrected, till the croſs hairs follow the ſtar quite round the pole. For ſuppoſing $aopbc$ to be an arch of the meridian (or in the ſecond practice of the ſix o'clock hour-circle) make the angle afp equal to half the angle afc, and the line fp will point to the pole; and the angle ofp, which is the error of the axis, will be equal to half the angle bfc or $mf\mu$, found by the obſervation; becauſe the difference of the two angles afb, afc, is double the difference of their halves afo and afp. Unleſs the ſtar be very near the pole, allowance muſt be made for refractions. *Smith's Optics.*

A'STROSCOPE, *aſtroſcopium*, a kind of aſtronomical inſtrument, compoſed of two cones, on whoſe ſurface the conſtellations,

ſtellations, with their ſtars, are delineated; by means whereof, the ſtars may eaſily be known.

The Aſtroſcope is the invention of William Schuckhard, formerly profeſſor of mathematics at Tubingen, who publiſhed a treatiſe expreſly on it, in 1698.

ASTROSCO'PIA, the art of obſerving and examining the ſtars, by means of teleſcopes, in order to diſcover their nature and properties.

A'STRUM, or Astron, a conſtellation, or aſſemblage of ſtars: in which ſenſe it is diſtinguiſhed from aſter, which denotes a ſingle ſtar.

Some apply the term, in a more particular ſenſe, to the great Dog, or, rather, to the great bright ſtar in his mouth.

A'TE, in mythology, a miſchievous and ill-natured goddeſs, who took delight in engaging men in troubles and quarrels, perverting their underſtanding, and dulling their reaſon. There was no way to be ſecured from her, but by having recourſe to the Lites, daughters of Jupiter, who ſaved men from her anger with this circumſtance, that, the more ſhe was in a paſſion, the leſs power they had with her, &c. This Ate is nothing elſe but the evil and injuſtice we commit; which is the real ſource of our trouble and misfortunes. The Lites are our prayers, which we are to make uſe of in our calamities. Laſtly, it is evident, that, when our crimes are very great, then we meet with the greater difficulties in obtaining our pardon.

ATHA'NATES, or the immortal, a name the Perſians gave a body of 10000 choice men, which was always kept complete, by filling up the number, as ſoon as any were killed, or died: they had great confidence in this body of men, and never engaged them, but in deſperate caſes. Q. Curtius ſpeaks of them thus: Proximi ibant quos Perſæ immortales vocant ad decem millia.

ATHA'NOR *(Dict.) plate* V. *fig.* 10. repreſents an Athanor furnace. *a a a a*, the tower of the Athanor, or chief furnace, which receives the fuel of the fire: the pricked lines indicate the thickneſs of the wall. *b b b b*, the inner ſides which form the cavity, and are each ten inches long. *c*, the door of the aſh-hole. *e*, the upper door. *d*, the grate which is placed even with the bottom of the door *e*. *f*, the cover wherewith the upper aperture of the tower is ſhut. *g g*, a flue, through which the fire aſcends from the tower into the firſt furnace. *h h h h*, a hollow priſm, which forms the firſt ſecondary furnace. *i i*, a ſemi-cylindrical arch, wherewith the aforeſaid priſm is cloſed up. *k k k k*, an iron-plate coated within, wherewith the firſt ſecondary furnace is ſhut. In this plate is a round hole, through which the neck of the veſſel 7 may be paſſed. *n*, iron-bars. *o o o o*, iron-hooks, faſtened to the wall, to receive the iron-bars. *q q q q*, the funnel of the furnace. *r*, an iron-plate, wherewith the funnel may be ſhut. *t t*, another flue, through which the fire paſſes from the firſt ſecondary furnace to the ſecond. *u u u u*, another ſecondary furnace cylindrical. *v v*, its upper circular aperture, ſloped at the fore part, to receive an iron-pot, which is to be hung in this ſecondary furnace. *z*, a flue, which conveys the fire from the ſecond to the third furnace. 1 1 1 1, the third ſecondary furnace, having an iron-pot, like the ſecond. 2222, the ſecond funnel. 3, a plate to ſhut the funnel. 4, an aperture, which leads from the third furnace into the funnel. 5 5 5, the third funnel. 7, an earthen retort, placed in the firſt ſecondary furnace, with its neck through the hole in the door. 8, a receiver. 9, a glaſs-retort, placed in the iron-pot, belonging to the ſecond ſecondary furnace; which pot is filled with ſand. 10, a receiver. 11, a glaſs cucurbit, with its head placed in the pot of the third furnace. 12 12, Stands which ſupport the receivers, and which may be raiſed or lowered by the help of ſcrews.

Uſes of the Athanor. You muſt put in, at the upper arch-door *e*, a ſemi-cylindrical muffle, twelve inches long, of the ſame heighth and breadth of the door, three quarters of an inch thick, and open behind, being ſhut there by the hinder part of the Athanor. For this purpoſe, a tile muſt be placed on the grate *d*, to ſupport the muffle. Under this muffle you may place your cement-pots, or ſuch bodies as muſt be calcined with a long and violent fire; which may be done without a muffle, though not ſo well. In the firſt ſecondary furnace, *h h h h*, *i i*, you may perform the moſt violent diſtillations, with an open fire; for retorts, and other veſſels, may be introduced into it, by taking away the door *k k k*, and placed either upon the hearth itſelf, or on a particular ſupport of ſtone. But you muſt be careful to place thoſe veſſels in ſuch a manner, that their necks may paſs through the hole in the door *k k*. You may cloſe all the crevices of the door with lute. To the neck of the retort apply a cylindrical ſegment ten or twelve inches long, that the heat of the vapours may be gradually diminiſhed, leſt the receiver, which muſt be of glaſs, ſhould ſplit. The receiver muſt be luted to the other orifice of the ſaid ſegment, and ſupported by a kind of trivet. In this chamber, inſtead of diſtillations, you may make cementations, calcinations, &c. in which caſe, the round hole, in the iron-plate *k k*, muſt be ſhut.

The ſecond and third ſecondary furnaces ſerve chiefly to perform ſuch operations as are made in baths of ſand, aſhes, or filings. You may alſo make in theſe furnaces diſtillations by a reverberating fire, as in the firſt; only the fire is leſs violent in theſe, though ſufficient for diſtilling aqua fortis: in order to this, you muſt take out the iron-pot, and invert it on the mouth of the furnace; by this means, the ſegment cut out from the pot, together with that cut out from the ſide of the cavity, will form a hole for the neck of the retort.

All the apparatus being thus prepared, you muſt introduce, through the top of the tower *b b b b*, a few burning coals; and then a ſufficient quantity of fuel, ſo that the tower may be entirely filled, or only in part, according to the nature of the operation. Then immediately put on the iron-cover *f*, and cloſe exactly all the crevices with lute; for, if you neglect this caution, all the fuel contained in the tower would immediately be kindled, which might be attended with very bad conſequences.

Manner of regulating the fire.—The fire may be made very ſtrong in the firſt chamber *h h h h*, *i i*, by leaving the door of the aſh-hole *c*, and the funnel *q q q q*, of the chamber, quite open, and the fire have free liberty to paſs from the tower into this cavity. But the cloſer the funnel is ſhut, together with the door of the aſh-hole, the more the violence of the heat diminiſhes: and this will be ſoon effected, if the iron ſlider, which ſeparates this cavity from the tower, be partly let down. Obſerve alſo, when the ſtrongeſt fire is required, that the hole in the door *k k* be cloſely ſtopped; becauſe, when open, the air, by ruſhing violently through it, cools the bodies placed in that cavity. At the ſame time diſtillation, or ſome other proceſs, may be performed, and with the ſame fire, in the ſecond and third furnaces; for the fire penetrates from the firſt cavity into the ſecond, and increaſes, when the funnel 2 2 2 2, erected on it, is opened. But, before you do this, the funnel of the firſt cavity muſt be ſhut as much as that of the ſecond is opened. By the ſame means, you may hinder the fire, which ſerves for the operations made in the two firſt cavities, from going out through their funnels, and force it out through the funnel 5 5 5, by which means it will alſo act upon the bodies placed in that cavity: for, the more the funnel erected on the third cavity is open, the more one or both the funnels of the other cavities muſt be cloſed: whence it is plain, that you cannot have the ſtrongeſt fire in the third cavity, unleſs there be an equal degree of fire in the other two; but, on the contrary, the heat in the third cavity may be rendered leſs, by cloſing its funnel, though it be violent in the others. The ſame is true of the ſecond cavity, with regard to the firſt. You cannot make the ſtrongeſt fire under the muffle placed within the upper door *e*, of the tower, unleſs you have an equal fire in the firſt cavity; which fire may, conſequently, be increaſed, by ſhutting the door quite againſt the muffle; and diminiſhed, by opening it; there being, at the ſame time, an equal heat in the firſt chamber, and in the following ones.

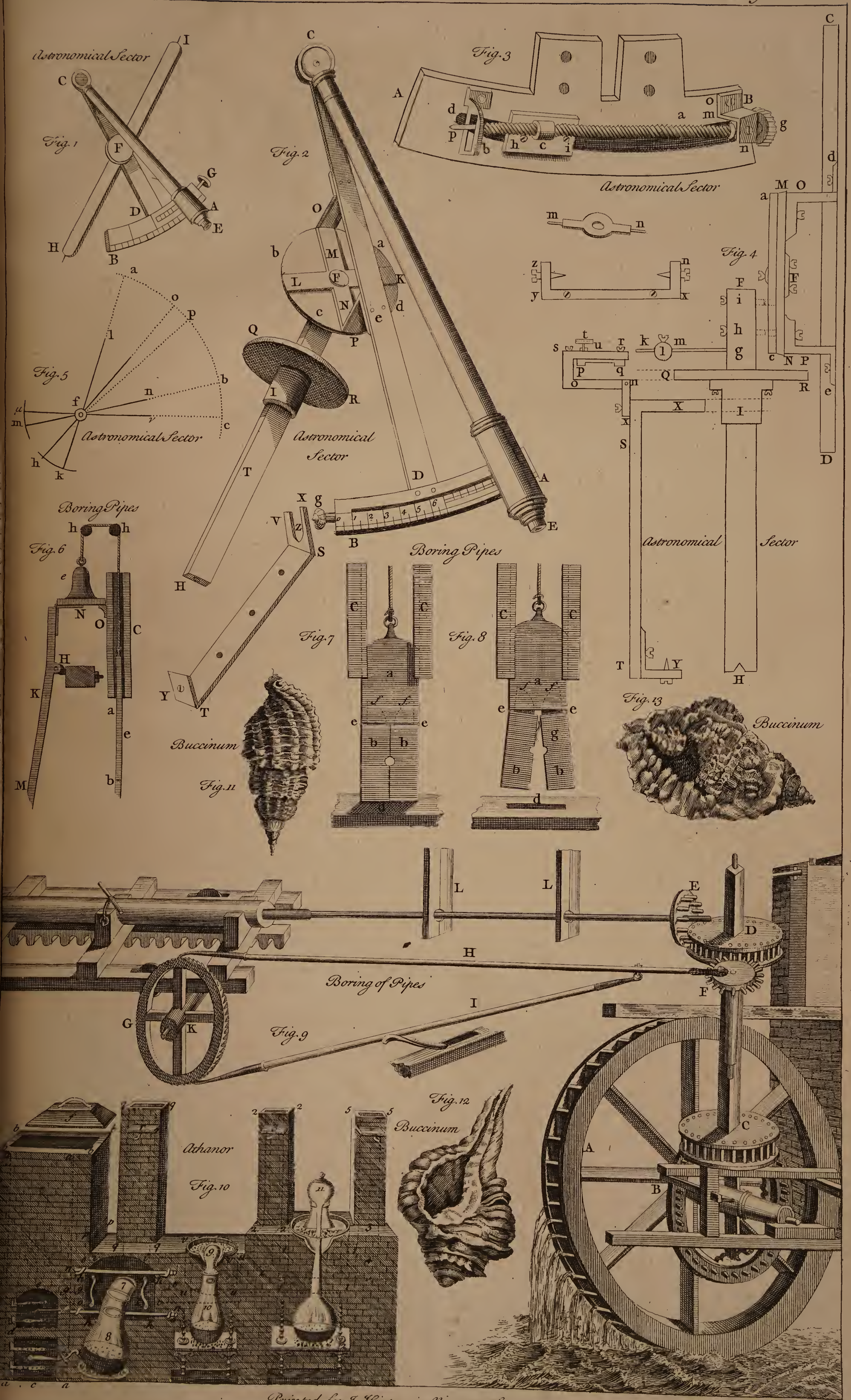
ATHEMADOU'LET, Atamadoulet, or Etmadoulet, is the prime miniſter in the Perſian empire. The word is Arabic, compoſed of itimade, and doulet, which is the truſt of majeſty, or, according to Tavernier, the ſupport of riches. His office is the ſame as the grand vizir's in Turky, and may be compared to the antient mayors of the palace in France. In regard all the affairs of the kingdom paſs through his hands, he ought to be rather a gown-man than a ſoldier; and herein he only differs from the grand vizir, who is always to be at the head of an army, and, for every ſlight fault, or diſtaſte, is ſubject to be ſtrangled by the grand ſignior; whereas in Perſia, where the government is milder, the prime miniſters generally die in their beds; or, if they are depoſed, they are only exiled to ſome frontier city, where they live as private men. When the king is young, the prime miniſter has a hard game to play, for then the favourite eunuchs and the ſultaneſſes diſannul and cancel, in the night, whatever orders he makes in the day-time. The Athemadoulet is great chancellor of the kingdom, preſident of the council, ſuperintendant of the finances, and has the charge of commerce and all foreign affairs; he is, in effect, the vice-roy of the kingdom, and iſſues the king's mandates, or orders, in this ſtyle, Benda derga ali il alia Etmadoulet, that is, I, who am the ſupport of the power, the creature of this port, the higheſt of all ports. He draws, every lunar month, a thouſand tomans from the treaſury for his expences; which, in the year, amount to 45000 l. ſterling. This, however, is the leaſt of his revenue; for, having in his gift all the places of the government, war, finances, &c. he makes what advantage he pleaſes of them: moreover, as all the governors of provinces, and officers of the court, are obliged to ſend preſents to the Sophy, they dare not forget the Athemadoulet. He has under him ſix vizirs, and two ſecretaries.

ATHLE'TIC *Habit*, in medicine, denotes a ſtrong, hale conſtitution of body.

Anciently it ſignified a full, fleſhy, corpulent ſtate, ſuch as the athletæ endeavoured to arrive at.

The Athletic habit is eſteemed the higheſt pitch of health; yet it is dangerous, and the next door to diſeaſe; ſince, when the body is no longer capable of being improved, the next alteration muſt be for the worſe.

ATLA'NTIDES, in aſtronomy, a denomination given to the Pleiades, or ſeven ſtars, ſometimes alſo called Vergiliæ. They are thus called, as being ſuppoſed, by the poets, to have been



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the daughters of Atlas, or his brother Heſperus, who were tranſlated into heaven.

A'TLAS, in commerce, a ſilk-ſattin, manufactured in the Eaſt-Indies. There are ſome plain, ſome ſtriped, and ſome flowered, the flowers of which are either gold, or only ſilk. There are Atlaſſes of all colours, but moſt of them falſe, eſpecially the red and the crimſon.

It muſt be owned, that the manufacture of them is wonderful and ſingular; and that, eſpecially in the flowered Atlaſſes, the gold and ſilver are worked together in ſuch a manner as no workman in Europe can imitate: but yet they are very far from having that fine gloſs and luſtre which the French know how to give to their ſilk-ſtuffs.

Among the ſeveral ſorts of Atlaſſes, the moſt conſiderable are, the cotonis, the caucanias, the cotonis-bouilles, and the bouilles-chaſmay, or charmay. The Atlaſſes cotonis are thus called, becauſe the ground of them is cotton, and the reſt ſilk. The caucanias are ſtriped ſattins, and thoſe of them which ſeem moſt ſilky, are ſtiled quenkas. The calquiers are ſattins made after the Turkiſh manner, or like Hungary point. The bouilles-cotonis and bouilles-charmay are thick ſilks, like thoſe ſtrong taffeties made at Tours in France.

There are Atlaſſes from four French ells and $\frac{1}{8}$ in length, by $\frac{2}{3}$ in breadth, to 14 ells in length, by $\frac{9}{16}$ in breadth. Thoſe that come near to half the uſual length are called half-pieces.

A'TMOSPHERE *(Dict.)*— There have been often ſeen in the Atmoſphere ſome very luminous parts, even near the zenith about midnight. It has been thought that theſe luminous parts are nothing elſe but terreſtrial exhalations floating in the air, at a prodigious altitude, and thereby reflecting the light of the ſun, which they are expoſed to, at that great height, to our eyes.

But Mr. Cotes juſtly obſerves, that it will be next to impoſſible to give any tolerable account, how theſe exhalations can be denſe enough to reflect ſo copious a light at that vaſt diſtance, and at the ſame time be ſupported by a medium ſo much rarer than the air we breathe in. It ſeems, therefore, more probable, that theſe extraordinary lights proceed from ſome ſelf-ſhining ſubſtance, or aerial phoſphorus.

A ſurprizing appearance of this kind was ſeen at Cambridge, on the 20th of March, in the year 1706. It was a ſemicircle of light, of about two thirds of the ordinary breadth of the milky-way, but much brighter. The top of it paſſed very near the zenith of that place, inclining about four or five degrees to the north; it croſſed the horizon at a very ſmall diſtance from the weſt, towards the ſouth, and again, about as far from the eaſt, towards the north. It was moſt vivid and moſt defined about the weſtern horizon, and moſt faint about the zenith, where it firſt began to diſappear. There was at the ſame time an Aurora borealis. The ſame appearance was ſeen in Lincolnſhire, at the diſtance of about 70 miles north of Cambridge, and there the ſemicircle ſeemed to lie in the plane of the equator. From theſe two obſervations compared together, it may be collected, that the matter, from which that light proceeded, was elevated above the earth's ſurface between 40 and 50 miles. *Cotes's Hydroſt. Lect.*

F. de Lana thought he had contrived an aeronautic machine for navigating the Atmoſphere: Sturmius, who examined it, declared it not to be impracticable: but Dr. Hook was of a different opinion, and detected the fallacy of the contrivance. Roger Bacon long before propoſed ſomething of the ſame kind. The great ſecret of this art, is to contrive an engine ſo far lighter than air, that it will raiſe itſelf in the Atmoſphere, and, together with itſelf, buoy up and carry men with it. The principle on which it is to be effected, is by exhauſting the air of a very thin light, yet firm, metalline veſſel, with an air-pump.

But the hopes of ſucceſs in ſuch an enterprize will appear very ſmall, if it be conſidered, that if a globe were to be formed of braſs, of the thickneſs only of $\frac{1}{12}$ of an inch, that globe muſt be above 277 feet in diameter, to ſwim in the air; and if, as de Lana ſuppoſes, the diameter of the globe were but 25 feet, the thickneſs of the metal could not exceed $\frac{1}{133}$ of an inch.

A'TRIPLEX, *Orach*, in botany, the name of a genus of plants, the characters of which are theſe: the flower has no petals, but is compoſed only of a number of ſtamina and a piſtil, ariſing from a five-leaved cup. The piſtil finally becomes a flat orbiculated ſeed, incloſed in the cup in the manner of a capſule. Some ſpecies of Atriplex have alſo another ſort of fruit, placed in a different part of the plant, not in that of the flowers. The embryo's of this fruit are large, and conſiſt of two angular leaves, which nicely incloſe and ſurround a ſeed of a roundiſh figure.

This plant is ſometimes cultivated in gardens as a culinary herb, being uſed as ſpinach, and, by ſome, much preferred to that herb: but there are few in England that are fond of it. It is to be ſown in the ſpring as ſpinach, and muſt be eaten, while it is young; for, when it is run up to ſeed, it is very ſtrong. If ſuffered to ſcatter its ſeed in a garden, it will make itſelf a laſting inhabitant, without farther trouble; the ſeeds often remain many years in the ground, and, every time it is turned up, ſend up new plants. *Miller's Gard. Dict.*

All the ſpecies of Atriplex are cooling and emollient. The leaves are ſometimes uſed in clyſters, and in cataplaſms, intended to ſoften tumors, and to abate pains. Some give the ſeeds internally as diuretics, and others recommend them againſt diſorders of the uterus and menſes. *Quinſ. Diſ.*

A'TROPOS, in the ancient mythology, one of the Parcæ, or fatal ſiſters; the other two were Lacheſis and Clotho.

ATTE'NTION, conſidered logically, means an operation of the mind, by which it applies itſelf more particularly to ſome part of a compound object, to arrive at a more clear and diſtinct idea of that part than the other whereof it is compoſed. Thus, in a play, the moſt lively and intereſting ſcenes draw our Attention principally, fill the whole ſoul, and abſorb or exclude our ideas of any other. Attention, like a microſcope, enlarges the objects it is applied to, and a thouſand properties are diſcovered by this Attention, that eſcaped a curſory view.

To increaſe Attention, we muſt baniſh every thing that may interrupt it, and ſeek every means to ſtrengthen and aſſiſt it. Our ſenſes are apt to divert our Attention; new ſenſations obſcure, efface, and obliterate acts of imagination. Yeſterday, you ſaw a fine piece of painting, were ſo ſtruck with it, its idea quite poſſeſſed you; another, offered to your view to-day, drives the former out of your imagination; thus external objects deſtroy Attention. For this reaſon ſome pray with their eyes ſhut, or directed ſteadily towards ſome fixed and immoveable point. Students chuſe a room remote from noiſe and the interruption of external objects, and the ſtudies of the night have been more ſucceſsful than thoſe of the day, becauſe a more univerſal calm and ſilence reigns.

The hurry of the imagination deſtroys Attention as much as that of our ſenſes; after a play, it is difficult to reſume our ſtudies immediately; next day ſome images will recur, apt to divert us and interrupt our attention. The ſenſes, the imagination, and the paſſions operate upon the ſoul and give it a kind of modification. All, therefore, who would apply themſelves ſtrenuouſly to the diſcovery of truth, ſhould be careful to avoid ſtrong and immoderate ſenſations, a great noiſe, a glaring light, exceſs of grief, or joy, &c. they ought to keep their imagination free from any thing that weakens or diſquiets the mind. They ought eſpecially to controll their paſſions, which, let looſe, make very powerful impreſſions on the ſoul and body, and exerciſe a ſtrange dominion over both. Yet the paſſions and the ſenſes may be made of uſe to preſerve our Attention. As, for inſtance, a deſire of diſcovering truth, rendering ourſelves uſeful to our neighbours, and improving ourſelves, is highly laudable, and tends to fix our Attention; but our Attention is fixed alſo by motives much leſs generous and noble, a thirſt of fame, deſire of riches, nay, even vanity. Experience ſhews us the ſenſes are of no ſmall ſervice to fix the Attention, for they have a natural connection with our ſituation; a man, retired to meditate in a ſolitary cell, will be alarmed, diſtracted, and his Attention intirely deſtroyed by an unexpected noiſe, or intermiſſion of adventitious light; ſo, if on the contrary, I reflect ſtrongly on an object amidſt day-light and noiſe, that idea baniſhes all others and poſſeſſes me; thus light and noiſe are no interruptions to Attention, but ſerve to fix it more ſtrongly. It is, in ſhort, a habit of the mind; and the philoſophers, who have ſhut their eyes to help their meditation, have furniſhed us with nothing but chimæra's. Had Deſcartes kept his eyes open to have ſurveyed the univerſe with Attention, inſtead of ſinking into meditation, he would never have publiſhed ſuch dreams as he has for a plan of the univerſe. Attention is progreſſive, and the power of it may be acquired, but depends, in ſome meaſure, on the conſtitution. Julius Cæſar could dictate to four ſecretaries; ſome no noiſe diſturbs, nothing interrupts; others the lighteſt accident.

Habit does all; we know not our ſtrength till we try it; the ſoul is as flexible and capable of impreſſions as the body; is ſo connected with it, that, like the body, it grows, improves, and ripens. Fixing our Attention properly will diſpel the gloom of ignorance, poliſh off the ruſt of idleneſs, cultivate the mind, and conduct human reaſon right in the purſuit of truth and ſcience.

ATTRA'CTION *(Dict.)*— All philoſophers agree that there is a certain force by which the primary planets tend towards the ſun, and the ſecondary planets towards their primary. As we ought carefully to avoid multiplying principles, and impulſe is the moſt known and leaſt controverted principle of the motion of bodies, it is clear, a philoſopher ought to attribute this impelling power to a fluid. To this notion, the vortices of Des Cartes owe their birth, and this opinion ſeemed more plauſible, becauſe it accounted for the motions of the planets by the circular motion of the matter of the vortices, and their tendency towards the ſun by the centrifugal force of the ſame matter. But an hypotheſis is not to be admitted which accounts only for general phænomena; particular phænomena are the teſts of an hypotheſis, and the failure of the Carteſian ſyſtem in theſe overturned it. The doctrine of vortices is therefore juſtly exploded, as ſo many difficulties attend it which never can be ſurmounted; for, if the planets move by virtue of the action of a fluid, this fluid muſt have contrary properties, it muſt impel in one intention, and in another make no reſiſtance, an apparent abſurdity ; and the remedy is worſe than the diſeaſe, for the force by which the planets tend towards the ſun on this hypotheſis muſt be aſcribed to an occult quality, which is ſaying nothing at all : and Ariſtotle, who perhaps invented the term, is much more pardonable than many modern philoſophers who have blindly followed him.

We may therefore truly aſſert, that Attraction is a primordial quality of matter : nor is it perhaps poſſible to explain the celeſtial bodies on the principle of impulſion. If Sir Iſaac Newton ſeems to waver in ſome part of his works concerning the nature of Attraction, and admits of an impelling power, there is reaſon to think it was a kind of tribute he choſe to pay to the prejudice, or rather the general opinion of the age he lived in, than his real ſentiment; becauſe he permitted Mr. Cotes, his diſciple, to adopt Attraction without reſerve, as may be ſeen in the preface to the ſecond edition of his Principia ; and this preface was written under the eye of Sir Iſaac, and had his approbation. Beſides, Sir Iſaac admits a reciprocal Attraction among the celeſtial bodies, and this very opinion ſeems to ſuppoſe Attraction a quality inherent in bodies. But he that as it may, according to Newton, the attractive force decreaſes in an inverſe ratio to the ſquares of the diſtances : this learned philoſopher has ſolved a great part of the celeſtial phænomena on this ſingle principle, and all who have tried to account for them ſince, on the ſame principle, have ſucceeded to a ſurprizing degree of exactneſs. The motion of the moon's apogee which was pretended to be irreconcileable to this ſyſtem, is now found to be intirely conformable to it, and does honour to the Newtonian ſyſtem. All the other inequalities of the motion of the moon, which are very conſiderable, may alſo eaſily be accounted for by the ſyſtem of Attraction, and demonſtrated by calculation.

All the phænomena hitherto obſerved demonſtrate a mutual tendency of the planets towards each other; wherefore, we muſt admit this for a truth on its own evidence : and, though we ſhould be forced to acknowledge this a primordial and inherent quality in matter, we may venture to ſay, that the difficulty of conceiving ſuch a cauſe would be a very weak argument againſt its exiſtence. No one doubts but that a body which meets another, communicates motion to it, but have we an idea of the power by which this communication is made ? The vulgar eye here perhaps penetrates as far as that of the philoſopher. No body is ſurprized at ſeeing a ſtone fall ; they have always ſeen it ; philoſophers, well acquainted with the effects of impùlſion, have never troubled themſelves about the cauſe which produces them. Now, if every body which meets another, ſhould ſtop without communicating motion to it, a philoſopher would be as much aſtoniſhed at this phænomenon, as a common man at ſeeing a heavy body ſuſpended in the air. If we underſtood wherein the impenetrability of matter conſiſts, we ſhould not perhaps be clearer about the nature of the impelling power. We only ſee, that, in conſequence of this impenetrability, the ſhock of one body againſt another muſt be followed by ſome change either in both or one of the bodies; but we know not, and perhaps never ſhall, by what power this change is effected; and why, for inſtance, a body which ſtrikes againſt another ſhould not always continue at reſt after the ſhock, without communicating a part of its motion to the body which reſiſts it. It is apprehended Attraction contradicts the notion we have of matter ; but, if we enquire attentively we ſhall find theſe ideas no ways repugnant. The univerſe is concealed from us by a curtain, we ſee only ſome part of it ; were that drawn up on a ſudden, we ſhould be ſurprized to ſee what paſſes behind it. Beſides, the pretended inconſiſtence of Attraction with the nature of matter is ſolved by admitting an intelligent being, who could as eaſily ordain bodies to act on each other at a diſtance, as in contact.

M. de Maupertuis, in his diſcourſe on the figures of the planets, has given an idea of the ſyſtem of Attraction with remarks on it; and the ſame author obſerves, in the Mem. Acad. 1734, that, long before Sir Iſaac Newton, Roberval de Fermat and Paſcal thought gravity an attractive power, and inherent in bodies. We will add, that Hook had the ſame notion, and foretold that all the motions of the planets would one day be accounted for on this ſingle principle. Theſe reflections, by increaſing the number of great men who were of the ſame opinion with Sir Iſaac, take nothing from his glory ; for, as he was the firſt who actually demonſtrated this principle, he is properly the author of it.

The ingenious Dr. Knight has juſt publiſhed a treatiſe, in which he has endeavoured to demonſtrate that all the phænomena in nature may be explained by Attraction and repulſion. See MAGNETISM and REPULSION.

Attraction *of Mountains.* If it be admitted that all parts of the earth attract each other mutually, it muſt be granted that there are mountains on it, whoſe magnitude is conſiderable enough to make a ſenſible Attraction. Let us ſuppoſe the earth a globe of an uniform figure, whoſe radius is equal to 1500 leagues, and ſuppoſe a mountain on the ſurface of ſome part of this globe one league in heighth, it is eaſy to demonſtrate, that a weight placed at the bottom of this mountain ſhall be attracted horizontally by the mountain, with a force equal to a 3000th part of the weight ; ſo that a pendulum or plumb-line, placed at the bottom of this mountain, muſt deviate from a perpendicular about a minute ; the calculation is not difficult, and this may be admitted by way of ſuppoſition.

From whence it follows, that, when we obſerve the elevation of a ſtar at the foot of a great mountain, the plumb-line muſt deviate from a perpendicular; and an obſervation of this kind, certainly, would afford a very ſtrong proof in favour of the ſyſtem of Attraction ; but it may be objected, how ſhall we be ſure the plumb-line actually deviates from a perpendicular, as the direction of the plumb-line only determines the vertical ſituation of the ſtar ? This difficulty is eaſily ſurmounted.

Let us ſuppoſe a ſtar on the north of the mountain, and the perſon who is to make his obſervation placed on the ſouth, if the Attraction of the mountain acts ſenſibly on the plumb-line, it will deviate from a perpendicular towards the north, and, conſequently, the apparent zenith of the ſtar will go back towards the ſouth, and ſo the diſtance of the ſtar on which the obſervation is made in the zenith, muſt be greater than if there was no Attraction.

After having made this obſervation, if we go at a diſtance from the mountain, on a right line towards the eaſt or weſt, ſo far, that the Attraction no longer operates, an obſervation, made in this new ſtation, will ſhew the ſtar at a leſs diſtance than in the former.

But there is another and better method. It is certain, that, if the plumb-line on the ſouth ſide of the mountain deviates towards the north, the plumb-line on the north ſide muſt deviate towards the ſouth, and the zenith of the ſtar, which in the firſt caſe went back towards the north muſt, in the latter, advance towards the ſouth. Therefore, taking the difference of theſe two diſtances, and dividing it into two equal parts will ſhew how much the pendulum has deviated from a perpendicular by the Attraction of the mountain.

The whole theory is clearly explained, with ſeveral remarks, in an excellent Memoir of M. Bouguer's, printed in the year 1749, at the end of his book on the Figure of the Earth. In which he gives an account of the obſervations he made in company with M. Condamine, on the north and ſouth ſides of the great mountain Chimboraco, in Peru; the reſult of his obſervations is, that the Attraction of this great mountain cauſes a deviation of the plumb-line from its perpendicular of 7″ and a half. Mr. Bouguer judiciouſly remarks, that the greateſt mountain is a trifle compared to the vaſt body of the terreſtrial globe; and that a hundred obſervations, where no ſenſible Attraction is found, prove nothing againſt the Newtonian ſyſtem; but that this made at the foot of the vaſt mountain Chimboraco, which is in favour of the doctrine of Attraction, deſerves the attention of all philoſophers.

AU'DIANISM, the ſyſtem or ſentiments of Audius and his followers; particularly as to the belief of the human figure of the Deity.

Audianiſm amounts to the ſame with Anthropomorphiſm.

Audianiſm appears to be much earlier than Audius : many, both among the antient Jews, Heathens, and primitive Chriſtians, ſeem to be given into ſentiments much like thoſe of the Audians. Not to mention that M. le Clerc makes Moſes the patriarch or founder of Audianiſm : it is certain, the antient Sadducees, the Ebionites, Seleucus, Hermias, Melito biſhop of Sardis, Tertullian, and others, held the Deity corporeal.

A'VENUES (*Dict.*)—The Engliſh elm will do in all grounds, except ſuch as are very wet and ſhallow ; and this is preferred to all other trees, becauſe it will bear cutting, heading, or lopping in any manner, better than moſt others. The rough or ſmooth Dutch elm is approved by ſome, becauſe of its quick growth ; this is a tree that will bear removing very well; it is alſo green almoſt as ſoon as any plant whatever in ſpring, and continues ſo as long as any, and it makes an incomparable hedge, and is preferable to all other trees for lofty eſpaliers. The lime is valued for its regular growth, and fine ſhade : the horſe cheſnut is proper for all places that are not too much expoſed to rough winds. The common cheſnut will do very well in a good ſoil, and riſes to a conſiderable height, when planted ſomewhat cloſe, though, when it ſtands ſingle, it is rather inclined to ſpread than grow tall. The beech is a beautiful tree, and naturally grows well with us in its wild ſtate, but it is leſs to be choſen for Avenues than the before-mentioned, becauſe it does not bear tranſplanting well, but is very ſubject to miſcarry. Laſtly, the abele is fit for any ſoil, and is the quickeſt grower of any foreſt-tree. It ſeldom fails in tranſplanting, and ſucceeds very well in wet ſoils, in which the others are apt to fail. The oak is but little uſed for Avenues, becauſe of its ſlow growth.

The old method of planting Avenues was with regular rows of trees, and this has been always kept to till of late ; but we have now a much more magnificent way of planting Avenues : this is by ſetting the trees in clumps or platoons, making the opening much wider than before, and placing the clumps of trees at about three hundred feet diſtant from one another. In each of theſe clumps there ſhould be planted either ſeven or nine trees; but it is to be obſerved, that this is only to be practiſed where the Avenue is to be of ſome conſiderable length, for, in ſhort walks, this will not appear ſo ſightly as ſingle rows of trees. The Avenues made by clumps are fitteſt of all for parks. The trees in each clump ſhould be planted thirty feet aſunder, and a trench ſhould be thrown up round the whole clump, to prevent the deer from coming to the trees to bark them. *Miller's Gard. Dict.*

A′VERAGE, in agriculture, a term uſed by the farmers in many parts of England, for the breaking of corn fields, eddiſh, or roughings. The word ſignifies, in law, either the beaſts which tenants and vaſſals were to provide their lords on certain occaſions, or, among the merchants, the money laid out to repair loſſes by ſhipwreck. In the firſt of theſe ſenſes, the word is derived from averium, a labouring beaſt: in the ſecond, from averia, goods or chattles, from the French, avoir, to have or poſſeſs. In the laſt, or the farmer's ſenſe, it may be derived from haver, an Engliſh name for oats, or from averia, beaſts, being as much as feeding for cattle or paſturage. *Ray's Engliſh Words.*

AVE′RRHOISTS, a ſect of Peripatetic philoſophers, who appeared in Italy ſome time before the reſtoration of learning, and attacked the immortality of the ſoul.

They took their denomination from Averrhoes, a celebrated interpreter of Ariſtotle, born at Cordova in Spain, in the twelfth century, from whom they borrowed their diſtinguiſhing doctrine. The founder of this ſect, Averrhoes, is ſometimes called the commentator, by way of eminence, as being ſuppoſed to have entered beſt of all the commentators into the ſentiments of the philoſopher; inſomuch that ſome have pretended the ſoul of Ariſtotle had migrated into the body of Averrhoes.

The Averrhoiſts, who held the ſoul was mortal, according to reaſon, or philoſophy, yet pretended to ſubmit to the chriſtian theology, which declares it immortal. But the diſtinction was held ſuſpicious; and this divorce of faith from reaſon was rejected by the doctors of that time, and condemned by the laſt council of the Lateran, under Leo X, yet it was ſtill maintained covertly: Pomponatius, Cæſalpinus, and others, were ſuſpected of it. But the corpuſcular philoſophy, now introduced into Italy, ſeems almoſt to have extinguiſhed Averhoiſm.

A′VERTI, in horſemanſhip, is applied to a regular ſtep or motion enjoined in the leſſons. *Guill. Gent. Dict.*

AU′GUR *(Dict.)*— The college of Augurs was firſt inſtituted by Romulus, who was himſelf very expert in the art of ſoothſaying. Their number at firſt was but three, one out of every tribe; then Servius Tullius added a fourth, and choſe them out of the nobility. Afterwards Quintus and Cælius Agellinus obtained that five ſhould be elected out of the commonalty; the ſenate at the ſame time decreeing, that their number ſhould not exceed nine. Notwithſtanding Sylla added ſix more, the eldeſt whereof was called maſter of the college. They preceded all other orders of prieſts, and were never depoſed, nor any ſubſtituted in their places, though they ſhould be convicted of the moſt enormous crimes. When the Augur made his obſervations, he ſat upon a high tower in a clear day, holding a crooked ſtaff or lituus in his hand, clad in his ſoothſaying robe, called læna, with his face directly eaſt: thus placed, he quartered out the heavens into ſo many regions, obſerving in which region the bird appeared, and then killing his ſacrifices, and having ſaid certain prayers, called effata, he proceeded to divination. The myſtery of ſoothſaying came firſt from the Chaldeans, who taught it the Greeks among whom Amphiaraus, Mopſus, and Colchis, were very eminent: from the Greeks it paſſed to the Hetrurians, or Tuſcans, and from the Tuſcans to the Romans.

AU′GUST, called by the Romans, Sextilis, is the eighth month of the year, according to our method of computing, beginning with January. But is was the ſixth with the Romans, who, for that reaſon called it Sextilis; which name was changed to Auguſtus, from Auguſtus Cæſar, becauſe this emperor, being returned from the Gauls, in the 746th year of Rome, endeavoured to reform the calendar; on which occaſion, and, in honour of whom, Sextilis was changed to Auguſtus. Others alledge, the reaſon was, becauſe he was firſt made conſul in this month, and becauſe he gained great victories in it. The Turks have alſo taken this name from the Greek or Roman calendars, ſince they call it Agoſtos.

This month was under the protection of the goddeſs Ceres, and had the following remarkable feaſts and ſacrifices On the firſt, to Mars and Hope. 2. On account of Cæſar's ſubduing Spain. 3. To Salus on the Quirinal mount. 7. To Hope. 8. To Soli Indigeti on the Quirinal mount. 10. To Ops and Ceres. 11. To Hercules in the circus Flaminius. 12. To the Lignapeſia. 13. To Diana in the ſilva Aricina. To Vertumnus. The feaſt of ſlaves and ſervant-maids. 17. Portumnalia to Janus. 18. Conſualia. The rape of the Sabine virgins. 19. The laſt Vinalia. The death of Auguſtus. 20. Vinalia Ruſtica, the grand myſteries. 23. The Vulcanalia in the circus Flaminius. 24. The Feriæ of the moon. 25. Opibonſivæ, in the capitol. 27. Volturnalia. 28. To Victory in the court. 29. The ornaments of the goddeſs Ceres are ſhewn. About the twenty-firſt of this month the ſun enters the ſign Virgo.

AUGUST, is repreſented in painting, by a naked man, with his hair diſhevelled and drinking out of a cup. Before him is a kind of fan, which ſeems to be made of a peacock's tail. Upon the ground are three large melons. *Danet, Roſini, and Mounfaucon's Antiquities.*

AUGUSTE′UM *Marmor*, in the natural hiſtory of the antients, a name given to the common green and white marble, ſo frequent in uſe with us for tables, &c. and called by our artificers Egyptian marble. The Romans, however, made a diſtinction between the differences of this marble, in regard to the diſpoſitions of its veins; for thoſe pieces of it which had the white matter diſpoſed into a ſort of arches, were called the Auguſtan marble, while thoſe which had the white in a more diffuſed and regular form, were called the Tiberian marble. But theſe are too ſlight diſtinctions; for the ſame block of marble, nay, ſometimes the compaſs of the ſame table, affords us both the Auguſtan and Tiberian kind. *Hill's Hiſtory of Foſſils.*

A′VIS, a military order in Portugal, inſtituted by Alphonſus I, after he had won the city of Evora from the Moors, called the fraternity of St. Mary of Evora: it was confirmed by Innocent IV. in 1234. They wore a black Ciſtercian habit, and bare for their arms a croſs flower-de-lis in a field, Or, having for their creſt, two birds ſable. *Vaſconcellos, Le Mire, Orig. Ordin. Equeſt.*

AU′RA, in chemiſtry, a certain fine and pure ſpirit, found in every animal or vegetable body; but ſo ſubtile, as only to be ſuſceptible by its ſmell and taſte, or other effects, not found in any other but that body. This Aura exhibits the proper characters of the body, by which it is accurately diſtinguiſhed from all others; but is itſelf too fine and thin to be ſeen by the eyes, though armed with a microſcope; or felt by the hands; and, withal, is extremely volatile; ſo that, when pure and ſingle, it flies off by its great mobility, mixes with the air, and is received into the great chaos of all volatiles, and there, ſtill retaining its ſame nature, it floats till it falls down in ſnow, hail, rain, or dew, when it again enters the boſom of the earth, impregnates it with its prolific virtue, and is at length received by other juices of the earth, and conveyed into the bodies of animals and vegetables, and, by this revolution, paſſes into new bodies, whoſe maſs it animates and directs. This ſubtile fluid is lodged in the oil of the body, to prevent its being diſſipated and thrown off, and hence it is, that all the antient alchymiſts ſay ſpirit reſides in ſulphur. *Boerh. Chem.*

AURI′CULA *Urſi*, *bear's ears*, or, as they are vulgarly called, Auriculas, in botany, a diſtinct genus of plants, the characters of which are theſe: the flower is funnel-ſhaped, conſiſting of one leaf, divided into ſeveral ſegments at the rim. The piſtil ariſes from the cup, and is fixed in the manner of a nail to the hinder part of the flower. It afterwards ripens into a roundiſh fruit, partly covered by the calx, and, opening at the top, is ſeen to be full of ſmall ſeeds, fixed to a placenta.

Tournefort has enumerated twenty-ſeven ſpecies of Auricula urſi.

The varieties, raiſed by ſeeds from theſe ſpecies, are endleſs, and are one of the greateſt ornaments of the Dutch and Engliſh gardens.

The ſeveral ſpecies of Auricula, when not in flower, are known by their thick hoary leaves, which are uſually terminated by a point.

Though this herb is ſeldom kept in the ſhops, it nevertheleſs ſtands recommended as a vulnerary, and as ſuch is found of ſervice, both for internal and external purpoſes. Mixed with ointments and plaiſters, it is reckoned good in ruptures. Four or ſix ſpoonfuls of the water, in which it has been boiled, taken every morning, are ſaid to cure coughs and ulcers of the lungs. The juice of its flowers removes ſpots of the face, and beautifies the ſkin; and with the ſame intention ſome diſtil a water from it.

AURO′RA *(Dict.)*—The poets and painters have perſonified Aurora. Homer deſcribes her as a young virgin having her hair diſhevelled, and hanging looſe about her ſhoulders; being of the colour of the pureſt gold, ſitting in a golden chair, with all her veſtments of that hue and colour.

Virgil deſcribes her, as coming, at the very inſtant of ſable night's departure, with one of her hands full of roſes, gilliflowers, and lilies, taken out of a baſket which ſhe carries in her other hand, beſprinkling them on the marble pavement of the lower heaven, adorning the ſun with unſpeakable beauty.

She is alſo repreſented as a young virgin with carnation wings, and a yellow mantle, in her forehead a ſtar, and golden ſunbeams from the crown of her head, riding upon Pegaſus; with a phial of dew in one hand, and various flowers in the other, which ſhe ſcatters upon the earth.

She is alſo deſcribed, holding in one hand a flaming torch, and drawn in a gorgeous chariot, beſpangled with ſtars, by winged Pegaſus; which favour ſhe is feigned to have obtained from Jupiter, by many importunate requeſts, preſently after the downfal of Bellerophon.

She is fabled to be the herald and meſſenger of Phœbus, and as receiving her being from the virtue of his beams; and is no other than that rubicund and vermilion bluſh of the heavens, which the ſun's firſt appearance works in the orient, and from thence deſcending beautifies our hemiſphere, with ſuch reſplendency.

She is alſo painted in a purple robe, and a blue mantle fringed with ſilver.

Aurora *Borealis.*— Under this article in the Dictionary, we have mentioned ſeveral hypotheſes to account for this phænomenon; we ſhall here give another, publiſhed by an anonymous author in the Univerſal Magazine.

Suppoſe the earth a great magnet,—that magnetic effluvia are conſtantly iſſuing great quantities from its north pole, and that theſe move from the north to the ſouthward, in the direction of what is called the magnetic meridian—that theſe effluvia are of a martial or ferrugineous nature, nothing being magnetical but a ſubſtance of that kind, and vice verſa.

Iron and ſulphur, even in their groſs bodies, mixed with a little water, are exceeding apt to take fire, much more ſo, when highly ſubtilized and attenuated.—The hot mineral waters, probably, ariſe from this, and ſo may volcano's—all chymiſts know with what eagerneſs ſulphur acts upon iron.

Several burning mountains or volcano's have been diſcovered of late years, in and about the north-polar regions, which caſt up ſulphureous vapours, to an immenſe height.—There are ſprings near them the hotteſt in the world, their heat even equalling that of boiling water.—May not thoſe ſulphureous vapours, blended with the magnetic or ferrugineous effluvia, catch fire and fulgurate?—The vapour or fume of iron diſſolved in ſpirit of vitriol is moſt readily ſet on fire.—May not the magnetic effluvia give them a kind of magnetic direction? We ſee, in fact, the lucid columns, or radiating flaſhes, of the Aurora borealis, almoſt always ſhot off from the north to the ſouth, correſpondent, in a great meaſure, to the magnetic meridian.—And I have conſtantly obſerved the corona, concourſe, or concentration, if I may ſo call it, of theſe lucid rays near the zenith, ſo much to the eaſt of it, as anſwered nearly to the weſtern declination of the common magnetic needle; that is, a ſtraight line, drawn from one to the other, would be nearly in the direction of the magnetic meridian.—I think I never obſerved the corona to the weſtward of it.—What ſeems not a little to confirm this notion is, that, during the appearance of a conſiderably great and vivid northern light, the magnetic needle ſuffers very great agitations; cauſed, probably, by the colluctation and exploſion of the ſulphureous and magnetic effluvia: this is more particularly obſerved in Sweden, and the northern parts of Europe, as being near the ſource of theſe effluvia.

But, farther, as we ſcarce ever ſee an Aurora borealis, but when the wind blows from ſome point, or other, between the eaſt and weſt of the northern ſemi-circle, this, alſo, may help to drive the ſulphureous, coruſcating vapours ſouthward.—And when the wind is very ſtrong from E. N. E. or W. N. W. it may not a little alter their magnetic direction or current. I have ſeveral times obſerved, when a ſtrong north-eaſterly wind hath blown ſome faint appearances of a northern light here and there, abundance of ſmall, lucid, coruſcating nubeculæ ſcattered up and down the hemiſphere, now ſuddenly appearing, then diſappearing; ſo that I imagined the wind had diſperſed the fund of the luminous vapours; for we ſee ſuch lucid, vibrating, broken, ſmall clouds after the grand exploſion, and at the end of a common Aurora borealis. Nay, frequently, ſuch ſmall, bright, flaſhing clouds are ſeen up and down the heavens, without any other appearance of an Aurora borealis, the lucid vapours being then but in ſmall quantities, and much ſcattered: but it is remarkable, that theſe little, flitting, luminous clouds ſeemed always in a vibrating, tremulous motion, and moving very faſt from north to ſouth, though ſometimes there was little or no wind. Theſe nubeculæ were ſo extremely thin, that even ſtars of the third or fourth magnitude were ſeen through them.

Thoſe northern lights are ſeen vaſtly more frequent, more bright, more beautiful, and variouſly coloured, in the northern parts of Europe, than here; and here much more lucid, large, and fragrant, than to the ſouthward; becauſe, in the polar regions, the magnetic effluvia are vaſtly more ſtrong and copious, and the neighbouring volcano's ſend up immenſe quantities of ſulphureous vapours (which cannot but riſe very high in ſuch a denſe, cold atmoſphere) and theſe, as it were, fermenting with one another, catch fire. In Sicily, and the ſurrounding ſeas, they ſee luminous appearances, very near reſembling thoſe of the Aurora borealis, when Veſuvius or Ætna burn; and theſe rays are commonly of various colours, as thoſe of the northern lights, viz. red, yellow, greeniſh, crimſon, &c. Poſſibly both the one and the other are tinged by ſome mineral ſubſtances from the volcano's. For, though globules of rain may reflect light of different colours, there ſeems to be nothing in the matter of an Aurora borealis that is apt to do it: beſides, it is unqueſtionable that the Aurora borealis ſhines by its own light, and not from the ſun, as well as the lights of Veſuvius. We well know that different minerals will tinge flame of different colours. May not then the diverſity of colours of an Aurora borealis be another argument that it ariſes from the exhalations of volcano's?

The ſulphureous vapours of vulcano's are ſhot up to an inconceivable height (ſometimes even great ſtones are thrown up from them to four or five hundred feet, and the aſhes vaſtly higher, ſo as oftentimes to be carried by the wind, fifty or an hundred miles, nay, leagues) ſo high, indeed, that they may retain very little gravity, their centripetal force continually decreaſing, as their diſtance from the earth increaſes—and their centripetal force will be much increaſed by their revolving about the axis of the earth, in a very large circle.—But, farther, ſulphureous vapours have a kind of a vis centrifuga, and will riſe in vacuo, whereas all other vapours ſink. It is certain, the fumes of gun-powder will riſe to the top of a tall exhauſted receiver, and even prove lucid, though the gun-powder itſelf doth not flaſh. Thus, the vapours over Veſuvius are ſometimes very lucid, though the crater may not, at that time, actually belch out flame.

We know ſulphureous vapours are ſometimes carried to an aſtoniſhing height, and collected into vaſt bodies of inflammable matter, far above the groſs terreſtrial atmoſphere.—The great Dr. Halley, from very juſt obſervation, eſtimated the meteor of the 19th of March, 1718-19 (which caſt ſuch an amazing brightneſs, and made ſuch a very loud diſploſion) to be very near ſeventy miles perpendicular altitude, above the ſurface of the earth; whence it was ſeen over a great part of Europe, at one and the ſame time. Now if ſuch a groſs body of ſulphureous vapours, as this, could be ſuſtained at the very top of our atmoſphere, or even in the æther above it, how much higher may we ſuppoſe the mere ſubtile vapour of the lumen boreale to be carried?—This will account for the great height and diſtance ſome of the northern lights are ſeen at, without having recourſe to monſieur Mairan's zodiacal light, or profeſſor Euler's impulſion of the ſun-beams.

It is poſſible theſe vapours, when carried to ſuch a vaſt height, and in a medium ſo exceeding rare, may actually become lucid, eſpecially when mixed with the ætherial nitre, as the fumes of gun-powder mount and ſhine in vacuo. Indeed, this phænomenon of the gun-powder ſuggeſts to me, that a highly ſubtilized aerial nitre always enters the compoſition of an Aurora borealis (for it is every-where diffuſed throughout the whole atmoſphere) and nothing is more like the vivid pearl-coloured flaſhes of an Aurora, than a deflagration of nitre and ſulphur; and the flame may be tinged with red, green, yellow, &c. by the addition of different minerals. Certainly, nitre, ſulphur, and iron are greatly diſpoſed to inflame and coruſcate. The Arctic regions abound with nitre.—The northern lights are vaſtly moſt frequent in cold ſeaſons, when the atmoſphere is greatly ſtocked with nitre.—It is ſcarce to be doubted, but that common lightning abounds with all theſe principles.

Hence may ariſe another conjecture, that, as lightning is certainly of an electrical nature, ſo poſſibly may be the matter of an Aurora borealis.—The incredible ſwiftneſs of its flaſhes, and the inſtantaneous propagation of its coruſcations through all the northern part of the hemiſphere, ſeem to favour ſuch a thought. May the luminoſity be conveyed on the magnetic effluvia, as the electric on an iron wire? But this is, I fear, indulging too far in whimſy.

The accounts we have had from Iceland, Greenland, and other places within the Arctic circle, by the whale-fiſhers, and ſome others, that have been given by the jeſuits, &c. who travelled to the north-eaſt parts of China and Tartary, aſſure us, that there are ſeveral volcano's in theſe parts, ſome of which have broken out within theſe few years. Is it not then the freſh erruptions of ſome of theſe volcano's, that have produced the northern lights, ſo common of late years? Before this preſent century began, it is certain, they did not appear even in Sweden, Norway, and Lapland, or, at leaſt, very ſeldom; whereas monſieur Maupertuis ſays, they are now almoſt conſtant in theſe countries, during the winter months. Is it not then the more frequent and violent eruptions of theſe volcano's, that make the Aurora borealis more common and more illuſtrious? And is it not the ceſſation of theſe eruptions, that puts a ſtop to theſe luminous phænomena, as we know they ceaſe for weeks, for months, for years; and that too, when all other circumſtances ſeem to favour their productions? They appear vaſtly more frequent and great, in the moſt northern countries, as they lie near the ſource of the magnetic effluvia and ſulphureous vapours. Doth not an appearance of a kind of theſe nocturnal lights and coruſcations in Sicily, &c. on the eruption of Veſuvius, and ſometimes merely from the ſulphureous exhalations iſſuing from it, without actual flames, ſeem to confirm this opinion? Moreover, it is not altogether improbable, that ſulphureous exhalations from more ſouthern volcano's, ſwimming on the top of the atmoſphere, and revolving, with the earth, round its axis, may be carried towards the pole, and contribute ſomewhat to the formation of an Aurora borealis?

Mr. de Maupertuis, in the relation of his voyage to the north, deſcribes the Auroræ boreales, which appear in Lapland, during the winter, in this manner: ‘ If the earth, ſays he, makes a diſmal appearance in theſe climates, the heavens exhibit a moſt delightful proſpect. As ſoon as the nights begin to grow dark, lights of a thouſand colours and a thouſand forms beſpangle the ſky, as if they were ambitious of compenſating the earth for the abſence of the ſun. Theſe lights have no certain ſituation as in the ſouthern countries; for, though we often ſee a luminous arch fixed towards the north, yet they ſeem indifferently to poſſeſs every region of the ſky. They begin ſometimes with forming a kind of mantle, of clear and moveable light, the extremities of which terminate the horizon, and which rapidly overſpread the whole ſky with a motion, reſembling that of a fiſherman's net, preſerving a ſenſible perpendicular direction towards the meridian. After theſe preludes, all lights generally unite near the zenith, and form a kind of corona.

Sometimes ſtreams of light like thoſe we ſee in France, towards the north, are ſeen towards the ſouth; ſometimes they are ſeen in the north and ſouth both together; their ſummits meet, as their extremities ſeparate, in deſcending towards the horizon. I have ſeen ſome quite of another direction, whoſe ſummits touched each other almoſt to the zenith; ſome have, beſides, ſeveral concentric arches. Their ſummits all point towards the meridian, but with ſome declination towards the weſt, but that varies and is at ſometimes inſenſible; ſome of theſe arches, after having extended to their largeſt amplitude above the horizon, open, and form the half of a large ellipſis. There would be no end of enumerating all the forms theſe lights aſſume, and the motions in which they are directed; they ſometimes emit ſtreaks of ſcarlet.

Mr. de Maupertuis tells us, that, notwithſtanding his being accuſtomed to theſe phænomena, one he ſaw at Oſwer Tornea, on the 18th of December, 1736, drew his admiration; towards the ſouth a large tract of the heavens appeared tinged with as lively a red, as if the whole conſtellation of Orion had been dipped in blood. This light, which was at firſt fixed, afterwards began to move, put on different colours and formed a dome, whoſe ſummit was a little inclined towards the ſouth-weſt of the zenith, and that the brighteſt moon-light did not obſcure this phænomenon. Mr. de Maupertuis obſerves, that red lights are uncommon in that country, and that the people look on them as ominous. The ſame learned perſon has given a very elegant ſolution of a geometrical problem relating to the Aurora borealis, in the Mem. Academ. 1733.

Mr. Monnier, in his Aſtronomical Inſtitutions, obſerves, as well as M. de Maupertuis, that in Sweden there is ſcarce a winter-night, wherein theſe Auroræ boreales are not viſible, even in every region of the hemiſphere; a circumſtance which ought particularly to be attended to, for the better explanation of theſe phænomena. M. Monnier thinks the matter of the Auroræ boreales analogous to that of the tails of the comets.

AU'RUM *muſivum*, the antient name of what has been ſince called Aurum moſaicum. This old name is brought into uſe again in the London Diſpenſatory; the preparation directed to be made in the following manner: take tin one pound, flour of brimſtone ſeven ounces, ſal armoniac and purified quickſilver, of each half a pound; melt the tin, and add to it the quickſilver; and, when this is cold, reduce it to powder, and mix it with the other ingredients: then ſublime the compound in a matraſs, and the Aurum muſivum will be found under the part ſublimed, with a ſmall quantity of foulneſs at the bottom. *Pemberton's Lond. Diſp.*

AURUM *ſophiſticum*, mimic gold, a chymical preparation, made as follows: take fine diſtilled verdigreaſe, eighteen ounces; crude Alexandrian tutty, four ounces; borax, twelve ounces; ſalt-petre, one ounce and an half; pulverize, and mix them all together, tempering them with oil, to the conſiſtence of a plaiſter; then put a German crucible into a wind furnace, heat it red-hot, and, putting your maſs into it, let it be covered, and the furnace filled with coals over the crucible. When the maſs is melted, let it cool of itſelf, then break the crucible, and you will find, at the bottom, a fine regulus, like gold, weighing about four ounces; which, being malleable, may be wrought into any form.

AUX, in aſtronomy, that point in a planet's path, or orbit, wherein it is at its greateſt diſtance from the center of the world.

Hence the ancients, who conſidered the earth as the center, uſe Aux in the ſame ſenſe with apogee. Among the moderns, on the contrary, it denotes the aphelion.

Some alſo uſe Aux to denote the arch of the ecliptic, intercepted between the firſt point of Aries, and the point wherein the ſun, or a planet, is at its greateſt diſtance from the earth.

AWA'RD *(Dict.)*—

1. The arbitrators ought to give their Award within the time limited by the compromiſe, and it will be null, if it were given after the ſaid time is expired; for their power is then at an end, and they are no longer arbitrators.

2. The parties may give power to the arbitrators to prolong the time; and, in this caſe, their power laſts during the time of their prorogation.

4. If the compromiſe regulates a certain time for inſtructing the cauſe which the arbitrators are to decide, they cannot give their Award till the ſaid time is expired.

4. The arbitrators having once given their Award, they cannot retract it, nor change any thing in it; for the compromiſe was only to give them power to give an Award; and, when that is done, their power is at an end; but their power is not at an end by an interlocutory ſentence, or an incident in the cauſe; and they may give different interlocutory ſentences, on ſuch incidents, as often as occaſion requires.

5. If there are ſeveral arbitrators named by the compromiſe, they cannot give their Award, unleſs they all ſee the proceſs, and give judgment of it together; and, although the greater part had given the Award in the abſence of one who was named with the others, yet the Award would be null, becauſe the abſent perſon ought to have been one of the judges; and, had he been preſent, he might have been able, by his reaſoning, to bring the other arbitrators over to his opinion.

6. The arbitrators can judge of nothing elſe, beſides that which is ſubmitted to their judgment by the compromiſe; and they muſt obſerve the conditions which are there preſcribed; and, if they judge otherwiſe, their Award is null.

Where there appears a maniſeſt error in the body of an Award, in ſome caſes there may be relief againſt it in equity; but, where the error does not appear without unravelling of it, and examining into matters of account, not relievable. 1 *Vern.* 158.

A'ZAB, in the military orders of the Turks, ſignifies a particular body of the ſoldiery taken in, or added firſt to the janizaries, but now become a ſeparate body from them.

The word, in the oriental languages, ſignified an unmarried perſon; and the original order of thoſe was, that they ſhould be ſingle men.

AZE'LFOGE, in aſtronomy, a fixed ſtar of the ſecond magnitude, in the Swan's tail.

Hevelius aſſigns its longitude, for the year 1700, ♓ 1°. 16′. 45″. and its latitude northward, 59°. 57′. 53″.

A'ZIMUTH *Compaſs*.—Under the article *Magnetical* NEEDLE, in the Dictionary, we have given a deſcription of a new ſea-compaſs, which is the invention of the learned Dr. Knight; we ſhall here add the contrivance of the ingenious Mr. Smeaton whereby the Doctor's compaſs anſwers the purpoſes of an Azimuth and amplitude compaſs.

The cover of the wooden box being taken off, the compaſs is in a condition to be made uſe of in the bittacle, when the weather is moderate: but if the ſea runs high, as the inner box is hung very free upon its centers (the better to anſwer its other purpoſes) it will be neceſſary to ſlacken the milled nut, placed upon one of the axes that ſupports the ring, and to lighten the nut on the outſide, that correſponds to it. By this means, the inner box and ring will be lifted up from the edges, upon which they reſt, when free; and the friction will be increaſed, and that to any degree neceſſary, to prevent the too great vibrations, which otherwiſe would be occaſioned by the motion of the ſhip.

To make the compaſs uſeful in taking the magnetic Azimuth, or amplitude of the ſun and ſtars, as alſo the bearings of head-lands, ſhips, and other objects at a diſtance, the braſs edge, deſigned at firſt to ſupport the card, and throw the weight thereof as near the circumference as poſſible, is itſelf divided into degrees and halves; which may be eaſily eſtimated into ſmaller parts, if neceſſary. The diviſions are determined by means of a cat-gut line, ſtretched perpendicularly with the box, as near the braſs edge as may be, that the parallax, ariſing from a different poſition of the obſerver, may be as little as poſſible.

Underneath the card are two ſmall weights, ſliding on two wires, placed at right angles to each other; which, being moved nearer to, or farther from, the center, counterballance the dipping of the card in different latitudes, or reſtore the equilibrium of it, where it happens by any other means to be got too much out of level.

There is alſo added an index at the top of the inner box, which may be put on, and taken off, at pleaſure; and ſerves for all altitudes of the object. It conſiſts of a bar, equal in length to the diameter of the inner box, each end being furniſhed with a perpendicular ſtile, with a ſlit parallel to the ſides thereof: one of the ſlits is narrow, to which the eye is applied, and the other is wider, with a ſmall cat-gut ſtretched up the middle of it, and from thence continued horizontally from the top of one ſtile to the top of the other. There is alſo a line drawn along the upper ſurface of the bar. Theſe four, viz. the narrow ſlit, the horizontal cat-gut thread, the perpendicular one, and the line on the bar, are in the ſame plane, which diſpoſes itſelf perpendicular to the horizon, when the inner box is at reſt, and hangs free. This index does not move round, but is always placed on, ſo as to anſwer the ſame ſide of the box.

When the ſun's Azimuth is deſired, and his rays are ſtrong enough to caſt a ſhadow, turn about the wooden box, till the ſhadow of the horizontal thread, or (if the ſun be too low) till that of the perpendicular thread, in one ſtile, or the light through the ſlit in the other, falls upon the line in the index bar, or vibrates to an equal diſtance on each ſide of it, gently touching the box, if it vibrates too far: obſerve, at the ſame time, the degree marked upon the braſs edge by the cat-cut line. In counting the degree for the Azimuth, or any other angle that is reckoned from the meridian, make uſe of the outward circle of figures upon the braſs edge; and the ſituation of the index bar, with regard to the card and needle, will always direct upon what quarter of the compaſs the object is placed.

But, if the ſun does not ſhine out ſufficiently ſtrong, place the eye behind the narrow ſlit in one of the ſtiles, and turn the wooden box about, till ſome part of the horizontal, or perpendicular thread, appears to interſect the center of the ſun, or vibrate to an equal diſtance on each ſide of it, uſing ſmoked glaſs next the eye, if the ſun's light is too ſtrong. In this method, another obſerver will be generally neceſſary, to note the degree cut by the nonius, at the ſame time the firſt gives notice that the thread appears to ſplit the object.

From what has been ſaid, the other obſervations will be eaſily performed; only, in caſe of the ſun's amplitude, take care to number the degree by the help of the inner circle of figures on the card, which are the complements of the outer to 90, and, conſequently, ſhew the diſtance from eaſt or weſt.

The Azimuth of the ſtars may alſo be obſerved by night; a proper light ſerving equally for one obſerver to ſee the thread, and the other the degree upon the card.

It may not be amiſs to remark farther, that, in caſe the inner box ſhould loſe its equilibrium, and, conſequently, the index be out of the plane of a vertical circle, an accurate obſervation may ſtill be made, provided the ſun's ſhadow is diſtinct; for, by obſerving firſt with one end of the index towards the ſun, and then the other, a mean of the two obſervations will be the truth.

Plate IV. *fig.* 33. is a perſpective view of the compaſs, when in order for obſervation; the point of view being the center of the card, and the diſtance of the eye two feet.

A B is the wooden box.

C and D are two milled nuts; by means whereof, the axis of the inner box and ring are taken from their edges, on which they move; and the friction increaſed, when neceſſary.

E F is the ring that ſupports the inner box.

G H is the inner box; and

I is one of its axes, by which it is ſuſpended on the ring EF.

K L is the magnet or needle; and

M a ſmall brace of ivory, that confines the cap to its place.

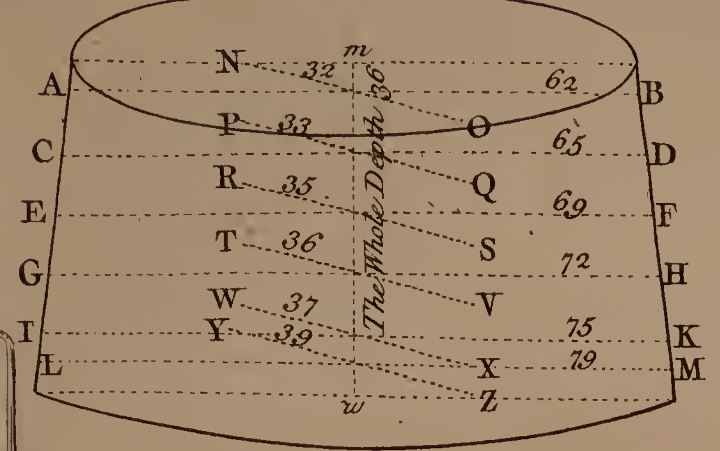
The card is a ſingle varniſhed paper, reaching as far as the outer circle of figures, which is a circle of thin braſs; the edge whereof is turned down at right angles to the plane of the card, to make it more ſtiff.

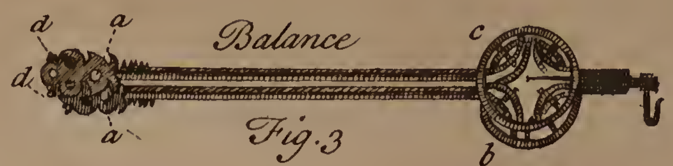
O is a cat-gut line, drawn down the inſide of the box, for determining the degree upon the braſs edge.

P Q R S is the index bar, with its two ſtiles and cat-gut threads; which, being taken off from the top of the box, is placed in two pieces, T and V, notched properly to receive it.

W is a place cut out in the wood, ſerving as an handle.

Fig. 1 Bac





Balance Fig. 3

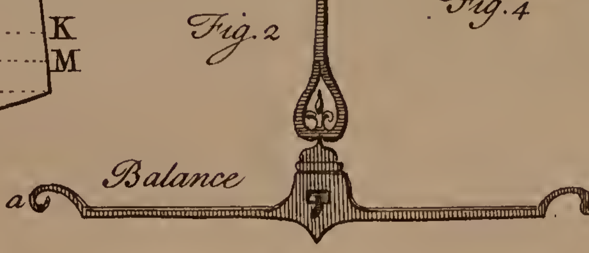


Fig. 2 Balance

Fig. 4

Fig. 5 Balance

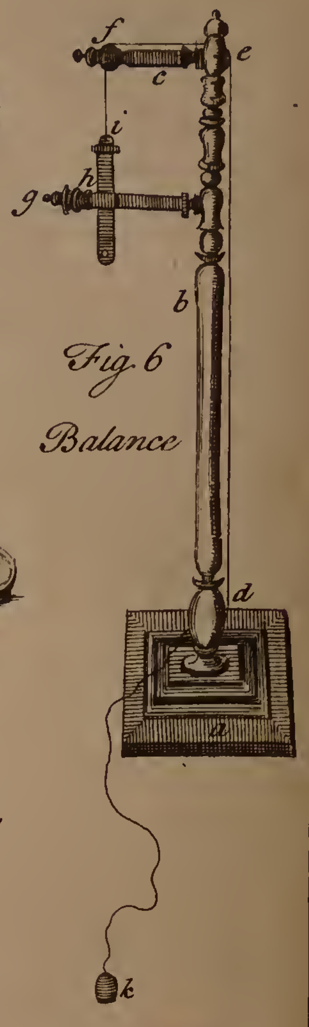
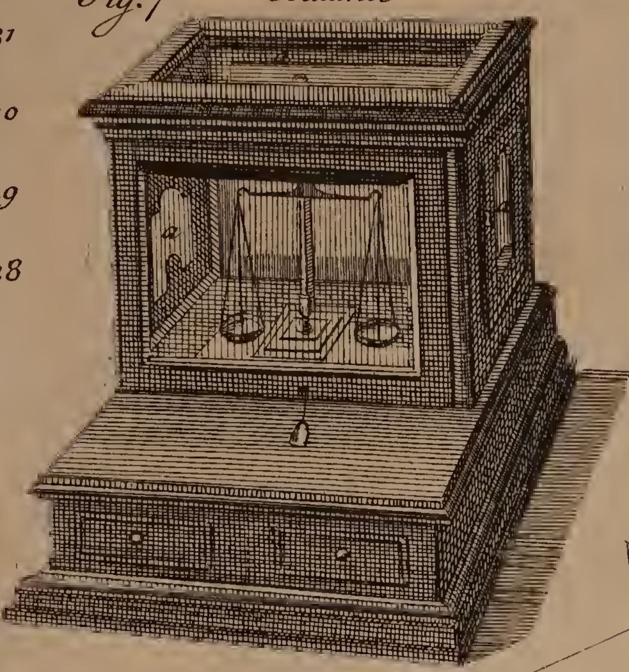


Fig. 6 Balance

Fig. 7 Balance



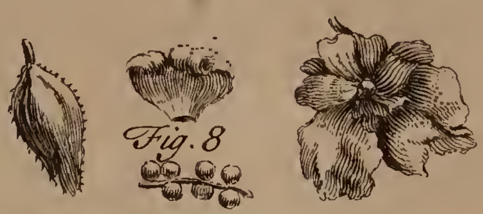


Fig. 8 Balsamina

Barry pily

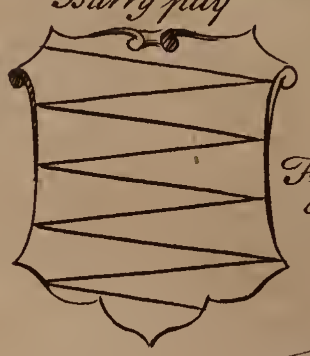


Fig. 11

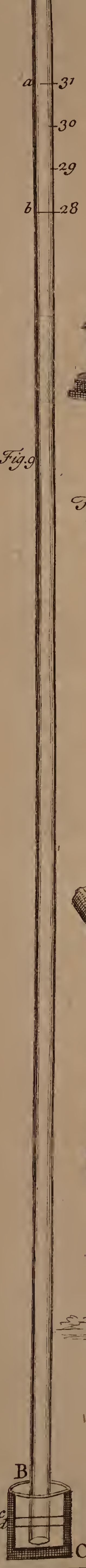
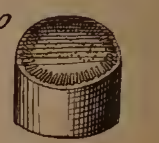


Fig. 9

Fig. 10



Burdock

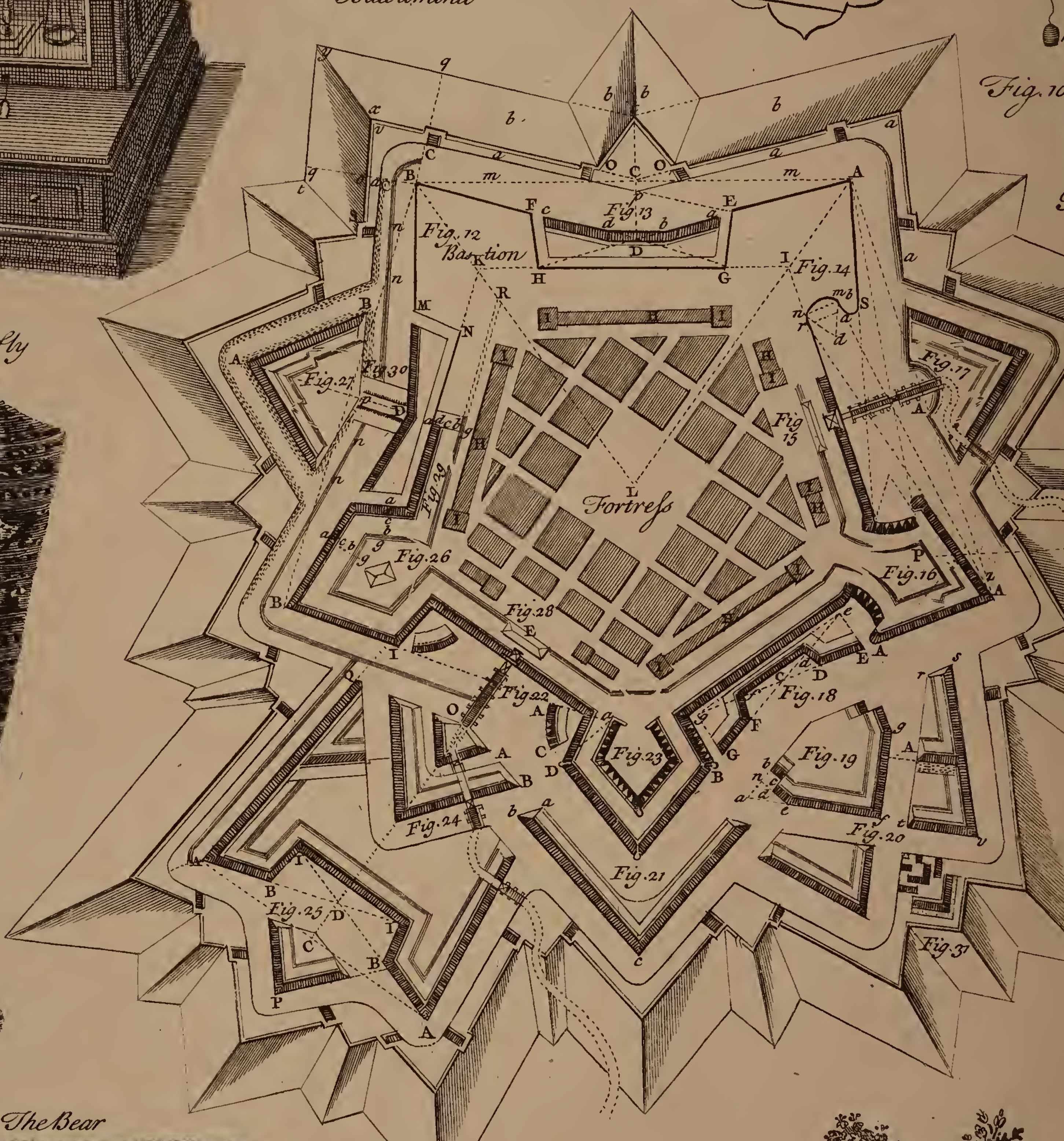


Fig. 12 Bastion Fig. 13 Fig. 14 Fig. 15 Fig. 16 Fig. 17 Fig. 18 Fig. 19 Fig. 20 Fig. 21 Fig. 22 Fig. 23 Fig. 24 Fig. 25 Fig. 26 Fig. 27 Fig. 28 Fig. 29 Fig. 30 Fig. 31

The Butterfly

Fig. 32

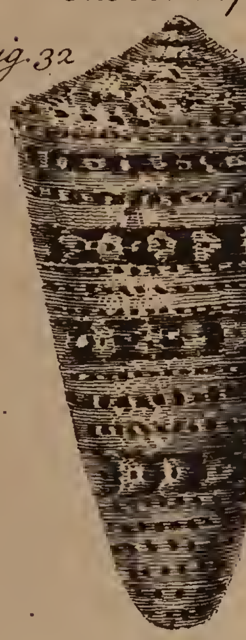
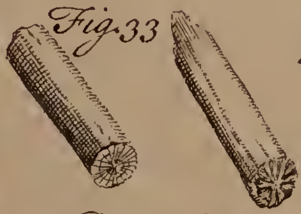


Fig. 33



Belemnitæ

Fig. 34 The Bear

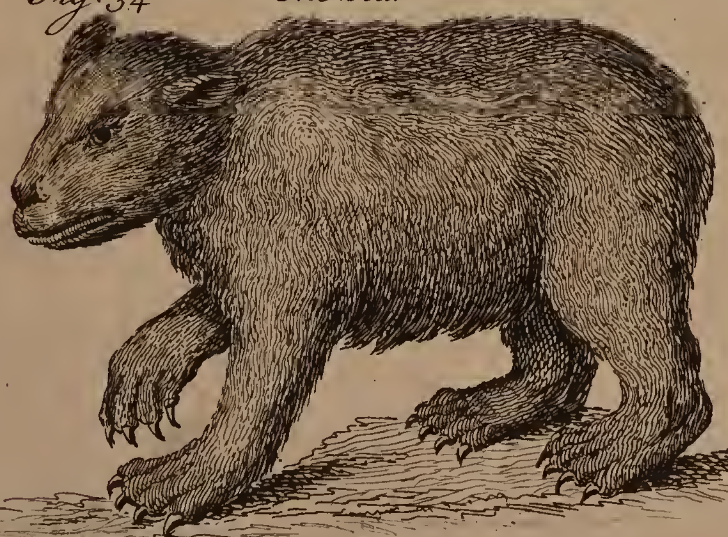
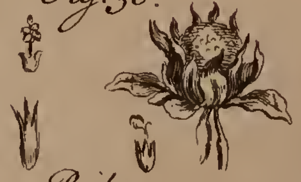


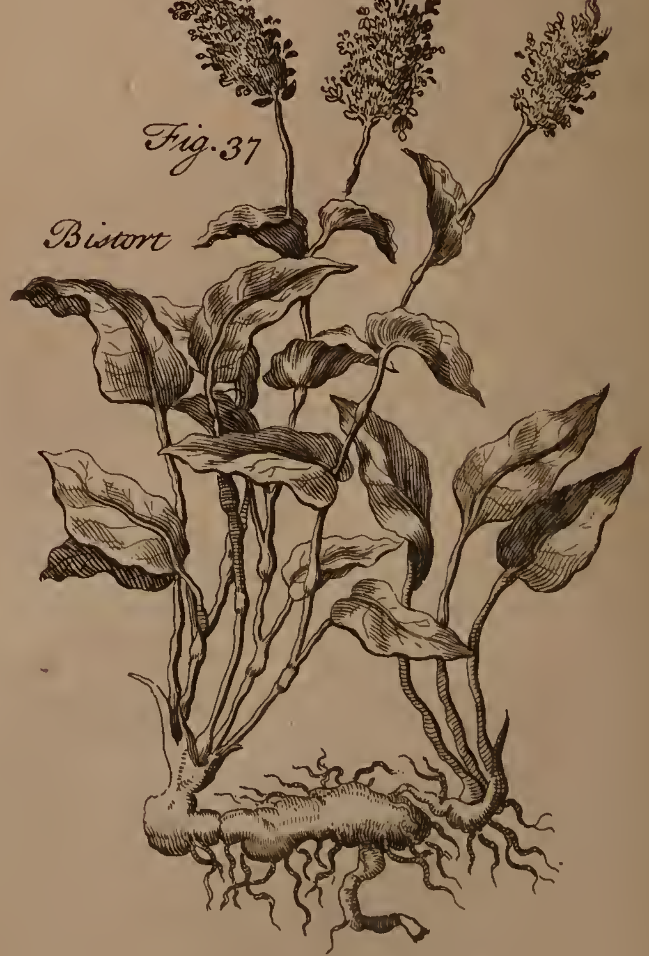
Fig. 36.



Bidens

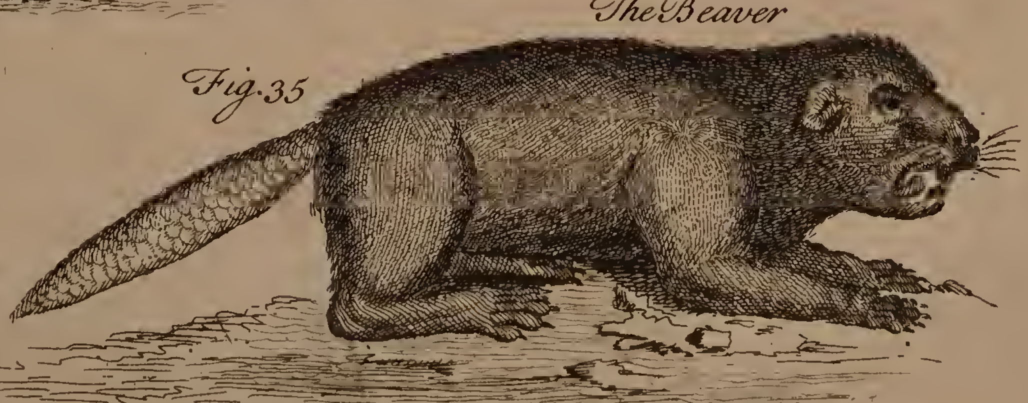
Fig. 37

Bistort



The Beaver

Fig. 35



Printed for J. Hinton in Newgate Street.

B.

B Is one of thoſe letters which the eaſtern grammarians call labial, becauſe the principal organs, employed in its pronunciation, are the lips. It has a near affinity with the other labials P and V, and is often uſed for P, both by the Armenians and other orientals; as in Betrus for Petrus, apſens for abſens, &c. and by the Romans for V; as in amabit for amavit, berna for verna, &c. whence aroſe that jeſt of Aurelian, on the emperor Bonoſs, Non ut vivat natus eſt, ſed ut bibat.

B, in muſic, *b* is uſed to denote a flat, or the lowering of a ſound by a ſemi-tone minor. Thus A *b*, or *b* A, is the flat of A, or the ſemi-tone minor below A.

B *b*, quadro, or ♮, in the ſcale of muſical notes, ſignifies the ſound which is a tone above A, and a ſemi-tone below C.

BAA'L, or Bel, an Hebrew and Chaldaic word, which ſignifies lord, or mighty. It was the name of the idol of the Moabites and Phœnicians, and of moſt of the nations that bordered upon the Jews. It ſeems that the idolaters, amongſt them, pretended to adore the true God, under the name and figure of Baalim, Hoſ. ii. 16, 17. The Grecians, who were accuſtomed to take the eaſtern divinities for their own, called this Bel ſometimes Jupiter, ſometimes Mars; but the truth is, that the Babylonians underſtood by it either the ſtars and hoſt of heaven, or ſuch kings and heroes, whoſe memory they had conſecrated to poſterity, by a religious worſhip. The Phœnicians adored the ſun, under the names of Baal and Moloch. It is thought, this idol was the firſt invented by ſuperſtition, and the original worſhip of idolatry. *Selden de Diis Syris.*

BAALGA'D, Bagad, or Begad, an idol of the Syrians, which they accounted the goddeſs of fortune. *Kercher.*

BAA'RAS, Baharas, or Bacharas, a miraculous kind of root, ſaid to grow on Mount Lebanon, in a valley called Baaras, whence the name, near the city Macheron.

Joſephus repreſents it as of a flame colour, and emitting rays of light in the night-time, like a ſtar, but diſappearing in the day; on which footing, it ſhould make a vegetable phoſphorus. This property it may be ſuppoſed to derive from the ſoil, which abounds in bitumen; not unlike the plains of Puzzuoli; which, being replete with ſulphur, will flaſh under the horſes feet. But what the hiſtorian adds, concerning the difficulty and danger of pulling up this root, its ſhunning the hand, and retiring under-ground, with the extraordinary means uſed to ſtop it, and the expedient to pull it up, are ſo much on the marvellous, that we dare not relate them. The root, it ſeems, was highly prized for its virtue in curing epilepſies, &c.

BABYLO'NICS, *Babylonica*, in literary hiſtory, a fragment of the antient hiſtory of the world, ending at 267 years before Chriſt; and compoſed by Beroſus, or Beroſſus, a prieſt of Babylon, about the time of Alexander.

Babylonics are ſometimes alſo cited in ancient writers, by the title of Chaldaics.

The Babylonics conſiſted of three books, including the hiſtory of the ancient Babylonians, Medes, &c. but only a few imperfect extracts are now remaining of the work, preſerved chiefly by Joſephus and Syncellus, where all the paſſages of citations of ancient authors, out of Beroſus, are collected with great exactneſs. Annius of Viterbo kindly offered his aſſiſtance to ſupply the loſs, and forged a complete Beroſus out of his own head. The world has not thanked him for his impoſture. *Fabric. Bibl. Græc.*

BAC, or Back, in brewing, a large flat kind of tub, or veſſel, wherein the wort is put to ſtand and cool before boiling. *Savar. Dict. de Com.*

The ingredients of beer paſs through three kinds of veſſels. They are maſhed in one, worked in another, and cooled in a third, called Bacs or coolers.

To guage a brewer's Bac.—Moſt Bacs have their ſides ſtraight; and, in caſe the ſides be not ſtraight, but make either an obtuſe, or acute angle, with the bottom, you muſt then be careful to take the true length and breadth in the middle of every inch in depth; from whence the area may be found upon every tenth.

For finding the area of the Bac, obſerve this rule: multiply the length by the breadth, and divide by 282: this gives the contents in ale gallons.

To find the true dip of a Bac.—Becauſe Bacs are not placed level, but ſloping, for conveniency of drawing off the wort; therefore, if you ſhould dip in too deep a place, you would wrong the ſubject, and, if in too ſhallow a place, you would wrong the king; to remedy which, take as many dips as you think convenient, and add them all together, and divide them by the number of dips, which will give a mean depth: when this is done, you muſt make trial in many places of the Bac, till you find a dip that anſwers your mean depth exactly; right againſt which, at the ſide of the Bac, make a mark, or notch, with a knife, and let that be your conſtant true dipping-place.

The bottoms of common brewers large Bacs generally warp, after they have been a little time uſed, and become more and more uneven, as they grow older, eſpecially ſuch as are not every-where well and equally ſupported: many of them are ſo large and uneven, that it is hardly poſſible to find a true medium of the depth of the wort, without taking a very great number of depths; beſides, ſome are ſo ſituate, that it is difficult to take depths in every part, where it may be neceſſary; and therefore it is a common practice to take one depth at a place in the back (cloſe to the ſide) which may be always moſt conveniently come at; then ſee all the wort let down into a tun, in which it may be exactly gauged, and (if the dip taken in the Bac doth not happen to be a mean one) mark, on the ſide of the Bac, ſuch addition or abatement as will make the gauge of the wort in the Bac equal to the gauge of the wort in the tun, which is called ſetting a Bac, by ſeeing the wort come down; and this is frequently done, becauſe moſt large Bacs are continually ſetting more one way than another. Beſides, the dimenſions of large Bacs, for want of proper inſtruments, are generally taken with inched tapes, which are ſeldom very exactly divided, and the alteration of the weather affects them in their lengths, and a very ſmall error, in the dimenſions of ſuch a large veſſel, cauſes a very conſiderable one in the area: but, by ſetting the Bac as above, there will be a compenſation in the depth, for any error that may happen in taking the other dimenſions.

Bac, in the diſtillery, is a veſſel in which the liquor to be fermented is put.

To gauge and tabulate a diſtiller's Bac.—*Plate* VI. *fig.* 1. repreſents a Bac, whoſe baſes are elliptical and unequal, but alike ſituated.

Find the center of the Bac, and in that center ſtrike a nail, as at *w*. Then, with a line and a bit of chalk, deſcribe a circle; this done, take a line and find the tranſverſe diameter, by holding the line from L to M, over the center *w*, and, at L and M, make a mark. Then find the conjugate diameter as Y Z, and mark it with chalk. Then take the depth in that place, where the officer propoſes to take his gauge, which ſuppoſe at *m*, and the depth from *m* to *w* is = to 36 inches; at which place make a notch. Then draw ſtraight lines with chalk, from M to B, from L to A, from Y to N, and from Z to O; the Bac being thus quartered, proceed to take the diameters thus: on the ſtraight lines make a mark in the middle of every ſix inches (with your chalk) as at A B, C D, E F, G H, I K, L M, which are the ſix tranſverſe diameters (as the depth of the bac is thirty-ſix inches) and, for the ſix conjugate diameters, make the like marks at N O, P Q, R S, T V, W X, Y Z; then take the ſeveral lengths and breadths in inches, and enter them on a piece of paper, as under:

Depth in inches.		Length, or tranſverſe diameters.		Breadth, or conjugate diameters.
6	——	A B = 62	——	N O = 32
6	——	C D = 65	——	P Q = 33
6	——	E F = 69	——	R S = 35
6	——	G H = 72	——	T V = 36
6	——	I K = 75	——	W X = 37
6	——	L M = 79	——	Y Z = 39

Then, to find the drip of the Bac, take a regular veſſel, and fill it with water, and continue pouring in water, till you have juſt covered the bottom of the Bac; then, with your rule, dip it, to know how much it wets; which ſuppoſe to be 1.5 inch, and that the quantity of water, poured in to cover the bottom, is juſt ſixteen gallons.

Now, to find the areas of the ſeveral diameters, multiply the diameters ſixty-two by thirty-two, and that product divided by 294 (the cubical inches in a wine gallon) the quotient will be the area = to 6.74 gallons, which multiply by ſix, that product will be 40.44 gallons = to the content of the firſt ſix inches. By this method, the other five areas are found: but you muſt obſerve, as the drip of the Bac is found to be 1.5 inches inch, it muſt be ſubtracted from the whole depth thirty-ſix inches, and the remainder will be 34.5 inches. See the whole work, as under.

Inches.	Longeſt diameter. Inches.	Shorteſt diameter. Inches.	Mean area in wine gallons.		Inches.		Content of the ſeveral depths in wine galls.
6	62	32	6.74	×	6	is	40.44
6	65	33	7.29	×	6	is	43.74
6	69	35	8.21	×	6	is	49.26
6	72	36	8.81	×	6	is	52.86
6	75	37	9.43	×	6	is	56.58
4.5	79	39	10.47	×	4.5	is	47.11
1.4 The drip		—	—		—	is	16.00
36 The whole depth.					The content is		305.99

By this work it appears, that the Bac contains 305.99 gallons, and that the laſt mean area 10.47 gallons is multiplied by 4.5, becauſe the depth of the drip is ſubtracted from the laſt ſix inches.

To tabulate the Bac, ſet down the content 305.99 gallons, and ſubtract the ſeveral mean areas, as often as you multiplied them, and the ſeveral remainders will give you the contents of the Bac at any dry inch, from top to bottom; but, to prove the truth of the work, ſubtract the ſeveral contents of the ſeveral depths from the content of the Bac, and it verifies your work at every ſix inches, and likewiſe at the laſt 4.5 inches, with the content of the drip.

Bac-maker is one who makes liquor-bacs, under-bacs, coolers, maſh-tuns, and working tuns, for the brewers. The workmanſhip is partly carpentry, in a particular manner; for it muſt be high enough to hold liquor; and partly cooperage, viz. the maſh-tun, or vat, which is hooped. See Cooperage.

There are not many of this trade, and it requires chiefly ſtrength, with a little art. A ſmall ſtock of ſtuff, beſides tools, will ſet a man up tolerably well; but, with 200 *l.* or 300 *l.* he will make a good figure in buſineſs.

BACCHANA'LIA (*Dict.*)—The Bacchanalia are ſometimes alſo called orgia, from the Greek ὀργὴ, fury, tranſport; by reaſon of the madneſs and enthuſiaſm wherewith the people appeared to be poſſeſſed at the time of their celebration.

They were held in autumn, and took their riſe from Egypt; whence, according to Diodorus, they were brought into Greece by Melampus.

The form and diſpoſition of the ſolemnity depended, at Athens, on the archon, and was at firſt exceedingly ſimple, but, by degrees, became incumbered with a number of ridiculous ceremonies, and attended with a world of diſſoluteneſs and debauchery; inſomuch that the Romans, who grew aſhamed of them, ſuppreſſed them, by a ſenatus-conſultum, throughout all Italy.

The women had a great ſhare in the ſolemnity, which is ſaid to have been inſtituted on their account; for a great number of them attended Bacchus to the conqueſt of the Indies, and carried in their hands the thyrſus, i. e. a little lance, covered with ivy and vine-leaves, ſinging his victories and triumphs where-ever they went: the ceremony was kept up, after Bacchus's deification, under the title of Bacchanalia; and the women were inſtalled prieſteſſes thereof, under that of bacchæ or bacchantes.

Theſe prieſteſſes, at the time of the feaſt, ran through the ſtreets, and over the mountains, covered with tygers ſkins, their hair diſhevelled, their thyrſus in one hand, and torches in the other, howling and ſhrieking.

Men and women met promiſcuouſly at the feaſt, all perfectly naked, except for the vine-leaves and cluſters of grapes which bound their heads and hips: here they danced and jumped tumultuouſly, and, with ſtrange geſticulations, ſung hymns to Bacchus, till, weary and giddy, they tumbled down diſtracted.

BACCHA'NTES, the name of ſuch women as followed Bacchus in the conqueſt of the Eaſt-Indies. It was afterwards given to the female prieſts of that falſe god, who celebrated his feaſt covered with ſkins of tygers or panthers, and running all the night, ſome with their hair looſe, with torches and links in their hands; others crowned with vine and ivy-leaves, carrying a thyrſus or ſtick covered with the like leaves. They had along with them cymbal-players, drummers, and others with hunting-horns; and they themſelves made a terrible noiſe, ſhouting and bawling, as they went along. The men were apparelled like ſatyrs, ſome riding upon aſſes, and others led he-goats to ſacrifice them. *Tertul. St. Auſtin.*

BACCHA'RACH *Wine*, a name of a particular kind of wine by ſome eſteemed a kind of Rheniſh; but Portzius, who has written expreſly on the ſubject, obſerves, that it differs from all the common Rheniſh wines, in colour, odour, taſte, and virtue. When the wine is firſt made, it is of a yellowiſh colour; but they take off this, by means of ichthyocolla, cut and ſteeped in fair water for ten or twelve hours, and then torn to pieces, and mixed with the wine, but only in a ſmall quantity. They add only ſo much of the wine, as they ſuppoſe capable of diſſolving it; and then, letting it ſtand ſix or ſeven days, they put it into a ſieve; and, pouring ſome more wine on it, they waſh it through; and, thus percolated, they pour it out of one veſſel into another, till it froths; they then pour the whole into a proper quantity of wine, to clarify it and take away its colour. Some add, at the ſame time, a quantity of ſand, or of powdered white glaſs, which being heavy, and entangling themſelves in the ſoul matter of wine, carry it to the bottom with them. When they pour this ſolution into the veſſel, they uſe a little ſtick with a piece of thin board perforated at the end of it, with which they beat the wine in the veſſel, to mix the ſolution of iſinglaſs everywhere with it. Four or five days ſtanding quiet, after this, ſeparates all the fæces, and the wine is then drawn out into other veſſels, pure and colourleſs *Portzius de Vin. Rhen.*

BACCHUS in the antient mythology, a god of the heathens. There were two eminent gods of this name; the Ægyptian Bacchus, ſon of Ammon, the ſame as Oſiris; and the Theban Bacchus, ſon of Jupiter and Semele.

The Ægyptian Bacchus was bred at Niſa, a city of Arabia Felix, and conquer'd the Indies. Orpheus carried his worſhip into Greece, and, out of flattery, attributed the wonders related of him to a prince of the race of Cadmus.

The Theban Bacchus, on the death of his mother Semele, which was effected by the arts of jealous Juno, in the ſeventh month of her pregnancy, was taken out of her womb by Jupiter, and ſewed up in his thigh, where he completed the time of ripening him for birth. Euripides, in his Bacchantes, ſays, that Jupiter hid the child in a cloud, to conceal him from his wife. Euſtathius tells us, he was bred on mount Meros (μέρος.) which ſignifies thigh, and from hence it is probable the fable had its origin.

Bacchus went to the conqueſt of the Indies, at the head of a number of men and women, armed with thyrſi and drums. The people, terrified at the multitude and noiſe, received him as a god; and why ſhould they oppoſe him? He did not come to load them with chains, but to teach them the culture of the vine. He is ſaid to have performed wonders in the war of the giants.

Painters repreſent him by the figure of a young man, beardleſs, full-cheeked, crowned with ivy or vine leaves, a thyrſus in one hand, and bunch of grapes, or cup, in the other.

BACCI'FEROUS *Plants*, are ſuch as bear berries, i. e. fruit covered with a thin membrane, wherein is contained a pulp, which grows ſoft and moiſt, when ripe, and incloſes the ſeed within its ſubſtance.

Bacciferous trees Mr. Ray divides into four kinds. 1. Such as bear a caliculate, or naked berry; the flower and calix both falling off together, and leaving the berry bare; as the ſaſſafras trees, &c.

2. Such as have a naked monopyreneous fruit, that is, containing in it only one ſeed; as the arbutus, terebinthus, lentiſcus, &c.

3. Such as have a naked but polypyreneous fruit, that is, containing two or more kernels or ſeeds within it; as the jaſminum, liguſtrum, &c.

4. Such as have their fruit compoſed of many acini, or round ſoft balls, ſet cloſe together like a bunch of grapes; as the uva marina, rubus vulgaris, rubus Idæus, and the rubus minor fructu cæruleo.

BACK *of a chimney*, the hind part between the jaumbs and the hearth, uſually formed of brick, ſometimes tiles.

Iron **Back**, is a large plate of caſt-iron, frequently adorned with figures in low relievo, ſerving not only to preſerve the ſtone-work of a chimney-back, but alſo to reflect the heat of the fire forwards. For the method of caſt-iron Backs; See Iron and Foundery.

Back *of a hip*, among builders, denotes the two planes on the outſide of a hip, lying parallel with the adjoining ſide and end of the roof. *Neve, Build. Dict.*

Back-painting, the method of painting metzo-tincto prints, paſted on glaſs, with oil-colours.

The art conſiſts chiefly in laying the print upon a piece of crown-glaſs, of ſuch a ſize as fits the print.

In order to do this, take your print and lay it in clean water for two days and two nights, if the print be on very ſtrong, cloſe, and hard gummed paper; but, if upon an open, ſoft, ſpungy paper, two hours will ſometimes ſuffice, or more, according as the paper is.

The paper or picture having been ſufficiently ſoaked, take it out and lay it upon two ſheets of paper, and cover it with two more, and let it lie there a little to ſuck out the moiſture.

In the mean time, take the glaſs the picture is to be put upon, and ſet it near the fire to warm; take Straſburg turpentine, warm it over the fire, till it is grown fluid; then with a hogs hair bruſh, ſpread the turpentine very ſmoothly and evenly on the glaſs.

When this has been done, take the metzo-tincto print from between the papers, and lay upon the glaſs; beginning firſt at one end, rubbing it down gently as you go on, till it lie cloſe, and there be no wind bladders between.

Then, with your finger or fingers, rub or roll off the paper from the backſide of the print, till it looks black, i. e. till you can ſee nothing but the print like a thin film left upon the glaſs, and ſet it by to dry.

When it is dry, varniſh it over with ſome white tranſparent varniſh, that the print may be ſeen through it, and then it is fit for painting.

Note, You muſt be very careful in rubbing or rolling the paper off the print, ſo as not to tear it.

You may, inſtead of ſoaking your prints two days and two nights, roll them up and boil them for about two hours, more or leſs, according to the quality of the paper, in water, and that will render it as fit for rubbing, rolling or peeling, as the other way.

This being done, and your oil colours prepared, ground very fine, and tempered up very ſtiff, lay, on the backſide of the tranſparent prints, ſuch colours as each particular part requires; letting the maſter lines of the print ſtill guide your pencil, and ſo each particular colour will lie fair to the eye on the other ſide of the glaſs, and look almoſt as well as a painted piece, if it be done neatly.

The ſhadows of the print are generally ſufficient for the ſhadow of every colour, but, if you have a mind to give a ſhadow by your pencil, then let the ſhadows be laid on firſt, and the other colours afterward.

In laying on colours in this kind of backſide-painting, you need not be curious as to the laying them on ſmooth. This is not at all requiſite here, where the chief aim is only to have the colours appear well on the foreſide of the print; and therefore the only care to be uſed in this work, is to lay the colours on thick enough, that its body may ſtrike the colour of it plainly through the glaſs.

BA'CON's *Philoſophy.*—Lord Bacon, baron of Verulam, and viſcount of St. Albans, was born in the year 1560. He gave marks in his youth of what his manhood would produce. Queen Elizabeth was an admirer of his remarkable ſagacity. He ſtudied the Ariſtotelian philoſophy at Cambridge, and, before he was ſixteen years of age, diſcovered the abſurdity of that jargon in vogue at that time. He afterwards applied himſelf to the ſtudy of the law; and his merit raiſed him to the dignity of lord chancellor, under king James I. He was accuſed of bribery, and, the king refuſing him protection, was fined by the houſe of lords, ſtripped of his chancellorſhip, and caſt into priſon. He was ſoon after reinſtated in his honours and fortune, but what he had undergone gave him a diſlike to buſineſs, and increaſed his paſſion for ſtudy. At laſt he died aged 66 years, poor, and in very mean circumſtances.

No man has contributed more to the advancement of learning than lord chancellor Bacon: he ſaw the imperfection of the philoſophy of the ſchools, and taught the only way to amend it. This great man, indeed, did not know nature, but he knew and pointed out all the ways that lead to her. He entertained an early contempt for what the univerſities called philoſophy, and did every thing in his power, to prevent ſocieties, inſtituted for the improvement of human reaſon, from continuing to ſpoil it by a heap of impertinent terms, ſubſtantial forms, &c. which not only had made ignorance to be reverenced, but was, by a ridiculous mixture with religion, rendered ſacred.

He compoſed two works with a deſign to improve the ſciences, and carry them to perfection. In the firſt, intitled de Augmentis Scientiarum, he ſhews the ſtate of learning, and points out a method of carrying it to greater perfection; but adds, that we muſt never hope to carry our diſcoveries to any great length, unleſs other methods were purſued, than thoſe then in uſe. He ſhews that the logic, then taught in the ſchools, was fitter for wrangling, than to direct the mind in its ſearch after truth. Ariſtotle, ſays he, from whom we have this art, has proceeded on wrong principles; he has made his phyſics conformable to his logic, inſtead of making his logic conformable to his phyſics; and, thus everturning the order of nature, has ſubjected the end to the means.

To correct the faults in the common logic, Bacon compoſed a ſecond work, intitled Organum Scientiarum, wherein he has taught a new logic, the principal end of which is to ſhew how to make a good induction, as the end of Ariſtotle is how to make a good ſyllogiſm. Bacon looked on this as his maſter-piece, and ſpent eighteen years in compoſing it.

Nor was the cauſe of our errors hid from this great man; he ſaw that our ideas were operations of the mind; and that, in order to diſcover truth, they muſt be directed in a new method. This advice he frequently repeats in the work juſt mentioned. But who, in an age ſo prejudiced in favour of the jargon of ſchools, and the notion of innate ideas, liſtened to his doctrine? Who did not look on his new method of improving the human underſtanding, as a chimerical project? The method Bacon propoſed was too perfect to be accepted at once: errors of long ſtanding maintain their poſt with ſome obſtinacy, and the Carteſian philoſophy was embraced, becauſe it admitted ſome of the former errors. Beſides, lord Bacon's employments took up much of his time, and prevented him from carrying into execution himſelf the advice he gave to others; whereas Deſcartes gave himſelf up entirely to philoſophy, and, being a man of a very lively and fruitful imagination, has ſubſtituted, in the room of the errors of the ſchools, others of a more ſeducing nature.

Lord Bacon's attention to the ſciences in general did not hinder him from applying himſelf to ſome in particular; and, as he thought natural philoſophy the baſis of all the other ſciences, he principally applied himſelf to bring that to ſome degree of perfection. But in this he acted like ſome great architects, who, ſcorning to work after others, begin with pulling every thing down, and raiſe their building on a plan entirely new. He, like theſe, never thought once about embelliſhing or repairing what had been already begun by others; but propoſed to eſtabliſh a new ſyſtem of phyſics, without making any uſe of what had been left us by the antients, whoſe principles he ſuſpected. To accompliſh this great deſign, he reſolved to publiſh a phyſical treatiſe every month, and began with one upon the winds; he afterwards publiſhed one on heat, another on motion, and, at laſt, one on life and death. But as it was impoſſible for a ſingle man to give a complete ſyſtem of phyſics in general, with equal exactneſs; after having given directions to ſerve as a rule for thoſe who were deſirous of proceeding on his principles, he contented himſelf with drawing the out-lines of four other treatiſes, and furniſhed materials for them, in a work intitled Sylva Sylvarum, wherein he has collected a vaſt number of experiments, to ſerve as a foundation for his new phyſics. In ſhort, before lord Bacon, no-body knew any thing of natural philoſophy; and all the experiments, made ſince his time, ſeem to have been pointed out by this great genius.

His moral eſſays are much eſteemed; but they are wrote rather to inſtruct than entertain: an eaſy genius, a ſound judgment, the ſenſible philoſopher, and man of reflection, ſhine in theſe eſſays by turns. This was one of the fruits of the retreat of a man who had quitted the world, after having long ſupported a great ſhare in its proſperity and adverſity. There are alſo ſome very fine things in his book concerning the wiſdom of the antients, wherein he has moralized the fables which compoſe the mythology of the Greeks and Romans. He wrote, beſides, the hiſtory of Henry VII. in which, notwithſtanding there are ſome traces of the bad taſte of his age, yet it abounds in judicious remarks, and ſhews he was a refined politician, as well as a great philoſopher.

BA'DGER, *taxus,* in zoology, called, in ſome parts of England, the brock, the grey, and the pate.

Authors who have deſcribed this animal, have all made two kinds; the taxus canius and taxus porcinus, the dog and hog Badger. The laſt of theſe is our common kind; and it is indeed doubted whether there be any ſuch animal as the authors deſcribe under the other name.

The body of the Badger is ſhort and thick, its neck very ſhort, and its hairs long, and very rigid, and ſtiff like hog's briſtles. Thoſe of the back are of a pale yellow, near the root: brown in the middle, and at the extremities yellow again; ſo that the creature appears, upon the whole, of a mixt colour, or what we call grey, on the back. The ſides and belly are covered with hairs, which are all over of a pale yellowiſh hue; and the legs and ſhoulders, as alſo the belly, are wholly black. It has a broad white line from the top of the head to the noſe, and, on each ſide of this, a very regular pyramidal black mark reaching up to the ears; and below theſe the jaws are whitiſh, ſo that the creature's face looks very odly variegated. Its eyes are ſmall, and its ſnout wholly like a dog's. The teeth are like thoſe of a dog alſo, and the legs ſhort; its fore feet have ſharp claws, with which it digs itſelf burrows in the earth; its face, like that of the fox, being broad at the top of the forehead, and ſharpening to a point at the noſe, ſo as to appear triangular in ſhape; and its cheeks are tumid, and furniſhed with ſtrong muſcles, whence it bites very hard. It feeds on inſects and ſmall animals, and on the roots of vegetables. We have them in many parts of England, particularly in the counties of Eſſex, Suſſex, and Warwickſhire. *Ray's Syn. Quad.*

The Badger's ſkin is of ſome uſe in commerce. Their fat is ſold by the druggiſts, as a remedy againſt diſorders of the kidneys and the ſciatica; and their hair for making pencils for painters and gilders. *Savar. Dict. de Comm.*

BADIA'GA, in the materia medica, the name of a ſort of ſpungy plant, common in the ſhops of Moſcow, and ſome other northern kingdoms.

The uſe of it is the taking away the livid marks from blows and bruiſes, which the powder of this plant is ſaid to do in a night's time.

We owe the knowledge of this medicine, and its hiſtory, to the accurate Buxbaum. He obſerves, that the plant is always found under water, and is of a very ſingular and peculiar nature.

It ſomewhat reſembles the alcyoniums, and ſomewhat the ſpunges; but differs greatly from both, in that it is full of ſmall round granules, reſembling ſeeds. It is of a looſe, light, and ſpungy ſtructure, and is made up of a number of fibres of an herbaceous matter, and is dry, rigid, and friable, between the fingers.

BADI'GEON, a mixture of plaiſter and free-ſtone, well ground together, and ſifted; uſed by ſtatuaries, to fill up the little holes, and repair the defects in ſtones, whereof they make their ſtatues and other work. *Savar. Dict. de Com.*

Maſons give the ſame name to a kind of mortar made of the duſt or fragments of free-ſtone, wherewith they colour or ſmear over the common plaiſter, to give it a reſemblance of free-ſtone.

The ſame term is alſo uſed by the joiners, for ſaw-duſt mixt with ſtrong glue, wherewith they fill up the chaps, and other defects in wood, after it is wrought.

BAFFE'TAS, or BAFTAS, a cloth made intirely of coarſe white cotton-thread, which comes from the Eaſt-Indies. Thoſe of Surat are the beſt. They are from thirteen French ells and three quarters to fourteen long, and ſeven eighths broad. There are alſo ſome which meaſure but five ſixths of an ell, or even but half of an ell in breadth. Theſe narrow Baffetas are called orgagis, gaudivis, nerindes, and dabouis, according to the names of the places where manufactured.

There are alſo narrow-white Baffetas, which meaſure thirteen ells and an half in length, by half an ell in breadth.

Broad-white Baffetas, 14 ells by three quarters.

Broad-brown and narrow-brown Baffetas. Theſe two laſt ſorts are made of raw thread, that is, which was never wetted or blanched. The former are fourteen ells long, by half an ell broad; the latter are of the ſame length, and three quarters in breadth.

BAGAU'Z.—Thus they call, in the Antilles iſlands, the ſugar-canes, after they have paſſed through the mill; they keep them under cover in ſmall huts, in order to uſe them, when dry, for boiling the ſugar. Theſe huts are called the Bagauz huts.

As ſoon as theſe Bagauz are taken from between the firſt and third roller, two or three negro women bind them up in bundles, which they pile up under the covers. In caſe the Bagauz be not long enough to be made up into bundles, as being too much broken, they carry them in large baſkets to a corner of the mill, where the horſes, oxen, and hogs, come and eat them.

Sometimes when they are ſtreightened for fuel, they only dry them in the ſun for three or four hours, which is ſufficient to make them fit for burning. In ſome places, where they have plenty of wood, they ſerve only to burn under the firſt boilers; but, where wood is ſcarce, they keep them for the two laſt, and under the firſt they burn ſtraw, and the dry leaves of the canes.

BA'GGAGE, is particularly uſed in the military art, for the neceſſaries, utenſils, apparel, &c. of the officers and ſoldiers.

The Baggage includes alſo women, children, ſuttlers, &c.

The Baggage-waggons before a march are appointed a rendezvous, where they are marſhalled by the waggon-maſter-general, according to the rank the ſeveral regiments bear in the army. On a march, they are ſometimes ordered to follow the reſpective columns of the army, ſometimes to follow the march of the artillery, and ſometimes to make a column of themſelves. The general's Baggage is commonly firſt. If the army march from the right, the Baggage of that wing has the van; if from the left, the Baggage of the left has the van. Each waggon has a diſtinguiſhing flag, to ſhew to what regiment it belongs. *Guillet.*

BA'HAR, or BARR, a weight uſed at Ternate, Mocha, in the Moluccas, Achem, and divers other parts of the Eaſt-Indies.

There are two kinds, the great, wherewith ſpice is weighed, equivalent to 200 catis, at 26 taels to the cati, amounting to 481 pounds 4 ounces, Paris meaſure.

The little Bahar ſerves for the weighing quick-ſilver, vermilion, ivory, ſilk, muſk, and other precious wares, containing likewiſe 200 catis, but at 22 taels to the cati, amounting to about 401 pounds ſeven ounces, Paris meaſure. The Chineſe Bahar is 300 catis, but each cati only equal to 16 taels.

BAIO'CCO, a money in modern Rome, equivalent to the tenth part of a julio, or hundredth part of the ducat.

BAIT.— Baits make a capital article in angling; on the choice whereof, much of the ſport depends; different ſeaſons, and different game, having their appropriated Baits. The red, or earth worm, is good for the ſmall fry moſt of the year round; and ſmall fiſh are good Baits for pikes at all times; ſheep's blood and cheeſe are good Baits in April; the bobs, dried waſps, and bees, for May; brown flies for June; maggots, hornets, waſps, and bees, for July; ſnails in Auguſt; graſhoppers in September; corn, bramble-berries, and ſeeds, at the fall of the leaf; artificial paſtes are for May, June, and July; and frogs, for March. *Sport. Dict.*

Natural Baits, include all kinds of worms, as the red-worm, maggot, and the like; alſo frogs, graſhoppers, hornets, bees, brown-flies, ſnails, roaches, bleak, gudgeon, and loaches.

Artificial Baits, are flies of all kinds and ſhapes, made of ſilk, feathers, and the like. The variety of which is very great; there being not only different ones for every ſeaſon and month of the year, but almoſt for every fiſh.

There are ſeveral artificial Baits, for intoxicating of fowl, and yet, without tainting or hurting the fleſh, as to make it unfit to eat.

Dead BAITS, are paſtes of divers ſorts, made of corn, cheeſe, fruit, waſps dried or undried, ſheep's blood, boiled beans, and the like.

Ledger BAIT, is that which remains fixed in one certain place, while the angler may be abſent; uſed eſpecially in fiſhing for pike.

Walking BAIT, is that which the angler attends, while he keeps moving from place to place, in queſt of the fiſh.

Live BAITS, are to be kept each ſort ſeparate, and fed with thoſe things which they like beſt.

The red-worm is to be kept in rich black mould, with a little fennel chopped among it; a little ox or cow-dung, newly made, is alſo a very acceptable thing to them. They may be kept in a box, with ſmall holes in it, or in a bag. Red-worms, and all other ſorts, ſcour quickly, and grow very tough and bright, on putting them into a thin rag, greaſed with freſh butter, or greaſe, before they are put into moſs.

This is the beſt of all things to keep them in; but the moſs muſt be firſt very well waſhed, and the water ſqueezed dry out again. As to food, a ſpoonful of cream, dropped into the moſs once in three or four days, is better than any thing elſe. The moſs is to be changed every week, and kept in a cool place.

White large maggots are an excellent Bait for many ſorts of fiſh, and they are to be kept on ſheep's-ſuet and liver, chopped ſmall. They will thrive extremely on this ſort of food.

Frogs and graſhoppers are to be kept in wet moſs and long graſs; and, on moiſtening this afreſh every evening, it will keep a long time. They are to have their legs and wings cut off, when they are uſed.

Live flies muſt be uſed as they are caught; but waſps, bees, hornets, and humble-bees, may be preſerved dry.

The beſt method of drying them, is putting them in an oven after the bread is drawn: care muſt be taken that they are not ſcorched; and, when they are taken out, they are to have their heads dipped in ſheep's blood. This is to be ſuffered to dry on, and then they are to be preſerved in a box. They will keep very well for three or four months.

BA'KERS.— This is a very ancient as well as uſeful trade; and the moſt general and extenſive branch of it is that of making, as well as baking, houſhold or family bread; though there are ſeveral others, as,

Biſcuit-baking, which is chiefly to prepare, in a particular manner for long-keeping, what is called ſea-biſcuit, or bread. See BISCUIT.

Of French bread, ſo called for its peculiar delicacy; who alſo makes various ſorts of the nicer ſweet, as well as inſipid, biſcuits, &c.

Of ginger-bread, or ſweet-ſpiced bread, and cakes of ſeveral kinds.

Of theſe three laſt there are but few of each, there not being ſuch a general call for their produce, as for the common bread; the Bakers of which, indeed, are many in number, yet not ſo numerous, but that moſt of them get a decent maintenance, if careful, and ſome acquire handſome eſtates. The principal expence they are at, when they ſet up, is that of building their ovens, one of which will coſt 20 pounds and upwards, according to the ſize; next to this, is their ſtock of flour and faggots: ſo that 2 or 300 pounds will ſerve very well to begin with.

BA'KING *of Porcelain.* The determining the due degree of heat for the Baking the China-ware, and the finding out the proper time it ſhould remain in that heat, are two very eſſential points in the manufactory of this elegant ware. Perhaps, our Engliſh attempts to imitate it would be brought nearer the perfection we are aiming at, by a juſt regard to theſe particulars, than by many other leſs material articles, about which we ſeem more ſollicitous.

It is generally ſaid, that the Chineſe judge of the proper degree of Baking for their ware, by obſerving when the gold and colours appear moſt perfect and brilliant, and then taking the thing out of the fire. But this is an idle opinion; for the colours are not ſeen at all, while the veſſel is red-hot in the fire, but only appear gradually, as it cools. The way they judge of the Baking being enough, is by looking down into the furnace; when they can diſtinguiſh the whole range of the veſſels equally red-hot, and ſee one from another to the very bottom of the ſurface, they know that the fire is ſtrong enough, and ought not to be increaſed any farther. From this time they diligently watch the things; and, when they perceive the inequalities on the ſurface of the coloured parts diſappear, and theſe coloured parts blend themſelves ſo with the reſt, as to make one even ſurface, they then know that the whole is done, and have nothing farther to do, but to let them cool as gradually as poſſible, to prevent their cracking.

This method of judging ſerves them very exactly for their ſmall furnaces; but, when they are employed about the larger, they are forced to judge by other ſort of ſigns. When the flame that comes out of the furnace is not ſo red as at firſt, but becomes whitiſh, and the veſſels, as far as can be ſeen, appear thoroughly red, and when the whole furnace is ſo perfectly heated, that, on looking in at the top, the floor is ſeen bright and ſhining; theſe are the tokens of the things being almoſt done, and what remains is to be performed by trial. The uſual way is to take out the pieces ſingly, at different times, and obſerving when the colours and the varniſhing are as bright and perfect as they ſhould be. The fire is then to be put out by degrees, and the furnace gradually cooled. *Obſervat. ſur les Coutumes de l' Aſie.*

BA'LANCE *(Dict.)*— If a weight of a known magnitude be hung at one end of a Balance, we may find the fixed point about which the Balance and weight will be in equilibrio, in the following manner:

Having ſuſpended the given weight D (ſee *Plate* IX. *fig.* 28. of the Dictionary) equal to four pounds (for example) at the end A of the Balance A B, which weighs alſo four pounds; ſince the weight of the Balance is conſidered in this operation, we muſt ſuppoſe the whole weight of the Balance reduced into its center of gravity, as if the weight E of four pounds hung at C the center of gravity of the Balance, which is at its middle diviſion 6: then we ſhall have a new Balance (viz. A C) without weight, at whoſe ends hang the weights D and E, whoſe fixed point will (by a known prop.) be eaſily found; or more generally by this analogy:

As D + E (or the weight of the body and the weight of the Balance):
Is to E (the weight of the Balance)::
So is C A (half the length of the Balance):
To A 3 (the diſtance of the fixed point from the given heavy body.)

Let the ſteel-yard P W (See *Plate* IX. *fig.* 27, in the Dictionary) be taken off of its hook K, and let its center of gravity C be placed upon a fulcrum or triangular priſm D E; and, inſtead of the weight 1 hanging at P to keep in equilibrio the weight W of 4 pounds, let an animate power, as the hand, be applied at P: the ſtatera or ſteel-yard will then be turned into a lever, whoſe fulcrum or fixed point is between the ends as at C, in which caſe the power may be four times leſs in intenſity than the weight; but equal to it, if C or the fulcrum was removed to M (the middle point of P W) and four times greater, if C was removed to 3. See LEVER, in the Dictionary.

Aſſay **BALANCE**, a very nice Balance, uſed in docimaſtical operations, to determine exactly the weight of minute bodies.

This Balance ſhould be made of the beſt ſteel: for it may be conſtructed much better of this metal, which muſt be of the hardeſt kind, though ſufficiently tractable, than of any other matter. Beſides, ſteel is not ſo eaſily ſpoiled with ruſt, as iron; and it is more apt than other metals to take a perfect poliſh, which at the ſame time prevents the ruſt.

The ſtructure of the aſſayer's ſcale is little different from that of common ſcales, otherwiſe than by its nicety and ſmallneſs. The longer the beam of it *(Plate* VI. *fig.* 2.) is, the more exact may the weight of a body be found: however, ten or twelve inches are a ſufficient length. Let the thickneſs of it be ſo very ſmall, that two drachms may hardly be hung at either of its extremities, *a*, *b*, without its bending. For the largeſt weight put upon it ſeldom exceeds one drachm. The whole ſurface of this beam muſt be altogether without ornaments, which only increaſe the weight, and gather duſt, &c. The beam is ſuſpended in a fork, *fig.* 3. the two legs of which are ſteel-ſprings joined at top, but kept together below with a braſs, pliant claſp, *fig.* 4, parallel, and two lines and an half diſtant from each other. This claſp being taken off, and the legs of the fork being ſtretched out, the axis of the beam may be put into two holes *a a* made for that purpoſe at the ends of the legs, or be taken away from them. Let a very ſharp needle *c* be fixed in the head of the fork, ſtanding perpendicularly downwards, if the fork is ſuſpended, and ſo long, as that it may almoſt touch the top of the tongue of the beam *(plate* VI. *fig.* 2. *c)* put into the fork, when in equilibrio. This needle is the mark of the equilibrium; and, that the artiſts may be able to obſerve this, the legs of the fork muſt be broader in that place, and have an opening two or three lines wide. However, this fork may be adorned at pleaſure, provided the motion of the Balance is not hindered by ſuch ornaments. Then take two ſcales (A A *fig.* 5.) made of a thin plate of ſilver, one inch and a half in diameter, hanging on three ſmall ſilk-ſtrings, almoſt as long as the beam, tied together at top with a ſilver hook, in form of an *S*, and hang them to the extremities of the beam. A ſmaller ſilver-diſh, ſomewhat leſs than one inch in diameter, belongs to each of theſe ſcales, as B, or, if made of ſteel blued over charchoal, they are leſs apt to wear. You firſt put into theſe diſhes, with a pair of pincers, the bodies to be weighed, or with a ſpoon or a ſmall ſhovel, when they are pounded, and then you put them into the ſcales: therefore, the ſmall diſhes muſt be perfectly equal in weight. We uſe them, that bodies may be more conveniently put into and taken out of the ſcales, and that theſe, which are vaſtly thin, may not be bent or ſoiled, and ſo be rendered falſe by wiping.

This Balance is ſuſpended on a moveable braſs or copper-ſupport, which conſiſts of a pedeſtal, *fig.* 6. *a*, and of a column ſet upon it *b* about twenty inches high, at the top of which comes out at right-angles an arm *c* one inch long. At the extremity of this arm, put a ſmall pulley *d* three lines in diameter: put another at the top of the column *e*, and a third near the bottom of it *f*: all which pullies muſt turn very eaſily on their axes. At the diſtance of one inch and a half below the upper arm, let another arm *g* one inch and a half long come out of the column at right-angles, having a hole through it *h* two lines long, a quarter of a line broad, and placed perpendicularly below the pulley of the upper arm *f*, to receive a ſmall plate *i*, one inch and a half long; and of ſuch breadth and thickneſs, as that it may freely move up and down, and yet not have too much play within the hole. This plate muſt alſo have a ſmall hook at each extremity.

And as ſuch a Balance will hardly ſtand ſtill in the open air, and becomes falſe, when ſpoiled with duſt: it muſt be put together with its ſupport into a ſmall caſe, *fig.* 7. having glaſſes *a*, *a*, *a*, at top and all round it, that you may ſee what is within.

Manner of uſing the Aſſay **BALANCE**.— Paſs a ſilk ſtring over the three pullies of the ſupport, *fig.* 6. *e f d*, and tie it at its upper extremity to the ſmall hook of the plate *i*, which is then introduced into the hole of the inferior arm *h*. Then put the ſupport in the middle of the ſmall caſe, and paſs the other extremity of the ſilk-ſtring below, through a hole bored in the middle of the lower border of the frame, containing the window in the fore-part of the caſe, and faſten it to a weight of a few ounces *k*, reduced into a cubic form. Suſpend the fork of the Balance, *fig.* 3, on the inferior hook of the plate *i*, *fig.* 6. By this means, if you move backwards and forwards, the weight faſtened to the ſtring *k*, placed upon the top of the draw, that juts out beyond the fore-part of the caſe, the Balance within is either lifted up, or let down. But you muſt put the bodies to be weighed, and the weights themſelves, in the ſmall ſilver-diſhes, *fig.* 5, and theſe, when loaded, into the ſcales, through the ſide-windows, which muſt be opened for that purpoſe. When any thing is to be added to, or taken out of them, you do it with the ſmall pincers, or, if it is powder, with the ſmall ſhovel or ſpoon. However, you muſt let the Balance down, every time any thing is to be added, or taken away; that the ſcales may reſt upon the bottom of the caſe: but then you muſt ſhut the windows, before the Balance is lifted up again, eſpecially if the air is not perfectly calm.

BALANCE, in merchants accounts, is, when the debtor and creditor ſides of any diſtinct account are equal. When that is the caſe, ſuch account is ſaid to be balanced.

Balance of a merchant's or trader's books. This is a branch of the art of accountantſhip. In the method of keeping the books of traders, according to that admirable art of charge and diſcharge, by double entry, ſuch books, if kept as they ought to be, will be always fit for a general Balance. For ſuch is the excellency of that method, that the books of themſelves muſt be neceſſarily upon a Balance upon the whole, though not in every diſtinct account throughout the ledger.

BALANCE *of Trade (Dict.)*— It is neceſſary that this Balance be kept in trading nations; and, if it cannot be made in commodities, it muſt in ſpecie.

Hereby it is that we know whether a nation gains, or loſes, by foreign trade, or any branch thereof; and conſequently, whether that nation grows richer or poorer.

There are divers methods of arriving at this knowledge.

1. That moſt received is, by taking a ſtrict ſurvey of what proportion the value of the commodities exported bears to thoſe imported. If the exports exceed the imports, it is concluded that nation is in a gaining way, it being ſuppoſed that the overplus is imported in bullion, and ſo increaſes the treaſure of the nation.— But this method is uncertain, by reaſon of the difficulty of obtaining a true account either of the exports or imports. 1. Cuſtom-houſe books are no rule in this caſe; by reaſon of the running of goods, eſpecially many fine commodities of ſmall bulk but great value: as point, lace, ribbands, ſilks, jewels, fine linens, &c. alſo wines, brandies, teas, and the like. 2. To which add various accidents which affect the value of the ſtock either ſent out or brought in; as loſſes at ſea, markets, bankrupts, ſeizures, &c. 3. Then, as to particular trades, there are divers countries to which the manufactures we ſend out are inconſiderable, yet the goods we import are neceſſary to the carrying on our trade in general; as the trade to Norway, &c. for timber and naval ſtores. Alſo the Eaſt-India company, whoſe imports much exceed their exports, yet is their trade highly advantageous to the nation: as we ſell much of theſe imports to foreigners, and wear others, *e. gr.* callico's and ſilks in lieu of linens, and ſilks, from other countries, which would coſt us dearer.

2. The ſecond method is by obſerving the courſe of exchange, which if generally above the intrinſic value or par of the coins of foreign countries, we not only loſe by ſuch exchanges, but the ſame is a proof that we loſe by the general courſe of our trade.—But this method is imperfect; ſince we

trade to many countries with which there is no ſettled courſe of exchange.

3. The third method (which is Sir Joſ. Child's) is made from the increaſe or diminution of our trade, and ſhipping in general: for, if theſe diminiſh, whatever profit particular men may make, the nation loſes: and vice verſa. He lays it down as an infallible rule, that in all parts of the world wherever trade is great, and continues ſo, and grows daily greater, and the ſhipping increaſes for a ſucceſſion of ages; that trade muſt be nationally profitable. Even in the caſe of a merchant, who by driving a great trade ruins himſelf; though he loſe, what a multitude are gainers by him? as the king, and cuſtom-houſe officers; beſides ſhip-wrights, butchers, brewers, bakers, ropemakers, porters, carmen, manufacturers, mariners, &c.

4. A fourth way is, by obſerving the increaſe and diminution of our coin and bullion.—But this is the leaſt obvious and palpable of any; for the money ſeems to vulgar eyes moſt plentiful, when there is leaſt occaſion for it; and more ſcarce, as the occaſions for employing it are more numerous and advantageous: by which means we ſeem to have moſt money when we have leaſt trade. Thus *e. gr.* when the Eaſt-India company have a great ſale to make, money is generally found to be ſcarce in London; becauſe the occaſion engages people to employ quantities which they had provided for that purpoſe. So a high rate of intereſt will make money ſeem ſcarce, becauſe every man, as ſoon as he can make up a ſmall ſum, ſends it to the goldſmith to be employed. *Child's Diſc. on Trade, c.* 9.

BALE *Goods*, in the Eaſt-India trade, the bulky goods, as ſalt-petre, pepper, red-earth, tea, &c.

BALES *of Camelet*, at Smyrna, are called tables, on account of their flat ſquare figure.

BALE *of Paper*, denotes a certain number of reams packed together in a bundle.

There are Bales of more and fewer reams. Thoſe ſent from Marſeilles to Conſtantinople uſually contain twenty-four reams.

A Bale or ballon of crown paper, manufactured in ſome parts of Provence, conſiſts of 14 reams, and is ſold in the Levant for Venice paper.

BALE *of Dice*, denotes a little packet or paper containing ſome dozens of dice for playing with.

BALL, a ſpherical and round body, either naturally ſo, or turned into that form. There are Balls of common wood, of box, of iron, &c.

The word Ball is alſo uſed to ſignify ſome tools and inſtruments of ſeveral arts and trades, becauſe they bear ſome reſemblance to Balls. Thus,

A Ball, or ſphere, is an inſtrument uſed by the optic-glaſs-makers: it is a piece of copper, iron, or ſome compound metal, cut into the form of an hemiſphere, or half Ball, to which a handle is joined with maſtic; with this inſtrument, thoſe workmen make the concave-glaſſes, which ſerve for teleſcopes, or ſpying-glaſſes, microſcopes, and other inſtruments of that kind.

There are Balls or ſpheres of ſeveral ſizes, according to the radius of the focus which the glaſſes require. They uſe thoſe Balls for concave-glaſſes, by applying them hard, and turning them upon the plate of glaſs, which is laid flat upon the former; contrary to what is done with regard to convex-glaſſes, which are worked in a kind of baſon. This difference excepted, the ſame methods are uſed informing, ſmoothing, and poliſhing both ſorts. Balls are alſo ſet upon a lath or turning-wheel, as are likewiſe baſons for the ſame purpoſe. See the article TURNING.

BALL, in the military and pyrotechnical arts, is a compoſition of divers ingredients, generally of the combuſtible kinds, ſerving to burn, ſmoak, give light, &c.

Fire BALLS, *globi incendiarii* are bags of canvas filled with gun-powder, ſulphur, ſalt-petre, pitch, &c. to be thrown by the ſoldiers, or out of mortars, in order to fire the houſes, incommoding trenches, advanced ports, or the like.

The preparations of fire Balls, among the moderns, conſiſts of ſeveral operations, viz. making the bag, preparing the compoſition, tying, and laſtly dipping the Ball.

The Bags for this purpoſe are either oval or round. *V. Wolf. l. c. ſect.* 48.

The compoſition wherewith fire Balls are filled, is various, To ten pounds of meal-gunpowder, add two of ſalt-petre. one of ſulphur, and one of colophony: or, to ſix pounds of gunpowder, add four of ſalt-petre, four of ſulphur, one of powdered-glaſs, half a pound of antimony, as much camphor, an ounce of ſal-ammoniac, and four of common ſalt, all pulverized. Sometimes they even fill fire Balls with hand-granadoes.

For tying the fire Balls, they prepare two iron rings, one fitted around the aperture, where the Ball is to be lighted, the other near its baſe. A cord is tied to theſe rings, in ſuch a manner, as that the ſeveral turns repreſent ſemicircles of the ſphere, cutting the globe through the poles: over the cords, extended according to the length of the Ball, others are tied, cutting the former at right-angles, and parallel to each other, making a knot at each interſection. Laſtly, putting in a leaden bullet, the reſt of the ſpace is filled with tow or paper. Thus compleated, the fire Ball remains to be dipped in a compoſition of melted pitch four pounds, colophony two, and linſeed-oil, or oil of turpentine two; after dipping, they cover it round with tow, and dip again, till it be brought to the juſt diameter required.

Light BALLS, *Globi lucentes*, are ſuch as diffuſe an intenſe light around; or they are Balls which, being caſt out of a mortar, or the hand, burn for ſome time, and illuminate the adjacent parts.

Luminous or light Balls, for the hand, are made of ground powder, ſalt-petre, brimſtone, camphor, and borax, all ſprinkled with oil, and mouldered into a maſs with ſuet and common and Greek pitch, to the ſize of an ordinary granado: this is wrapped up in tow, with a ſheet of ſtrong paper over it. To fire it, they make a hole into it with a bodkin, into which they put ſome priming, that will burn ſlow. Its uſe is to be caſt into any works they would diſcover in the night-time. *Millit. Dict.*

For the larger light Balls, or thoſe to be thrown to a greater diſtance, they melt equal quantities of ſulphur, turpentine, and pitch; and herein dip an earthen, or ſtone Ball, of a diameter much leſs than that of the mortar out of which the fire Ball is to be caſt: then rolling it in gunpowder, and covering it round with gauſe, they dip it again, and repeat the reſt till it come to fit the cavity of the mortar: laſtly, they ſprinkle it around with gunpowder. This, being once kindled, will ſtrongly illuminate all round the place where it is thrown, and give opportunity to examine the ſtate and condition thereof.

Smoak or Dark BALLS, thoſe which fill the air with ſmoak, and thus darken a place, to prevent diſcoveries. To prepare a darkening Ball, make an oval or ſpherical bag, melt roſin over the coals, and add an equal part of ſalt-petre not purified, alſo of ſulphur, and a fifth part of charcoal. The whole being well incorporated, put in tow firſt ſhred, and fill the bags with this compoſition, and dip it after the ſame manner as a fire Ball.

Stink BALLS, *globi fœtentes*, thoſe which yield a great ſtench, where fired to annoy the enemy.

Their preparation is thus; melt ten pounds of pitch, ſix of roſin, twenty of ſalt-petre, eight of gunpowder, and four of colophony; to theſe add two of charcoal, ſix of horſe-hoofs cut ſmall, three of aſſafœtida, one of ſtinking ſaracen, and any other offenſive ingredients. The reſt as in the former.

Sky BALLS, *globi aerii*, thoſe caſt on high out of mortars, and which, when arrived at their height, burſting like rockets, afford a ſpectacle of decoration. Sky Balls are made of a wooden ſhell, filled with various compoſitions, particularly that of the ſtars of rockets.

Theſe are ſometimes intermixed with crackers, and other combuſtibles, making rains of fire, &c.

Water BALLS, *globi aquatici*, thoſe which ſwim, and burn a conſiderable time in the water, and at length burſt therein.

Theſe are made in a wooden ſhell, the cavity of which is filled with refined ſalt-petre, ſulphur, ſaw-duſt boiled in water of ſalt-petre, and dried; to which ſometimes other ingredients are added, as iron-filings, Greek pitch, amber-duſt, glaſs powdered, and camphor. The ingredients are to be ground, mixed up, and moiſtened with linſeed-oil, nut-oil, olive-oil, hempſeed-oil, or petrol. At the bottom is placed an iron coffin, filled with whole gunpowder, that the Ball may at laſt burſt with a greater noiſe; and, laſtly, the Ball is, by the addition of lead, or otherwiſe, made of the ſame ſpecific gravity with water.

BALL *of a Pendulum*, the weight at the bottom. In ſhorter pendulums, this is called the bob.

BALL, among the Corniſh miners, ſignifies a tin-mine.

BALL, among printers, a kind of wooden tunnel ſtuffed with wool, contained in a leather cover, which is nailed to the wood; with which the ink is applied on the forms to be wrought off.

The preſs-man, holding one of theſe Balls with either hand, firſt daubs them on the ink-block, and afterwards on the forms, which retain the ink neceſſary to make an impreſſion.

Horſe BALLS, among farriers, a kind of cordial medicine, adminiſtered in the form of Balls, ſuppoſed of great virtue for feeding and ſtrengthening ſound, as well as healing and raiſing unſound horſes.

Markham's horſe Balls, are a preparation of aniſeeds, carthamus, elicampane, and other ingredients, wrought into a ſtiff paſte, and thence formed into Balls. They are cleanſing and emollient, efficacious in colds, ſurfeits, and hard labour, and eſpecially uſeful where any of the chief viſcera are decayed: nothing raiſes a lean jade ſo ſoon, being partly food and partly phyſic. *Ruſt. Dict. Farr. Dict.*

Chewing BALLS, are thoſe which the horſe is to keep champing, or maſticating in his mouth, a conſiderable time, without ſwallowing. Theſe are chiefly uſed for a loſt appetite, a thing very incidental to horſes.

They are uſually made of aſſafœtida, liver of antimony, juniper, bay-wood, and pellitory of Spain, beaten and incorporated into a maſs with verjuice. The method of adminiſtration is to wrap one of the Balls in a linen cloth, and, having a ſtring faſtened to it, make the horſe chew it three or four hours at a time. *Ruſt. Dict.*

Ball *Vein*, in minerology, a name given by the miners of Suſſex to a ſort of iron ore, common there, and wrought to conſiderable advantage. It yields not any great quantity of metal, but what it has runs freely in the fire; it is uſually found in looſe maſſes, not in the form of ſtrata, and is of ten covered with one or more cruſts. It generally contains ſome ſparkling particles, and is uſually of a circular form, in the perfect maſſes; thickeſt in the middle, and gradually thinner, as it approaches the ſides. The ores of Suſſex in general are poor, but they require very little trouble in the working; ſo that a conſiderable profit is made annually from them.

BA'LLANCERS, in natural hiſtory, two ſmall oblong bodies, placed under the wings of the two-winged flies, and in ſome meaſure ſupply the office of the two other wings, which thoſe of the four-winged claſs are poſſeſſed of.

BA'LLUSTER, or **Ballister**, in architecture, a kind of column or pillar, whereof balluſtrades are formed.

BA'LSAM *of Life*. See Balsamum *Vitæ*.

Odoriferous **Balsams**, are a fragrant kind of unguents, generally of a thick conſiſtence, compoſed of ſome fatty, denſe juice, joined with ſome diſtilled oils of divers kinds.

Boerhaave's method of preparing theſe Balſams, which is this: melt an ounce of fine pomatum, in a China veſſel, over a ſmall and perfectly clear fire; then gradually add a drachm of white wax, ſhaved into thin pieces. After theſe are perfectly blended together, remove the veſſel from the fire; and, when the matter begins to thicken in cooling, drop in, by ſlow degrees, a drachm of any of the fragrant eſſential oils; keep the whole continually ſtirring, all the time the oil is dropping in, that it may perfectly mix. After which, ſet the veſſel in cold water, that the whole matter, immediately condenſing by the cold, may keep in the oil and ſpirit. When the Balſam is thoroughly cold, put it immediately up in veſſels of lead or pewter; and, if theſe are cloſe covered, it will keep perfect a great many years.

Inſtead of pomatum and wax, the expreſſed oil of nutmeg may be uſed in this proceſs, after it has been waſhed in water, till perfectly inſipid, white, and inodorous.

If theſe Balſams are required to be of any colour, it may be eaſily given at pleaſure. A ſcruple of fine cochineal, in fine powder, will tinge the Balſam of a fine purple; or the ſame quantity of the inſpiſſated juice of buckthorn-berries, to a fine green; a little native cinnabar will turn it ſcarlet: turmeric yellow; and ſmalt, to a beautiful blue. Any of theſe may be uſed at pleaſure, provided that they have no ill ſmell, or hurtful properties.

Theſe Balſams are prepared as rich perfumes, to raiſe the languid ſpirit; and the nobleſt and richeſt of the eſſential oils ſhould therefore be uſed in them. The oils, principally directed by Boerhaave to this purpoſe, are thoſe of balm, calamus aromaticus, cinnamon, cedar, citron, cloves, jaſmin, lavender, white lillies, marjoram, mace, nutmegs, origanum, oranges, both thoſe of China and Seville; roſes, rhodium, and yellow ſaunders; to which may be added, the natural Balſams of Peru and Gilead; theſe two being ſpontaneouſly fragrant without diſtillation. *Vid. Boerh. Chem.*

BA'LSAMINA, *Balſamine*, in botany, the name of a genus of plants, whoſe characters are: the flower is of the polypetalous anomalous kind, and is, in ſome ſpecies, four-leaved, and, in others, ſix-leaved. In the four-leaved flowers, the upper leaf is arched, and the lower hollowed, and terminated by a tail, and the two ſide-leaves are large. In the ſix-leaved flowers of this genus, the flower-leaf has no tail.

In both the piſtil, which is furniſhed with two leaves, occupies the middle part of the flower, and, at laſt, becomes a fruit; ſometimes turbinated at one end, or both, and ſometimes emulating the ſhape of a pod, conſiſting of ſeveral muſcles, as it were, and endued with an elaſtic force, and flying open with great violence. The ſeeds it contains, are fixed to the axis or placenta. See it repreſented in *Plate* VI. *fig.* 8.

Mr. Miller has enumerated nine, and M. Tournefort nineteen ſpecies of Balſamina.

The common white, red, and purple kinds of this plant will come up in common ground, without any artificial heat; and even be the ſtronger, and flower better, than if raiſed on hot beds. All the other varieties are raiſed from ſeeds ſown on hot beds in the ſpring, and afterwards planted into pots and borders. But the fine double large kind, or immortal eagle-flower, as it is called, requires to be ſet on a freſh hot bed, after it has been raiſed on one, in order to bring it forward; otherwiſe it will not get into flower till late in the year, and will not ripen its ſeeds; there are two kinds of this beautiful ſpecies; one brought from the Weſt-Indies, and called the cock's-ſpur, which produces large and ſtrong plants, but flowers very late: the other is from China, and called the immortal eagle-flower, and is one of the fineſt annual plants we have, producing large double flowers, and continuing a long time in flower, if ſheltered from violent winds and rain. This produces ſeeds very well with us; but, after a few years, they are apt to degenerate into ſingle flowers.

When the young plants are raiſed in a hot bed, and are to be planted out into pots, ſuch are always to be preferred as have ſtalks finely ſpotted with red; for theſe always produce red and double flowers. *Miller's Gard. Dict.*

BALSA'MUM *Traumaticum*, vulnerary balſam, a form of medicine preſcribed in the London Diſpenſatory, intended to ſupply the place of the tincture, commonly called the Friars balſam, ſo famous for curing freſh wounds. It is made thus: take of benjamin three ounces, ſtrained ſtorax two ounces, balſam of Tolu one ounce, ſuccotrine aloes half an ounce, rectified ſpirit of wine a quart; digeſt them together, till as much as may be of the gums are diſſolved, and then ſtrain off the ſpirit. *Pemberton's Lond. Diſpenſ.*

Balsamum *Vitæ*, *balſam of life*, the name of a celebrated medicine, prepared by the learned Hoffman.

This preparation is found under the title of Balſamum Vitæ Hoffmani, in the Straſburg and Ratiſbon Diſpenſatories; and is taken, with a little variation, from the author's notes on Poterius; where the following inſtructions are given for its preparation:

Take of the freſh diſtilled oils of lavender, marjoram, cloves, cubebs, cardamoms, and citron, each one ſcruple; of the oil of cinnamon, twenty-four drops: of the oils of rue and white amber, each half a ſcruple: let theſe oils be mixed together, and ſtand for ſome weeks.

When therefore we want the extemporaneous balſam of life, let ten drops of theſe oils be poured into an ounce of highly rectified ſpirit of wine. And, if we intend it ſhould be rendered more grateful, half a ſcruple of ambergriſe may be previouſly diſſolved in the oils. But this medicine will ſtill be impregnated with higher balſamic qualities, if to one ounce of it we add half a drachm of Peruvian balſam, by which it is rendered good againſt apoplexies, and is of ſingular uſe both internally and externally. Internally, it may be given from ten to twenty drops in weakneſſes, cholic pains, faintings, and lowneſs of ſpirits; and, externally, in all weakneſſes of the head, as alſo in ſpaſmodic and lethargic diſorders; it may be applied to the noſe, the wriſts, the nape of the neck, and the crown of the head.

BA'MBOE, or **Bambou**, as they ſpell that word in the Indies, and not bamboue. It is a plant that multiplies very much by its root, from which ſprings a ramous or branchy tuft, after the manner of ſome gramina, or, to ſpeak more naturally, after the manner of the European reeds; for the Bamboe is of the kind of reeds, as well as the ſugar-cane. The Indian Bamboe is the largeſt kind of cane that is known. It is of an extraordinary heighth and bigneſs, when it bears its bloſſom: each ſhoot or cane is often, towards the bottom, of the bigneſs of a man's thigh, and decreaſes gradually to the top, where it bears a bloſſom or flower, like our reeds, in their proper ſeaſon. The Bamboe grows in all the maritime countries of the Eaſt-Indies. Monſieur Lemery calls it a tree, whoſe leaves reſemble thoſe of the olive-tree. But John Bohin, from whom he has extracted his deſcription, has miſled him: for it is not a tree, though it grows very high, even to 20 or 25 feet, and ſometimes to 30. Its leaves are like thoſe of the other canes or reeds, except that they are not ſo long, nor ſo broad at their baſe, as thoſe of the other kinds: they are but half a foot long, and their breadth, towards the middle, is an inch, or ſometimes more. With theſe canes of Bamboe, the Indians build their houſes. and make all ſorts of furniture, in a very ingenious manner. The wood of theſe canes is ſo hard and ſtrong, that they ſerve very well to make piles for ſupporting their little houſes, built over rivers, which have a gentle courſe, as it were over ſtanding waters. They alſo make, with this wood, all ſorts of utenſils for their kitchens and tables. The thickeſt Bamboes ſerve to make the ſticks or poles, with which the ſlaves or other perſons carry thoſe ſorts of litters, which are called palanquins, and are of ſo common an uſe, and ſo convenient in all the Eaſt. They alſo make of that wood a kind of pales, in which the water keeps extremely cool. The walking-canes which we ſee in Europe, are the firſt and ſmalleſt ſtocks of the Bamboes. The Malays and theſe Chineſe, who are diſperſed in the Molucca and Sunda iſlands, uſe the young ſmall ſhoots of the Bamboes, preſerved in vinegar, after their manner, with very ſtrong or peppered ingredients. This they call achior Bamboe. For they give the name of achior to all that is preſerved in vinegar, and, to diſtinguiſh it, they add, to the name of achior, that of the thing preſerved.

BANA'NA, a name uſed by many authors for the muſa, or plaintain-tree, of the common kind; but more frequently, with us, underſtood to mean another ſpecies of the ſame genus, which the Portugueſe call pacoeira, and we, particularly, the Banana-tree. *Piſo.*

The difference between the two is this; the muſa has a green ſtalk, and a long, crooked, angular, fruit, reſembling a crooked cucumber; the Banana, a ſpotted ſtalk, and a round fruit. *Dale Pharm.*

BANDALI'ER, or **Bandaleer**, a kind of belt worn over the body, from the left to the right. It is uſed by horſemen to carry their carbines and muſketoons, and was formerly uſed by the foot, to faſten to it thoſe ſmall leather caſes, which they call charges. The ordonnance, or regulation publiſhed in France, in the year 1687, puts the Bandaliers among the contraband merchandizes, the exportation of which is prohibited.

BANDS *of iron*, a term uſed by blackſmiths and others, to ſignify thoſe long, narrow, and flat pieces of iron, which they forge, to faſten, ſtrengthen, or ſupport, ſeveral works of timber or bricks.

Bands are alſo thoſe iron plates which are faſtened with large nails to the jaunts of the wheels of coaches, carts, and other carriages. In France and elſewhere, theſe Bands are made of ſeveral pieces, but, in Holland and Lombardy, the Band is but one large iron hoop, which covers all the jaunts. This method of ſtrengthening wheels begins to be uſed at Paris, and is indeed the beſt.

BANK, in natural hiſtory, denotes an elevation of the ground, or bottom of the ſea, ſo as ſometimes to ſurmount the ſurface of the water, or, at leaſt, to leave the water ſo ſhallow, as uſually not to allow a veſſel to remain a-float over it.

In this ſenſe, Bank amounts to much the ſame as flat, ſhoal, &c. There are Banks of ſand, and others of ſtone, called alſo ſhelves, or rocks. In the North-ſea, they alſo ſpeak of Banks of ice, which are large pieces of that matter floating. *Aubin. Dict. Marin.*

Banks are uſually diſtinguiſhed by a buoy, poſt, or the like. On charts, ſand Banks are uſually marked by little dots, and banks of ſtone, by croſſes. The colours of the buoys are alſo varied accordingly; ſand Banks being denoted by light-coloured buoys, and rocks by black ones.

In large rivers, as the Elbe, &c. ſand Banks, by high tides and inundations, are liable to change places; care is therefore taken to ſhift the buoys from time to time, to ſhew the true channel of the river.

An exact knowledge of the Banks, their extent, and the depth of water on them, makes the moſt eſſential part of the ſcience of a pilot, and a maſter of a ſhip; if the veſſel be large, and draw much water, great attention will be neceſſary to keep clear of the Banks; on the contrary, if it be ſmall, the ſame Banks afford a ſure aſylum, where it may brave the largeſt and ſtouteſt veſſels, which dare not follow it here. By means of this barrier, many ſmall craft have eſcaped its enemy.

BA'NKER, in bricklaying, a piece of timber whereon they cut the bricks.

The Banker is ſix feet long, or more, according to the number of men to work at it, and nine or ten inches ſquare: it is to be laid on two piers of timber, three feet high from the floor they ſtand on. *Moxon. Mech. Exerc.*

BA'NKING, the making of banks to oppoſe the force of the ſea, rivers, or the like, and ſecure the land from being overflowed thereby.

With reſpect to the water which is to be kept out, this is called Banking; with reſpect to the land, which is thereby to be defended, imbanking.

Banking, in a ſalt work, the raiſing a fence againſt the ſea, whereby its waters may be kept out, excepting ſo much as is neceſſary for the preparation of the ſalt.

BA'NNER, properly denotes a ſquare flag, faſtened like a cornet to a lance. *Dict. de Trev.*

A Banner differed from a pennon, or guidon, which had a long tail, or train; the cutting of which, in the ceremony of creating a banneret, converted it into a Banner.

BA'NQUET, in the manage, denotes that ſmall part of the branch of a bridle under the eye; which, being rounded like a ſmall rod, gathers and joins the extremities of the bit to the branch, in ſuch a manner, that the Banquet is not ſeen, but covered by the cap, or that part of the bit next the branch.

BA'NTAM-WORK, a kind of Indian painting, and carving on wood, reſembling Japan work, only more gay, and decorated with a great variety of gaudy colours.

Bantam work is of leſs value among conoiſſeurs, though ſometimes preferred, by the unſkilful, to the true Japan work. Formerly it was in more uſe, and eſteem, than at preſent, and the imitation of it much practiſed by our Japanners.

There are two ſorts of Bantam, as well as of Japan work; as, in the latter, ſome are flat, lying even with the black, and others high or emboſſed; ſo, in Bantam work, ſome are flat, and others in-cut, or carved into the wood, as we find in many large ſcreens; with this difference, that the Japan artiſts work chiefly in gold and other metals, and the Bantam generally in colours, with a ſmall ſprinkling of gold here and there.

For the flat Bantam work, it is done in colours, mixed with gum-water, proper for the thing deſigned to be imitated. For the carved, or in-cut kind, the method of performing it is thus deſcribed by an ingenius artiſt: 1. The wood is to be primed with whiting and ſize, ſo often, till the primer lie near a quarter of an inch thick; then it is to be water-plained, i. e. rubbed with a fine wet cloth, and ſome time after, rubbed very ſmooth, the blacks laid on, varniſhed up with a good body, and poliſhed well, though with a gentle hand. This done, the deſign is to be traced out with vermilion and gum-water, exactly in the manner wherein it is intended to be cut; the figures, trees, buildings, &c. in their due proportions. Then the graver is applied, with other tools of proper ſhapes, differing according to the workman's fancy. With theſe he cuts deep or ſhallow, as is found convenient, but never deeper than the whiting lies; the wood being never to feel the edge of the inſtrument. Lines, or parts of the black, are ſtill to be left, for the draperies, and other outlines, and for the diſtinction of one thing from another; the rule being to cut where the white is, and leave the black untouched. The carving being finiſhed, then take to the pencil, with which the colours are laid into the cut work. After this, the gold is to be laid in thoſe places which the deſign requires; for which purpoſe, a ſtrong, thick gum arabic water is taken, and laid with a pencil on the work; and, while this remains wet, leaf gold is cut with a ſharp ſmooth-edged knife, in little pieces, ſhaped to the bigneſs and figure of the places where they are to be laid. Theſe being taken up with a little cotton, they dab them with the ſame cloſe to the gum water, which affords a rich luſtre. The work thus finiſhed, they clear up the black with oil, taking care not to touch the colours. The European workmen ordinarily uſe braſs duſt, which is leſs bright and beautiful. *Park. Treat. of Japan, c. 13. p. 37 & ſeq.*

BA'RBERRY-*Tree*, *berberis*, is very eaſily and plentifully propagated from the ſuckers taken from the roots of the old plants, which may be planted either in October or February, and ſucceed beſt in a ſtrong loamy ſoil. They may be either produced from ſeeds, or by laying down the branches; but the ſuckers are commonly ſo plentiful, as to make it unneceſſary. *Miller's Gard. Dict.*

This medicinal ſhrub is uſed, both in the berry and bark, though with oppoſite intentions.

The berry is of an agreeable, cooling, aſtringent taſte, uſed chiefly in conſerve to quench thirſt, and ſtrengthen the ſtomach: yet the bark is, by experience, found an aperient and detergent. That which grows neareſt the tree is moſt eſteemed. It is rarely found in diſpenſatory compoſitions, but much in extemporaneous preſcription, againſt the jaundice, and other diſorders from foulneſs and obſtructions of the viſcera. *Quinſ. Diſpenſ.*

BA'RBUS, in zoology, the fiſh called in Engliſh the barbel, and, by ſome writers in natural hiſtory, muſtus fluviatilis. It grows to a foot, or ſomewhat more, in length: its back is of a duſky, browniſh, olive colour, but with a paleneſs not common with other fiſh: its belly is of a ſilver white: its back and ſides are ſpotted with black ſpots: the figure of its body is long and rounded, and its back riſes into a prominence and ſharp ridge; its ſcales are of a moderate ſize, and its ſide lines dotted: its mouth is large, but toothleſs: and its upper jaw hangs out a great way beyond the lower: it has four beards, two at the angles of the mouth, and two near the edge of the jaws; and in the middle of theſe there runs a ſlender red vein: it has only one fin on the back, and its tail is forked. Its fleſh is lax and ſoft, and there is an opinion that its ſpawn is poiſonous. It is caught in many of our rivers, and in thoſe of other parts of the world. *Ray's Ichthyog. Geſner, de Piſc.*

The barbel is a fiſh commonly known, and ſo called, on account of the barb or beard under its noſe, or chaps. It is of the leather-mouthed kind.

This is but a moderately well taſted fiſh. The male is eſteemed better than the female; but neither of them is very much valued. The worſt ſeaſon for them is April. They uſually ſwim together in great ſhoals, and love to be among weeds, where there is a hard, gravelly bottom. In ſummer they frequent the ſtrongeſt and ſwifteſt current of the water, as deep bridges, weirs, and the like places, and are apt to get in among the piles, weeds, and other ſhelter; but, in winter, they retire into the deepeſt and ſtilleſt waters.

The time for taking this fiſh is very early in the morning, or late in the evening: the place ſhould be baited with chopped worms ſome time before; and no bait is ſo good for the hook as the ſpawn of the ſalmon, or ſome other fiſh: in defect of theſe, lob-worms will do; but they muſt be very clean and nice, and the hook carefully covered, otherwiſe he will not touch them. Old cheeſe ſteeped in honey is alſo a very fine bait.

The rod and line for fiſhing for this fiſh ought to be very ſtrong: the line ſhould have a running plummet, that is, a bullet with a hole through it; and a piece of lead muſt be placed a foot or more above the hook, to keep the plummet from falling upon it; the worm, or other bait, will, by this means, always be at the bottom; and the plummet will lie, and not choak the fiſh: the bending of the rod will ſhew when he bites, but indeed it will be felt in the hand by the twitch he gives; but, if not carefully managed, he will often break the tackle, for he is a very ſtrong fiſh. The beſt ſeaſon for fiſhing for this fiſh is from May to Auguſt.

BARDA'NA, *burdock*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the floſculous kind, being compoſed of ſeveral floſcules, jagged at the ends, placed upon the embryo ſeeds, and contained in one general cup, which is of a ſquammoſe ſtructure; each of the hooks of the whole being ſo bent back, as to lay hold of any thing which touches it. The embryo's finally ripen into ſeeds, winged with a ſhort down.

The root of the common burdock is a very powerful diuretic and diaphoretic. It is given, with great ſucceſs, in decoction, in obſtructions of the ſpleen, and in dropſies. It is alſo recommended by ſome in all diſeaſes of the breaſt and lungs, in aſthmas, in the ſtone, and in the ſciatica. The ſeed of it is eſteemed by many to be one of the greateſt lithontriptics known; and, by the inſtances that have been produced of its doing ſervice in nephritic complaints, it ſeems to merit a fair trial. The freſh leaves are by ſome recommended as a dreſſing for old ulcers, and for burns and uxations. They are alſo applied, by the good women, to the ſoles of the feet, as a remedy in hyſteric complaints.

The ſection of a burdock-root, viewed with a microſcope, has the appearance repreſented in *plate* VI. *fig.* 10.

BARDE'LLE, in the manage, denotes a ſaddle made in form of a great ſaddle, but only of cloth ſtuffed with ſtraw, and tied tight down with packthread, without either leather, wood, or iron.

BA'RGAIN and *Sale*, in law, is properly a contract made of manors, lands, and other things, transferring the property thereof from the bagainer to the bargainee, for a conſideration in money.

It is a good contract for land, and the fee paſſes, though it be not ſaid in the deed, to have and to hold to him and his heirs; and though there be no livery and ſeiſin given by the vender, ſo it be by deed indented, ſealed, and inrolled, either in the county where the land lies, or in one of the king's courts of record at Weſtminſter, within ſix months after the date of the deed. *Blount.*

This manner of conveying lands was created and eſtabliſhed by the 27th of Henry VIII. cap. 10. which executes all uſes raiſed; and, as this introduced a more ſecret way of conveying than was known to the policy of the common law, therefore, the inrollment of the deed of Bargain and ſale was made neceſſary, by the ſixteenth chapter of the Statute. *New Abridgement of the Law.*

BA'RGHMOTE, or BARMOTE, a court which takes cognizance of cauſes and diſputes between miners. *Pett. Fodin. Regal. in fine.*

BARI'LLIA, in the glaſs-trade, a ſort of pot-aſhes, imported from Spain, inferior in goodneſs to that of the Levant; called pulverine, when looſe, ſmall, and in powder; and rochetta, when in hard, rocky lumps. *Neri's Art of Glaſs*, page 27.

BA'RKING of trees, is the peeling off, or ſtripping the bark from the wood.

The month of May is the ſeaſon for Barking of trees, becauſe then the ſap looſens the bark from the wood; which it is very hard to effect in any other time, unleſs the ſeaſon be very wet; heat and drineſs being always oppoſite thereto.

Maliciouſly Barking of apple-trees, or other fruit-trees, is made felony, by the 37th of Henry VIII. chap. 6.

BA'RLEY, *hordeum*, a gramineous frumentaceous plant, whoſe ſeeds are of the larger ſort, being covered with a huſk growing in a ſpike, and the grains bearded.

Cultivation of BARLEY.—Some people ſow Barley upon land where wheat grew the former year; but, when this is practiſed, the ground ſhould be plowed the beginning of October, in a dry time, laying it in ſmall ridges, that the froſt may mellow it the better; and this will improve the land greatly: then, in March, the ground is plowed again, and laid even, where it is not very wet; but in ſtrong wet lands the ground ſhould be laid round, and the furrows made deep, to receive the wet. When this is finiſhed, the ſeed ſhould be ſown with a broad caſt, at two ſowings; the firſt being harrowed in once, the ſecond ſhould be harrowed until the ſeed is buried: the common allowance of ſeed is four buſhels to an acre.

It is a very common fault with farmers to ſow too much grain of all ſorts on their land; not conſidering, that, if the roots of corn ſtand very cloſe together, there will not be room for them to put out many ſtems; ſo that, frequently, there is not more than two or three ſtalks to a root; whereas, if the roots were farther diſtant, there might be ten or twelve, and, on good land, many more. I have counted upward of ſeventy ſtalks of Barley from one root, which was tranſplanted in a garden, where the ground was light, but not rich: and I am ſatisfied, by ſeveral experiments, that, where Barley is ſown early upon light ground, it ſhould not be too thick; for, if it is rolled two or three times before it ſtalks, the roots, by being preſſed, will ſhoot out a greater number of ſtalks; and it will not be ſo liable to lodge with wet, as the Barley which is ſown thick; ſo muſt, conſequently, be drawn up much taller, and have weaker ſtalks.

When the Barley is ſown, the ground ſhould be rolled after the firſt ſhower of rain, to break the clods, and lay the earth ſmooth; which will render it better to mow, and alſo cauſe the earth to lie cloſer to the roots of the corn, which will be of great ſervice to it in dry weather.

Where Barley is ſown upon new broken up-land, the uſual method is, to plow up the land in March, and let it lie fallow until June; at which time it is plowed again, and ſown with turneps, which are eaten by ſheep in winter; by whoſe dung the land is greatly improved; and then in March following the ground is plowed again, and ſown with Barley as before.

There are many people who ſow clover with their Barley; and ſome have ſown the lucern with Barley; but neither of theſe methods is to be commended; for, where there is a good crop of Barley, the clover or lucern muſt be ſo weak, as not to pay for ſtanding; ſo that the better way is to ſow the Barley alone, without any other crop among it; and then the land will be at liberty for any other crop, when the Barley is taken off the ground: but this practice of ſowing clover, rye-graſs, and other graſs ſeeds, with corn, has been ſo long and univerſally eſtabliſhed among farmers, that there is little hope of prevailing with thoſe people to alter a cuſtom which has been handed down to them from their predeceſſors; although there ſhould be many examples produced, to ſhew the abſurdity of this practice.

The time for cutting of Barley is, when the red colour of the ears is off, and the ſtraw turns yellow, and the ears begin to hang down: in the north of England they always reap their Barley, and make it up in ſheaves, as is practiſed here for wheat; by which method, they do not loſe near ſo much corn, and it is alſo more handy to ſtack; but this method cannot ſo well be practiſed, where there are many weeds amongſt the corn; which is too frequently the caſe in the rich lands near London, eſpecially in moiſt ſeaſons; therefore, when this is the caſe, the Barley muſt lie on the ſwarth till all the weeds are dead: but, as it is apt to ſprout in wet weather, it muſt be ſhook up, and turned every fair day, after rain, to prevent it. When it is carried, it ſhould be thoroughly dry; otherwiſe, if it be ſtacked wet, it will turn muſty; or, if too green, it is ſubject to burn in the mow.

The common produce of Barley is two and an half, or three quarters, on an acre; but I have ſometimes known four quarters on an acre.

Pearl BARLEY, and French Barley, are both of the ſame kind, though differing ſomewhat in the whiteneſs and ſize of the grain; and are thoſe chiefly uſed in phyſic.

Barley-water is a decoction of either of theſe, reputed ſoft and lubricating, of frequent uſe in phyſic.

This well known decoction is a very uſeful drink in many diſorders; and is recommended, with nitre, by ſome authors of reputation, in ſlow fevers.

BA'RNACLES, in farriery, are alſo called horſe-twiſters, or brakes.

Barnacles differ from pinchers, as the latter have handles to hold them; whereas the former are faſtened to the noſe with a lace or cord.

There is another meaner ſort of Barnacles, uſed in defect of the former, called roller Barnacles, or wood twiſters, which are only two rollers of wood bound together, with the horſe's noſe between them. *Dict. Ruſt.*

BARO'METER (*Dict.*)—The principal uſe of the Barometer is to eſtimate the gravity of the air at different times, in order to foreſee the alterations of the weather, which are conſequent thereon. To this end, Dr. Halley, in the 181ſt number of the Philoſophical Tranſactions, has laid down the more remarkable phænomena, relating to the different heights of the mercury at different times, together with the ſolution of each; which are ſo juſt, and ſo agreeable to true philoſophy, that I doubt not but the reader will be glad to ſee the account in his own words.

1. In calm weather, when the air is inclined to rain, the mercury is commonly low.
2. In ſerene, good, and ſettled weather, the mercury is generally high.
3. Upon very great winds, though they be not accompanied with rain, the mercury ſinks loweſt of all, with relation to the point of the compaſs the wind blows upon.
4. Cæteris paribus, the greateſt heights of the mercury are found upon eaſterly and north-eaſterly winds.
5. In calm froſty weather, the mercury generally ſtands high.
6. After very great ſtorms of wind, when the mercury has been low, it generally riſes again very faſt.
7. The more northerly places have greater alterations of the Barometer, than the more ſoutherly.
8. Within the tropics, and near them, thoſe accounts we have had from others, and my own obſervations at St. Helena, make very little or no variation of the height of the mercury in all weathers.

Hence I conceive, that the principal cauſe of the riſe and fall of the mercury, is from the variable winds which are found in the temperate zone, and whoſe great unconſtancy, here in England, is moſt notorious.

A ſecond cauſe is the uncertain exhalation and precipitation of the vapours lodging in the air, whereby it comes to be, at one time, much more crouded than at another, and, conſequently, heavier; but this latter, in a great meaſure, depends upon the former. Now, from theſe principles, I ſhall endeavour to explicate the ſeveral phænomena of the Barometer, taking them in the ſame order I laid them down: thus,

1. The mercury's being low inclines it to rain, becauſe, the air being light, the vapours are no longer ſupported thereby,

being become ſpecifically heavier than the medium wherein they floated; ſo that they deſcend towards the earth, and, in their fall, meeting with other aqueous particles, they incorporate together; and form little drops of rain; but the mercury's being at one time lower than at another, is the effect of two contrary winds blowing from the place where the Barometer ſtands; whereby the air of that place is carried both ways from it, and, conſequently, the incumbent cylinder of the air is diminiſhed, and, accordingly, the mercury ſinks: as for inſtance, if in the German ocean it ſhould blow a gale of weſterly wind, and, at the ſame time, an eaſterly wind in the Iriſh ſea; or if in France it ſhould blow a northerly wind, and in Scotland a ſoutherly; it muſt be granted, that that part of the atmoſphere impendent over England, would thereby be exhauſted and attenuated, and the mercury would ſubſide, and the vapours, which before floated in thoſe parts of the air of equal gravity with themſelves, would ſink to the earth.

2. The greater height of the Barometer is occaſioned by two contrary winds blowing towards the place of obſervation, whereby the air of other places is brought thither, and accumulated; ſo that the incumbent cylinder of air, being increaſed both in height and weight, the mercury preſſed thereby muſt needs ſtand high, as long as the winds continue ſo to blow; and then, the air, being ſpecifically heavier, the vapours are better kept ſuſpended; ſo that they have no inclination to precipitate and fall down in drops, which is the reaſon of the ſerene good weather which attends the greater heighths of the mercury.

3. The mercury ſinks the loweſt of all, by the very rapid motion of the air in ſtorms of wind. For, the tract or region of the earth's ſurface, wherein the winds rage, not extending all round the globe, that ſtagnant air which is left behind, as likewiſe that on the ſides, cannot come in ſo faſt as to ſupply the evacuation made by ſo ſwift a current; ſo that the air muſt neceſſarily be attenuated, when and where the ſaid winds continue to blow, and that more or leſs, according to their violence; add to which, that the horizontal motion of the air, being ſo quick as it is, may, in all probability, take off ſome part of the perpendicular preſſure thereof; and the great agitation of its particles is the reaſon why the vapours are diſſipated, and do not condenſe into drops, ſo as to form rain, otherwiſe the natural conſequence of the air's rarefaction.

4. The mercury ſtands the higheſt upon the eaſterly and north-eaſterly wind, becauſe, in the great Atlantic ocean, on this ſide the thirty-fifth degree of north latitude, the winds are almoſt always weſterly or ſouth-weſterly; ſo that, whenever here the winds come up at eaſt and north-eaſt, it is ſure to be checked by a contrary gale, as ſoon as it reaches the ocean; wherefore, according to what is made out in our ſecond remark, the air muſt needs be heaped over this iſland, and, conſequently, the mercury muſt ſtand high, as often as theſe winds blow. This holds true in this country, but is not a general rule for others, where the winds are under different circumſtances; and I have ſometimes ſeen the mercury here as low as at twenty-nine inches upon an eaſterly wind, but then it blew exceeding hard, and ſo comes to be accounted for, by what was obſerved upon the third remark.

5. In calm froſty weather the mercury generally ſtands high, becauſe (as I conceive) it ſeldom freezes, but when the winds come out of the northern and north-eaſtern quarters; or, at leaſt, unleſs thoſe winds blow at no great diſtance off; for the north parts of Germany, Denmark, Sweden, Norway, and all that tract from whence north-eaſterly winds come, are ſubject to almoſt continual froſt all the winter; and thereby the lower air is very much condenſed, and in that ſtate is brought hitherwards by thoſe winds; and, being accumulated by the oppoſition of the weſterly wind blowing in the ocean, the mercury muſt needs be preſſed to a more than ordinary height; and, as a concurring cauſe, the ſhrinking of the lower parts of the air into leſſer room by cold, muſt needs cauſe a deſcent of the upper parts of the atmoſphere, to reduce the cavity made by this contraction to an æquilibrium.

6. After great ſtorms, when the mercury has been very low, it generally riſes again very faſt: I once obſerved it to riſe one inch and an half in leſs than ſix hours, after a long continued ſtorm of ſouth-weſt wind. The reaſon is, becauſe, the air, being very much rarefied by the great evacuations which ſuch continued ſtorms make thereof, the neighbouring air runs in the more ſwiftly, to bring it to an æquilibrium; as we ſee water runs the faſter for having a greater declivity.

7. The variations are greater in the more northerly places, as at Stockholm, greater than that at Paris (compared by M. Paſchal) becauſe the more northerly parts have uſually greater ſtorms of wind than the more ſoutherly, whereby the mercury ſhould ſink lower in that extreme; and then the northerly winds bringing the more denſe and ponderous air from the neighbourhood of the Pole; and that again being checked by a ſoutherly wind at no great diſtance, and ſo heaped, muſt of neceſſity make the mercury, in ſuch caſe, ſtand higher in the other extreme.

8. Laſtly, this remark, that there is little or no variation near the equinoctial, does, above all others, confirm the hypotheſis of the variable winds being the cauſe of theſe variations of the height of the mercury; for, in the places above-named, there is always an eaſy gale of wind blowing nearly upon the ſame point, viz. eaſt-north-eaſt, at Barbadoes; and eaſt-ſouth-eaſt, at St. Helena; ſo that, there being no contrary currents of air to exhauſt or accumulate it, the atmoſphere continues much in the ſame ſtate: however, upon hurricanes (the moſt violent of ſtorms) the mercury has been obſerved very low; but this is but once in two or three years, and it ſoon recovers its ſettled ſtate about 29½ inches.

M. Leibnitz accounted for the deſcent of the mercury before rain, upon another principle, viz. as a body ſpecifically lighter than a fluid, while it is ſuſpended by it, adds more weight to that fluid, than when, by being reduced in its bulk, it becomes ſpecifically heavier, and deſcends; ſo the vapours, after it is reduced into the form of clouds, and deſcends, adds leſs weight to the air, than before; and therefore the mercury falls. To which it is anſwered; 1. That, when a body deſcends in a fluid, its motion, in a very little time, becomes uniform (or nearly ſo) a farther acceleration of it being prevented by the reſiſtance of the fluid; and then, by the third law of nature, it preſſes the fluid downwards, with a force equal to that whereby it tends to be farther accelerated; that is, with a force equal to its whole weight. 2. The mercury, by its deſcent, foretels rain a much longer time before it comes, than the vapour, after it is condenſed into clouds, can be ſuppoſed to take up in falling. 3. Suppoſing, that as many vapours, as fall in rain, during the ſpace of a whole year, were at once to be condenſed into clouds, and even quite ceaſe to gravitate upon the air, its gravity would ſcarce be diminiſhed thereby, ſo much as is equivalent to the deſcent of two inches of mercury in the Barometer. Farther, in many places between the tropics, the rains fall at certain ſeaſons, in very great quantities; and yet the Barometer ſhews there were little or no alterations in the weight of the air.

The following are Mr. Patrick's obſervations on the riſing and falling of the mercury: they are very juſt, and are to be accounted for on the ſame principles with thoſe of Doctor Halley.

1. The riſing of the mercury preſages, in general, fair weather; and its falling, foul weather; as rain, ſnow, high winds and ſtorms.

2. In very hot weather, the falling of the mercury foreſhews thunder.

3. In winter, the riſing preſages froſt; and in froſty weather, if the mercury falls three or four diviſions, there will certainly follow a thaw: but in a continued froſt, if the mercury riſes, it will certainly ſnow.

4. When foul weather happens, ſoon after the falling of the mercury, expect but little of it: and, on the contrary, expect but little fair weather, when it proves fair ſhortly after the mercury has riſen.

5. In foul weather, when the mercury riſes much and high, and ſo continues for two or three days before the foul weather is quite over, then expect a continuance of fair weather to follow.

6. In fair weather, when the mercury falls much and low, and thus continues for two or three days before the rain comes, then expect a great deal of wet, and, probably, high winds.

7. The unſettled motion of the mercury denotes uncertain and changeable weather.

8. You are not ſo ſtrictly to obſerve the words engraved on the plates (though, for the moſt part, it will agree with them) as the mercury's riſing and falling; for if it ſtands at Much Rain, and then riſes up to Changeable, it preſages fair weather, although not to continue ſo long, as it would have done, if the mercury were higher: and ſo, on the contrary, if the mercury ſtood at Fair, and falls to Changeable, it preſages foul weather; though not ſo much of it, as if it had ſunk down lower.

From theſe obſervations, it appears, that it is not ſo much the height of the mercury in the tube, that indicates the weather, as the motion of it up and down; wherefore, in order to paſs a right judgment of what weather is to be expected, we ought to know, whether the mercury is exactly riſing or falling; to which end, the following rules are of uſe.

1. If the ſurface of the mercury is convex, ſtanding higher in the middle of the tube than at the ſides, it is generally a ſign that the mercury is then riſing.

2. If the ſurface is concave, or hollow in the middle, it is ſinking. And,

3. If it is plain, the mercury is ſtationary; or rather, if it is a little convex; for mercury being put into a glaſs tube, eſpecially a ſmall one, will naturally have its ſurface a little convex; becauſe the particles of mercury attract each other more forcibly than they are attracted by glaſs. Further,

4. If the glaſs is ſmall, ſhake the tube; and if the air is grown heavier, the mercury will riſe about half the tenth of an inch higher, than it ſtood before; if it is growing lighter, it will ſink as much. This proceeds from the mercury's ſticking to the ſides of the tube, which prevents the free motion of it, till it is diſengaged by the ſhock: and therefore,

when an obſervation is to be made with ſuch a tube, it ought always to be ſhaken firſt, for ſometimes the mercury will not vary of its own accord, till the weather, it ought to have indicated, is preſent.

Phoſphorus of the BAROMETER.—M. Picard firſt obſerved, in the year 1676, that, on ſhaking the mercury in the Barometer, in the dark, a light iſſued; but, on trying others, found few which exhibited the ſame phænomenon.

M. Bernouilli, having tried the experiment on his Barometer, found, that, though ſhaken very forcibly, in the dark, it emitted only a weak light. He obſerved, that, on ſhaking of the Barometer, ſo as to force the mercury above and below its æquilibrium by turns, this light never ſhewed itſelf but on the deſcent of the mercury, and always ſeemed to adhere to the upper ſurface; from whence he conjectured, that there might proceed, out of the mercury, a thin ſubtile matter, which was before locked up in the cloſe interſtices of this mineral, to ſupply the uncommon vacuum in the tube, which followed on a violent concuſſion; and that there might, poſſibly, on this occaſion, ſome particles, finer than air, pervade the glaſs tube, and, by meeting thoſe which proceeded from the quickſilver, produce the effect. But why is not this phænomenon common to all Barometers? M. Bernouilli imagined that the motion of the ſubtile matter, which proceeds from the mercury in its deſcent, might be weakened, deſtroyed, or interrupted, by ſome matter heterogeneous to the mercury; which might be collected on the upper ſurface, being forced thither by the mineral, which was heavier than it; that this pellicula always formed itſelf on quickſilver, unleſs very well purified; and even then it would ſoon contract it on the admiſſion of air; that this pellicula was formed by the impurities of the air; that this concuſſion made the quickſilver collect more impurities in an inſtant, than it would have done in many days in a ſtate of reſt; and that the certain method to have a luminous Barometer, was to take care, that, in the conſtruction of it, the mercury poured into the tube ſhould be well cleanſed, and free from any foulneſs of air.

Experiments have juſtified M. Bernouilli's reaſoning exactly, except, perhaps, what he advances about the pellicula formed on the ſurface of the quickſilver.

Nothing obſtructs this phænomenon more than moiſture; for if water gets in with the quickſilver, or even rectified ſpirit of wine, though in its nature apt to take fire; yet they have the ſame effect as the pellicula, to prevent the production of the phoſphorus. The tube muſt, therefore, be thoroughly dry and clean on the inſide.

Scale of the BAROMETER.—The ingenious Mr. Biſſet, of Newington-green, has favoured us with the following method, for graduating the ſcales of common or perpendicular Barometers, when the ciſterns or baſons are cylindrical.

Rule.—Deduct the ſquare of the external diameter of the tube, from the ſquare of the internal diameter of the ciſtern; to the remainder add the ſquare of the internal diameter of the tube, and compare the amount with the ſquare of the internal diameter of the tube; and, whatever part the ſaid ſquare appears to be of the ſaid amount, deduct or cut off a like part from the three inches, for the ſcale; divide the remainder into three equal parts; which parts treat as inches, by placing the numbers 28, 29, 30, and 31, and ſubdivide them into tenths, &c. as uſual.

This rule is founded on the twelfth book of Euclid's Elements, where we learn, that cylinders are to each other as the products of their heighths, multiplied by the area of their baſes; that their baſes (being circles) are to each other as the ſquare of their diameters; hence it would follow, that, when the mercury riſes in the tube, it, at the ſame time, falls in the ciſtern, and vice verſa, in an inverſe proportion of the ſquares of their internal diameters.—But, before a true compariſon can be made, we are to conſider the two following particulars, viz. 1. That, as the tube is immerſed in the mercury in the ciſtern, the ſquare of the external diameter thereof is to be deducted from the ſquare of the internal diameter of the ciſtern, to obtain the true ſuperficial contents of the mercury in the ciſtern. 2. That, whenever the mercury riſes in the tube, it, at the ſame time, falls in the ciſtern; and that theſe two ſpaces are to be added together, to expreſs the true riſe of the mercury; ſo, vice verſa, when the mercury falls in the tube, the riſe thereof in the ciſtern is to be deducted. Hence it is plain, that the mercury always riſes more, and falls leſs, than a ſcale with full inch diviſions can expreſs; and that, in the direct proportion, that the ſquare of the internal diameter of the ciſtern, leſs by the ſquare of the external diameter of the tube, bears to the ſquare of the internal diameter of the tube: ſo that, to obtain a ſcale that will expreſs the riſe and fall of the mercury, within the compaſs of three inches, we muſt proceed by the above rule; or ſay, as the ſquare of the internal diameter of the ciſtern, minus the ſquare of the external diameter, and plus the ſquare of the internal diameter of the tube, is to three inches; ſo is the ſquare of the internal diameter of the ciſtern, minus the ſquare of the external diameter of the tube, to the length of the ſcale; which proportion will, for the following example, ſtand in figures thus: 16 — 4 + 1 : 3 inches : : 16 — 4 : 2 inches $7\frac{9}{13}$

But, perhaps, this may be better underſtood by a figure. Let therefore A B (*plate* VI. *fig.* 9.) repreſent a tube immerſed in the ciſtern B C, with the mercury ſtanding in the former, at *b*, and in the latter at *c*. Now, let us ſuppoſe the mercury in the tube to riſe to *a* (three inches) and, at the ſame time, to fall in the ciſtern to *d*; it is certain the two ſurfaces of the mercury, viz. in the tube and in the ciſtern, have removed further from each other than they were before, by the ſpaces marked *a b* in the tube, and *c d* in the ciſtern, i. e. more than three inches by the ſpace *c d*.—Now, to aſcertain the diſtance of *c* from *d*, it is firſt to be conſidered, that the mercury that paſſed out of it exactly fills that part of the tube marked *a b*; conſequently, the ſolid contents of theſe two cylindrical ſpaces are equal: and as the internal diameter of the ciſtern, the external and internal diameters of the tube, and the diſtance from *a* to *b*, are given, the diſtance from *c* to *d* may be found, from the nature and effect of cylinders; by ſaying, as the ſquare of the internal diameter of the ciſtern, minus the ſquare of the external diameter of the tube (for, as the tube occupies part of the ciſtern, the ſquare thereof muſt be deducted from the ſquare of the ciſtern) is to the ſquare of the internal diameter of the tube; ſo is the diſtance *a b* to the diſtance *c d*; which, being thus obtained, muſt be added to *a b*, to expreſs the true riſe of the mercury. Hence it is plain, a ſcale, with full inch diviſions, cannot ſhew the true riſe of the mercury; and it will appear as plain, by carefully conſidering the figure, that it cannot ſhew the true fall thereof. In both caſes it is deficient; therefore the ſcale *a b*, which we have hitherto ſuppoſed to be three inches, ſhould exceed it, by the addition of a ſpace equal to *c d*; but as this cannot be done without marking fractional quantities on the ſcale (which would puzzle common obſervers) the beſt method is to let the ſcale expreſs only three inches, by making it proportionably ſhort thereof; by ſaying, as *a b* + *c d* : three inches : : three inches to the length required; which, when found, muſt be divided into three equal parts, and numbered as inches, as above directed.

Example.—Suppoſe the diameter of the bore of the tube to be $\frac{1}{4}$ inch, the external diameter thereof $\frac{2}{4}$ or $\frac{1}{2}$ inch, and the internal diameter of the ciſtern to be only * $\frac{4}{4}$ or one inch; and let us ſuppoſe the ſquare of the diameter of the bore of the tube to be the integer, then will the ſquare of the internal diameter of the ciſtern be (in ſuch parts) ſixteen; from which deducting the ſquare of the external diameter of the tube, viz. four, there will remain twelve; to this remainder, add the ſquare of the diameter of the bore, viz. 1, the amount will be 13; i. e. $\frac{1}{13}$ part of three inches (equal to $2\frac{4}{13}$ tenths of an inch) is to be deducted from the common ſcale of three inches; or, in other words, the ſcale ſhould, for this example, be only two inches $\frac{7}{1}$ and $\frac{9}{13}$ of a tenth long. Now, ſuch a ſcale, being divided as above, will, in every point thereof, ſhew, in inches and tenths, the true height of the mercury in the tube, from the ſurface of that in the ciſtern; which is the diſtance that ſhould be expreſſed: whereas the beſt Barometers, with the preſent ſcale (of full three inches) will ſhew the true diſtance at one point only, viz. that where the mercury ſtood when the ſcale was fixed; but, whenever the mercury riſes above, or falls below, that point, the expreſſion is erroneous.

* I chuſe to give an example, by a ciſtern of a ſmall diameter, as ſuch an one will ſave much mercury, and, at the ſame time, be equally true with one of a larger diameter.

BA'RRACKS, in military affairs, buildings to lodge ſoldiers in fortified towns, or others. Thus we ſay the Barracks of the Savoy, of Dublin, &c.

Barracks, when damp, are greatly prejudicial to the health of the ſoldiers lodged in them; occaſioning dyſenteries, intermitting fevers, coughs, rheumatic pains, &c. For which reaſon quarter-maſters ought to be very careful in examining every Barrack, offered by the magiſtrates of a place; rejecting all ground-floors in houſes that have either been uninhabited, or have any ſigns of moiſture. *Vid. Pringle, Obſerv. on the Diſeaſes of the Army.*

BA'RREL *of a pump*, is the wooden tube, which makes the body of the engine, and wherein the piſton moves. *Ozan. Dict. Math.*

BARREL *of a muſket, firelock, piſtol, or the like*, is that part wherein the charge or load is put.

BARREL *of a clock*, is a cylindrical part, about which the ſtring is wound, anſwering to what in watches is properly called the fuſy. *Derham's Artif. Clock-maker.*

BARREL *of a jack*, is the cylindrical part whereon the line is wound. *Moxon's Mech. Exer.*

BA'RRING *a vein*, an operation performed by farriers on the veins of horſes legs, and of other parts, in order to ſtop the courſe, and leſſen the quantity of the malignant humours which prevail there.

It is done by opening the ſkin above the part, and, after diſengaging it, and tying it both above and below, ſtriking between the two ligatures.

When horſes have got traverſe mules, or kibed heels, and rat-tails, or arreſts in the hinder legs, it is common to bar a vein. *Farr. Dict.*

BA'RRY-*Pily*, in heraldry, is when a coat is divided as repreſented in *Plate* VI. *fig.* 11. which is blazoned, Barry-pily, of eight pieces.

BARS *of iron*, are made of the metal of the ſows and pigs, as they come from the furnaces.

Theſe paſs through two forges, called the finery and the chaufery, where, undergoing five ſeveral heats, they are formed into Bars. See IRON *Works*.

BA'SKET *Salt*. This is a brine ſalt, made from the water of our ſalt ſprings in Cheſhire and elſewhere, differing from the common brine ſalt in the fineneſs of the grain, and in its whiteneſs and purity. See SALT.

BA'SON, *pelvis*, in anatomy, a round cavity in the form of a tunnel, ſituate between the anterior ventricles of the brain, deſcending from its baſe, and ending in a point at the glandula pituitaria.

It is formed of the pia mater, and receives the pituita which comes from the brain and paſſes through the pituitary gland, and from thence into the veins.

That capacity alſo is called pelvis, or baſon, which is formed by the oſſa ilia and ſacrum, and contains the bladder of urine, the matrix, and the inteſtines.

BASONS *of a balance*, two pieces of braſs, or other matter, faſtened to the extremities of the ſtrings; the one to hold the weight, the other the thing to be weighed.

BASON, or *diſh*, among glaſs-grinders. Theſe artificers uſe various kinds of Baſons, of copper, iron, &c. and of various forms, ſome deeper, other ſhallower, according to the focus of the glaſſes to be ground. In theſe Baſons it is, that convex-glaſſes are formed, as concave ones are formed on ſpheres or bowls.

Glaſſes are worked in baſons two ways. In the firſt, the Baſon is fitted to the arbor or tree of a lath, and the glaſs (fixed with cement to a handle of wood) preſented and held faſt in the right hand within the Baſon, while the proper motion is given by the foot of the Baſon. In the other, the Baſon is fixed to a ſtand or block, and the glaſs with its wooden handle moved.

The moveable Baſons are very ſmall, ſeldom exceeding five or ſix inches in diameter, the others are larger; ſometimes above ten feet diameter.

After the glaſs has been ground in the Baſon, it is brought ſmoother with greaſe and emery; and poliſhed firſt with tripoli, and finiſhed with paper cemented to the bottom of the Baſon.

BASON, among hatters, is a large round ſhell, or caſe, ordinarily of iron, placed over a furnace; wherein the matter of the hat is moulded into form.

The hatters have alſo Baſons for the brims of hats, uſually of lead, having an aperture in the middle, of a diameter ſufficient for the largeſt block to go through.

BASON, is alſo uſed on various occaſions for a ſmall reſervatory of water: as the Baſon of a jet d'eau, or fountain, the Baſon of a port, of a bath, &c. which laſt Vitruvius calls labrum.

BASON *of a port*, denotes the place where the ſhips lie.

The word is alſo uſed for a ſmall private port contrived in a large one, for the refitting of veſſels, more frequently called a dock. See DOCK.

BASONS *or Fountains*, among gardeners, are reſervoirs for holding water either for the ornament or uſe of the garden.

They are made in divers forms, ſome round, ſome oblong or oval, others ſquare, octangular, &c. but their moſt common form is circular; and, if the ground will permit, the larger they are, the better: and, when they exceed in ſize, they are called pieces of water, canals, fiſh-ponds, pools, &c.

In making theſe, care ought to be taken to avoid both extremes, and not to make them too big or too little; that a water-work may not take up the beſt part of a ſmall piece of ground; nor to make too little a Baſon in a large ſpot. This muſt depend intirely on the judgment of the deſigner of the garden.

Some would have the ſize of a Baſon to be proportioned to the jet d'eau, that the water, thrown up in the air, may not, by being blown by the air, be carried beyond the edge of the Baſon, but all fall down without wetting the walk.

As to the depth of Baſons, it uſually from two to three feet; this depth being ſufficient to ſecure the bottom of the Baſons from froſt, and to dip watering-pots.

But if they are to ſerve as reſervoirs, or to keep fiſh in, then they may be made four or five feet deep, which will both hold water enough, and be deep enough for the fiſh to breed in, and alſo to bear a boat.

Deeper than this they ſhould not be; for, if they were deeper, they would be dangerous as to the drowning of perſons, who might chance to fall in.

In making Baſons, great care ought to be taken of making them at firſt; for the water always naturally endeavouring to run away, and, by its weight and preſſure in a Baſon, making its way out at the leaſt cranny, it will grow conſtantly bigger and bigger; ſo that, if it be not well made at firſt, it will be very difficult to repair it.

Baſons are made either with clay, cement, or lead; they are moſt uſually made of clay: in making ſuch, at the marking out the dimenſions, the diameter ought to be four feet bigger on each ſide; yet the Baſon will not be the wider, for it will be taken up with the walls on each ſide; and the clay-work, which is to fill the ſpace between the Baſon, muſt alſo be dug two feet deeper than the depth of the water is deſigned to be, becauſe it is to be laid over eighteen inches thick with clay, and ſix inches with gravel and paving.

The clay ought to be well wrought with the hands and water; and, when it is ſpread, ſhould be trodden in with the naked feet, that the water of the Baſon may not dilute through it, and the roots of any trees that may grow near, may not penetrate into the outward wall; which may be made of ſhards, rubble, or flints, with mortar made of the natural earth, and is called the ground-wall, becauſe it is only made to reſiſt the preſſure of the ground about it. The inward wall ought to be made with good rubble-ſtones, that will not ſcale and come off in flaſhes in the water; or elſe of flints and ſtones from the hills, which will make durable works, but will not look ſo neat as the pointed rubble; and there ought to be laid here and there ſtones, the thickneſs of the wall, to render it the more ſubſtantial.

The method of making Baſons of cement is as follows: after you have marked out the dimenſions of the Baſon, as before, if you inlarge it one foot nine inches, it will be ſufficient; and the ſame depth deeper at the bottom will be enough.

This being done, you muſt begin to back up and raiſe againſt the ground: cut perpendicularly a wall of maſonry a foot thick, which muſt go to the bottom, and ſhould be built with ſhards and rubble-ſtones laid in a mortar of lime and ſand. When the wall is finiſhed round the circumference, then the bottom is to be wrought a foot thick with the ſame materials; and the ſolid work or lining of cement is to be backed up againſt the walls nine inches thick, including the plaiſtering and inward ſurface.

This ſolid ought to be made of ſmall flints, laid in beds of mortar made of lime and cement.

When this ſolid is eight inches thick, it ought to be plaiſtered over the whole ſurface of the bottom with cement well ſifted before it be tempered with lime; and with this it ſhould be wrought over ſmooth with the trowel.

The proportion of this cement ſhould be two-thirds of cement or powdered tile to one-third of lime.

This cement has the property ſo to harden under-water, that it will be as hard as ſtone or marble, and the body will be ſo ſolid as never to decay.

After the finiſhing of the Baſon, the plaiſtering ſhould be for four or five days ſucceſſively anointed over with oil, or bullocks blood, to prevent it from cracking or flawing: this being done, the water ſhould be let into the Baſon as ſoon as may be.

Thoſe Baſons which are made of lead, are to be thus wrought: the out-lines ought to be inlarged one foot of a ſide, and digged half a foot deeper than the Baſon is to be. The wall muſt be made a foot thick, that it may be able to bear up againſt the earth lying againſt it; but the bottom will not require to be more than half a foot thick.

Theſe walls muſt be built with rubble laid in mortar all of plaiſter, becauſe the lime will corrode the lead; and then the lead muſt be laid on the walls and bottom, and be ſeamed with ſolder.

But Baſons of lead are not much in uſe, becauſe of their great charge in making, and the danger of the lead being ſtolen.

Great care ought to be taken to keep the upper edge and ſuperficies of a Baſon upon a level, that the water may cover all the wall equally.

As for the waſte pipes of Baſons, whether at the bottom or ſuperficies, they ought not to be made too ſmall, leſt they ſhould be choaked, notwithſtanding the cauls that are drawn before them.

When this waſte water is only to be loſt in ſinks and common-ſewers, it is carried away in drains, or earthen-pipes; but, when it ſerves to play the Baſons that lie below it, it muſt paſs through leaden-pipes.

Theſe Baſons are now pretty generally rejected by perſons of good taſte, as being no-ways ornamental: therefore, where there is a neceſſity to make reſervoirs for water for the uſe of gardens, they are commonly dug in the loweſt part of gardens, or where the ſpot is moſt convenient for receiving the water which may run from the adjacent grounds in hard rains. Theſe ponds ſhould have their ſides made very eaſy; for, if they are too upright, the earth frequently breaks down, by the water waſhing and making it hollow below: the ſides and bottom of theſe ponds ſhould be laid nine or ten inches thick with well wrought clay; and, as the clay is finiſhed, it ſhould be well covered to prevent the ſun and wind from cracking it before the water is let in: the figures of theſe ponds ſhould not be regular; for the ſhape of the hollow, where they are made, ſhould be followed, which will ſave expence and have a better appearance.

BA′SIL, among joiners, denotes the angle to which the edge of an iron tool is ground.

To work on ſoft wood they uſually make their Baſil twelve degrees, for hard wood eighteen; it being obſerved, that, the more acute or thin the Baſil is, the better and ſmoother it cuts; and, the more obtuſe, the ſtronger and fitter for ſervice.

BA′SSETING, in the coal-mines, denotes the riſe of the vein of coal towards the ſurface of the earth, till it come within two or three feet of the ſurface itſelf.

This is alſo called by the workmen croping, and ſtands oppoſed to dipping, which is the deſcent of the vein to ſuch a depth, that it is rarely, if ever, followed to the end.

BA′STION (*Dict.*)— To conſtruct the plan of a Baſtion.

1. Draw a capital line B K (*Plate* VI. *fig.* 12.) and make the angles M B K, F B K, each equal to half the flanked angle.
2. Take the lines B F, B M, each of the length of the face.
3. At the points F, M, make the angles of the ſhoulder B F H, B M N.
4. Make the lines F H, M N, each the length of the flank.
5. At the points H, N, make the angles F H G, M N *a*, equal to the angle of the curtin, and draw the pieces of the curtin H G, N *a*.

This problem may be found uſeful on many occaſions; particularly when the drawings of works in a Baſtion are to be repreſented with that Baſtion only, on a large ſcale; therefore it was here introduced, more eſpecially for beginners, who are for the moſt part apt to be ſomewhat puzzled about conſtructing part of a work, independent on the whole.

BAT, in phyſiology, a mongrel or amphibious ſort of animal, partaking both of the mouſe and the bird, and flying, but without feathers.

The Bat, called alſo by us lapwing, and flittermouſe, by the Latins, veſpertilio, ſeems a medium between the quadruped and the feathered kinds; but it partakes more of the former tribe, agreeing only with the birds in the ſternum, and the poſition of its liver; and with the quadrupeds in the kidneys, bladder, teeth, penis, teſticles, diaphragm, and lungs. In reality, it only appears to be a bird by its flying. They lay themſelves up in the winter in the drieſt apartments of caves; where planting their talons to the roof, they cover their bodies with their wings, and ſo hanging perpendicularly in great numbers, but ſo as not to touch each other, they ſleep for ſome months.

BAT-*Fowling*, a method of catching birds in the night, by lighting ſome ſtraw or torches near the place where they rooſt: for, upon beating them up, they fly to the flames, where, being amazed they are eaſily caught in nets, or beat down with buſhes fixed to the ends of poles, &c.

BA′TEMENT, a term in carpentry, ſignifying an abatement or waſte of a piece of ſtuff, by forming it to a deſigned purpoſe or uſe: thus, inſtead of aſking how much was cut off from ſuch a board or piece of ſtuff, they ſay what abatement had that piece of ſtuff.

BATH *Metal*, a preparation of copper with zink, which gives a more beautiful colour than the calamine uſed in the preparation of the common braſs. See PRINCE's *Metal*.

BA′TISTE, in commerce, a fine white kind of linen cloth, manufactured in divers parts of the Spaniſh Netherlands. There are three kinds of Batiſte; the firſt very thin; the ſecond leſs thin; and the third much thicker, called holland. The chief uſe of Batiſte is for neck-cloths, head-cloaths, ſurplices, &c. *Savar. Dict. Comm.*

BA′TMAN, a weight in Turkey conſiſting of ſix okes. Forty of theſe Batman's make a camel's load, and amount to about ſeven hundred and twenty pounds Engliſh weight. *Pocock's Egypt.*

BATRACHOMYOMA′CHIA *, battle of the frogs and the mice; the title of a fine burleſque poem, uſually aſcribed to Homer.

The ſubject of the war is the death of Pſycharpax, a mouſe, ſon of Toxartes, who, being mounted on the back of Phyſignates, a frog, on a voyage to her palace, to which ſhe had invited him, was ſeized with fear when he ſaw himſelf in the middle of the pond, ſo that he tumbled off and was drowned. Phyſignates being ſuſpected to have ſhook him off with deſign, the mice demanded ſatisfaction, and unanimouſly declared war againſt the frogs.

Stephens, Nunneſius, and other modern authors, take the poem not to be Homer's; but ſeveral of the ancients ſeem of another opinion; and Statius, who wrote under Domitian, makes no doubt of it.

BA′TTEN (*Dict.*)— This term is chiefly uſed in ſpeaking of doors, and windows of ſhops, &c. which are not framed of whole deal, or one quarter inch-oak, with ſtiles, rails, and pannels, as wainſcot is framed; and yet they are made to appear as if they were, by means of theſe pieces or Battens, bradded on upon the plain boards which are joined together for the door, or window, all round, and ſometimes croſs them, and up and down, &c. according to the number of the pannels, the workman deſigns the door, or window, ſhall appear to have.

Theſe pieces, which are thus bradded on, to repreſent ſtiles, rails, and montans, and are of different breadths according to the deſign of the workman, as from two to ſix or ſeven inches; and there is uſually ſome moulding ſtruck, as a bead, an ogee, or the like, on one edge of thoſe that repreſent the ſtiles, and the upper and lower rails, and on both the edges of thoſe which are deſigned to appear like montans and middle rails.

BATTEN *Doors*, are ſuch as ſeem to be wainſcot ones, but are not; for, in wainſcot ones, the pannels are grooved into the framing; but, in theſe, they firſt joint and glue the boards, which are cut to the full length and breadth of the door-caſe; which gluing being dry, they traverſe them over with a long plane; and, being ſmoothed, the Battens are fitted on, on the front-ſide. And theſe are called ſingle Batten-doors; for there are others, called double Batten-doors, viz. ſuch as are battened on both; though this is but rarely done.

But there are battened doors, which are called double doors, ſuch as front or outer-doors; which are uſually made of whole deal, and afterwards battened on the outſide, and pieces, four or five inches broad, mitred round the edges on the inſide of the door; and then it is lined croſs the door betwixt theſe pieces, with thin ſlit-deal, which renders it level with the mitred pieces.

Some doors have been lined with pieces laid bevelling, and not at right-angles, but near mitre to the ſides of the door; and, when all has been plained off level, it has been divided into rhombus's, and ſtruck with a pencil, and round-headed nails driven in at the angles of the rhombus's, which added ſomething of beauty to the work.

This way of lining upon the doors, viz. pointing from the lower corner behind, towards the upper corner before, ſeems to be a good way to prevent a door from ſagging or ſinking at the fore-corner, whenever the joints ſhall happen to unglue. *Builder's Dict.*

BA′TTER, a term uſed by bricklayers, carpenters, &c. to ſignify that a wall, piece of timber, &c. doth not ſtand upright, but leans from you, when you ſtand before it.

BA′TTERY (*Dict.*)— All field Batteries conſiſt of four chief parts, namely, the ditch, the parapet, the platform, and the magazine.

The Ditch is uſually dug in the front and ſides, and ſometimes quite round; and ſerves not only to furniſh the earth neceſſary for the parapet, but it alſo prevents the enemy from entering the Battery ſo readily as he might otherwiſe do.

The ditch in front is commonly eighteen or twenty feet broad, and the depth about ſeven or eight feet; the ſides ſloping towards the bottom, which is about ſix feet wide: but the ditches on the ſides are about ten feet wide, and ſix feet deep. Theſe are the dimenſions uſually given; but the general practice ſeems to be, only to get earth ſufficient for the work, and not mind the regularity of the ditch: for, as theſe works in attacks are uſually done by night, the keeping ſtrictly to the aſſigned dimenſions is hardly practicable.

The parapet is generally raiſed about three or four feet diſtant from the brink of the ditch, the ſpace left between, called the berm or foreland, ſerving to lodge the rubbiſh beat down by the enemies ſhot, that it may not fall into the ditch.

The thickneſs of the parapet ſhould be about eighteen or twenty feet, in order to be cannon-proof, and about ſeven or eight feet high, when the enemy has no command above the Battery: but, if they have a command over this height, the parapet ſhould be raiſed high enough to cover the men when they load the guns.

The length of the parapet depends on the number of guns to be employed in the Battery.

Thus, for one gun allow eight yards in length. And ſix yards more for every other gun. So two guns have fourteen yards, three guns twenty yards, four guns twenty-ſix yards, &c.

There ſhould be great care taken that the Battery be not enfiladed or raked by the enemies cannon: neglects of this kind are often fatal to the officers and gunners, as was well known at the ſiege of Carthagena, anno 1741. But this is eaſily prevented by raiſing at one, or both ends of the parapet, a bank acroſs the Battery called an epaulment, of the ſame thickneſs and height with the parapet, and about fifteen or eighteen feet long.

The parapet conſiſts of two parts, namely, the wall and the merlons.

The wall is that part of the parapet, which is contained in one piece from end to end, and is about two and a half or three feet high.

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* The word comes from the Greek βάτραχος, frog, μῦς mouſe, and μαχη, battle.

The merlons are detached pieces of the parapet, leaving openings called embraſures, through which the cannon deliver their ſhot.

The embraſures ſhould, as much as is poſſible, be cut perpendicular to the parapet; therefore the Battery ſhould be parallel, or nearly ſo, to the object to be battered: for the direct ſhots have moſt force; and oblique embraſures weaken the merlons, or parts of the parapet ſtanding between the embraſures.

The embraſures are uſually about two or two and a half feet wide on the inſide, and about nine or ten feet on the outſide: whereby the cannon may be traverſed from the right to the left, ſo as to command a pretty large extent in front.

The diſtance from the middle of one embraſure to the middle of the next ſhould be about eighteen feet, in order to leave ſufficient room for the working of the guns, and the ſtowage of the ſhot and other neceſſaries.

Platforms are generally laid ſloping towards the parapet nine or ten inches; this carries off the rain, prevents the gun from recoiling ſo much when fired as it would do if laid level; and, when loaded, it is more eaſily brought to the embraſure.

In temporary Batteries, the platforms are made of planks laid acroſs ſome ground timbers or ſleepers: there is uſually a platform made to each gun; it is about eighteen feet long, eight feet broad next the parapet, and about fourteen feet broad at the tail, the intermediate ſpaces between the platforms ſerving for the ſhot and other neceſſaries.

When a platform is to be laid on marſhy ground, firſt lay a floor or two of faſcines; cover theſe with hurdles of twelve or fifteen feet long, and ſix or ſeven broad; on theſe lay a floor of three or four inches of earth, and therein lay the ſleepers, and over theſe the planks.

When a Battery is built of ſtone or brick, the platform is generally a flat-ſtone pavement ranging the whole length of the Battery: this, on account of its reſiſting the injuries of the weather for a long time, is to be preferred to planks; but, in caſe of a bombardment, ſuch a platform is to be avoided, becauſe the ſhells will not only break the pavement, but alſo, by driving about the broken ſtones, do the troops much miſchief.

The magazine to a field Battery is uſually made about fifty or ſixty yards behind the platform: it is a cavity dug in the ground, about four feet deep; the earth whereof is thrown between the pit and the platform; the ſides of the pit are ſometimes planked round to keep it dry, and prevent the earth from crumbling in; and the powder barrels placed herein are covered with hurdles and earth, or tanned hides, to preſerve the powder from wet and fire.

The communication to the magazine is by a ſloping trench beginning to deſcend about five or ſix yards behind the platform; and the earth thrown on that ſide where it will moſt conveniently cover the perſons who remove the barrels of powder from the great magazine to the Battery, or ſmall magazine.

When there are many cannon in Battery, and the ſervice is quick, it is cuſtomary to have to every two pieces a ſmall magazine to hold twenty or thirty barrels of powder: this is placed about fifteen or twenty yards behind the platform, and againſt the merlon between the cannon; and, as theſe barrels are uſed, they are replaced by others from the great magazine.

At each magazine a centinel is placed to prevent accidents.

And, to prevent perſons coming into the Battery and magazines who have no buſineſs there, a trench is ſometimes dug behind the magazine, and carried into the trenches which communicate between the magazine and Battery.

To conſtruct a Faſcine Battery.— For one gun provide faſcines, of 9 feet, 600; of 6 feet, 100; of 3 feet, 120.

And, for every other piece of 9 feet, 400; of 6 feet, 100; of 3 feet, 100; each faſcine being about nine inches thick; and let there be three or four pickets for every faſcine, for many will break in driving.

Trace the limits of the parapet in two parallel lines about eighteen feet diſtant, allowing eight yards in length for one gun, and ſix yards for every other gun; and along theſe line cut a trench about half a ſpade deep.

Lay a row of nine feet faſcines along one trench, obſerving that their ends be well jammed one into the other, and let each be pegged down with two pickets, drove into the ground till the head is ſunk into the faſcine.

Cloſe to this row lay another, letting the two end ones be of ſix feet, and the reſt nine feet, whereby the joinings in this row will not fall againſt the joinings in the firſt row: let theſe be alſo ſtaked down as before. Cloſe to the ſecond row lay a third all of nine feet. Cloſe to the third lay a fourth, the two end ones being ſix feet, and the reſt nine feet. In this manner lay the rows of faſcines within the limits ſtaked out, which will be covered with twenty-four rows; then over this floor of faſcines ſprinkle earth to fill up the hollows, and let the whole be trod or rammed down.

On the firſt floor lay a ſecond, obſerving, that as in the firſt floor every ſecond row ended with ſix feet faſcines; ſo in the ſecond floor let every odd row end with ſix feet ones, whereby the joinings of no two faſcines in this floor will fall over the joining of the faſcines below them. Let the outſide rows in the ſecond floor be ſo placed over thoſe of the lower, that there be a little ſloping preſerved, the work narrowing upwards. The pickets which ſtake down this floor are to be drove up to the head, and the channels or hollows in the floor are to be filled up with earth. In this manner lay four floors, which will raiſe the work to about two and a half or three feet; and that part of the breaſt-work called the wall will be compleated.

Meaſure from each end of the wall twelve feet, there ſtick a ſtake; and plant other ſtakes at every intermediate eighteen feet: this being done on the inſide of the wall, let other ſtakes be planted on the outſide, either directly oppoſite the former, or in the line towards the place where the gun is more particularly intended to deliver its ſhot. Plant other ſtakes on the inſide, one a foot diſtant on each ſide the former, and this will leave ſpaces of two feet each for the inner opening of the embraſures: Then, on the outſide, plant other ſtakes at five or ſix feet diſtance from the former ones, one on each ſide, and ſpaces of ten or twelve feet will be marked out for the outſide openings of the embraſures.

In the direction of the pickets which limit the inner and outer openings of the embraſures, let ſingle rows of faſcines be ſtaked down acroſs the wall, and theſe will be the ſides of the embraſures: fill the intermediate ſpaces or merlons with rows of faſcines laid lengthwiſe to the wall, and this will be the firſt floor of the merlon, which is to be picketed down, and the hollows filled with earth as before directed. Let other floors be raiſed in like manner, until the merlons are carried up to about five or ſix feet, or more, if neceſſary; and on the top of each let a bed or floor of earth be laid of about 8 or 12 inches thick.

Acroſs the top of the inner opening of the embraſure, either lay a bundle of 10 or 12 faſcines bound together, or as many ſtuffed into a kind of baſket open at both ends, and the bundle well ſtaked to the merlons.

Provide a blind made of planks three or four inches thick, to fit the inner opening of the embraſure, which is to be put up, while the gunners are loading the piece, to preſerve them from the fire of the muſketry.

The cheeks or ſides of the embraſures are to ſlope ſo, as to have the top wider than the bottom; which not only leaves a greater opening for the blaſt of the gun, but theſe ſlopes in works of this kind give a greater degree of ſtrength to ſupport themſelves againſt the thruſt of the upper parts.

Againſt each embraſure lay on the ground five pieces of timber called ſleepers, of about eighteen feet long and ſix or eight inches ſquare; let the ends next the embraſure be placed at ſuch a diſtance from one another, that the diſtance from out to out be about ſix feet, the other ends ſpreading about twelve or fourteen feet from out to out; drive two ſtakes of about three inches ſquare into the ground on both ſides of each end of every ſleeper, whereby they will be kept ſteady in their places, and let the earth be well rammed and beat up cloſe to them: but obſerve to let the tails of the ſleepers be raiſed about ſix or eight inches higher than the ends next the wall, to prevent the cannon from recoiling too much, when fired.

Cover the ſleepers with planks of about two inches thick laid croſswiſe; that next the embraſures being about eight feet long, the reſt gradually increaſing, ſo that the plank at the tail be about fourteen feet long; and let the planks be nailed to the ſleepers.

On this floor fix a piece of timber of about ſix or eight inches ſquare next the embraſure, to ſerve as a ſpur for the carriage wheels to knock againſt (and is therefore uſually called the knocker) when the gun is run up to the wall; obſerving that the ſpur be laid parallel to the object to be battered.

The whole platform ſhould be of oak, if it can be had.

If there is any danger of the Batteries being raked by the enemies cannon, let an epaulment or ſcreen be raiſed at one or both ends of the parapet, joining to it, and conſtructed by floors of faſcines, as before ſhewn: then, all the ſtraggling twigs of the faſcines being cut off, the Battery is conſtructed.

A Battery thus made will do in caſe of haſte, and where earth enough is not eaſily had: but, as it is ſubject to be fired when the wood is dry, it is not ſo much in uſe as another ſort called a coffer Battery, eſpecially where wood is ſcarce and earth plenty.

A Coffer Battery, is that where the ſides of the wall and merlons only are formed of faſcines, and all the cavities or included ſpaces filled with earth.

The place of the Battery being determined, make out, with a line of ſome kind, the limits of the parapet of about eighteen or twenty feet thick; and, three or four feet before the parapet, mark out with lines, or ſtakes, the limits of the ditch of about ten or twelve feet broad, or more, if earth is wanted; allowing eight yards in length for one gun, and ſix yards more for every other gun.

On the outlines of the parapet, cut a trench of about five or ſix inches wide and deep, and therein lay a row of faſcines, the ends being jammed one into the other; let theſe be ſtaked down: lay on them another row, ſo that the joinings of theſe be not directly over the joinings of the lower one, and the knots of all the bands turned inwards; ſtake theſe down, and on them lay, in like manner, a third and a fourth row, &c. until the height be about three feet. The ſame kind of work being done at the ends, and for the epaulment, if wanted, the coffer for the wall will be made.

Then let the men be diſpoſed along the place intended for the ditch, and, with the proper tools, break the ground, and throw it into the coffer; where another ſet of men are, as the earth is thrown in, to ſpread it and ſtamp it down with rammers; and this work is to be continued until the coffer is filled.

When the wall is finiſhed, let the embraſures be ſtaked out as before, and a coffer formed in like manner, as for the wall, for each merlon, which is alſo to be filled with earth, and rammed down.

The other articles in the preceding Battery are to be followed in this, the only difference being in the making of the parapet.

When a proper place for a temporary Battery is deſtitute both of dry earth and wood, then materials muſt be carried to the place; theſe uſually are gabions and earth-ſacks.

To make a gabion BATTERY.—Along the line, pitched out for the Battery, let the gabions be planted in the places where the merlons are to be: the gabions uſed are of five, ſix, and ſeven feet diameter, and eight feet high. Each merlon muſt have ſeven; that is, three within, of ſix feet diameter, next, two of ſeven feet diameter, and, on the outſide, two of five feet diameter; obſerving to leave proper openings for the embraſures, of about two feet on the inſide, and nine or ten on the outſide.

Or thus: let the merlons be made of gabions five feet diameter; then put four within, three in the middle, and two on the outſide; this conſtruction being rather ſtronger than the former.

The ends and epaulments are alſo formed by three rows of gabions.

The floors or bottoms of the embraſures are to be filled with gabions of about three feet high, and of a proper diameter, to fill up the ſpaces between the merlons.

The gabions being placed, they are to be filled with earth brought from the neareſt places that will afford it, in the earth-ſacks; or elſe they may be filled with dung, mingled with ſand; and, in caſes of neceſſity, they may be filled with large faggots, or billet-wood, obſerving that the voids between the gabions are alſo filled.

Batteries of this conſtruction are uſually made on marſhy or rocky ground. *Robertſon's Elem. Nov.*

BATTERY is ſometimes uſed in ſpeaking of the fabric of metalline utenſils.

In this ſenſe, Battery-works include pots, ſaucepans, kettles, and the like veſſels, which, though caſt at firſt, are to be afterwards hammered or beaten into form.

A ſociety for the mineral and Battery-work of England was incorporated by queen Elizabeth, to whom ſhe granted all mines, minerals, and ſubterraneous treaſures, except copperas and alum, in all parts of England, not mentioned in the patent of the ſociety of the mines royal. This ſociety has a governor, court of aſſiſtants, and other officers, who are the ſame as thoſe for the mines royal, with whom they are now aſſociated.

BAY, among carpenters, part of the capacity of a barn.—Thus, if a barn conſiſts of a floor and two heads, where they lay the corn, they call it a barn of two Bays.

BAY-*window*, in architecture, one that is compoſed of an arch of a circle, and ſtands without the ſtreſs of the building.

BAYS *(Dict.)*—This ſtuff is without wheal, and is wrought on a loom, with two treddles, like flannel. It is chiefly manufactured at Colcheſter and Bockin in Eſſex, in England, where there is a hall, called the Dutch Bay-hall, or Raw-hall. By the ſtatute, 12 Car. II. cap. 22, no perſon ſhall weave at Colcheſter any Bay, known by the name of four and fifties, ſixty-eights, eighties, or hundred Bays, but, within two days after weaving any ſuch, ſhall carry it to the Dutch Bay-hall, to be viewed and examined, that it may appear whether it be well and ſubſtantially wrought, before it be carried to be ſcoured and thickened. No ſcourer or thickener ſhall receive any ſuch Bay, before it has been marked or ſtamped at the ſaid hall. This manufacture, which is very conſiderable, was firſt introduced into England with that of ſays, ſerges, &c. by the Flemings, who, being perſecuted by the duke of Alva, for the ſake of their religion, fled hither, about the ſixth year of queen Elizabeth's reign.

The exportation of Bays was formerly much more conſiderable than it is as preſent, the Engliſh then furniſhing the French and Italians with thoſe ſtuffs; but, of late years, the French have attempted to imitate them, and have admirably well ſucceeded, particularly at Beauvais, Caſtres, Montpelier, and Niſmes. They alſo manufacture vaſt quantities of Bays in Flanders, and eſpecially at Tournay, Liſle, and Neuf-Egliſes. The people of that country call them baigues: however, the export of Engliſh Bays is ſtill very conſiderable to Spain and Portugal, where they are called baetas; and even Italy. Their chief uſe is for dreſſing the monks and nuns, and for linings, eſpecially in the army. The looking-glaſs-makers alſo uſe them behind their glaſſes, to preſerve the tin, or quickſilver; and the caſe-makers, to line their caſes.

The breadth of Bays is commonly a yard and an half, a yard and three quarters, or two yards, by forty-two and forty-eight in length. Thoſe of a yard and three quarters are moſt proper for the Spaniſh trade.

BA'ZAC, or BAZA, ſpun cotton, very beautiful and very fine, which comes from Jeruſalem, whence it is called Jeruſalem cotton. The half Bazac, and the middling Bazac, come from the ſame place, but are of a much inferior quality.

BAZGE'NDGES, in natural hiſtory, the name of a ſubſtance uſed by the Turks, and other eaſtern nations, in their ſcarlet dying: they mix it for this purpoſe with cochineal and tartar, the proportions being two ounces of the Bazgendges to one ounce of cochineal.

The Bazgendges ſeem to be no other than the horns of the turpentine-tree in the eaſtern parts of the world: and it is not only in Syria that they are found, but China alſo affords them. Many things of this kind were ſent over to Mr. Geoffroy at Paris, from China, as the ſubſtances uſed in the ſcarlet dying of that country; and they all proved wholly the ſame with the Syrian and Turkiſh Bazgendges, and with the common turpentine horns. The lentiſk or maſtic-tree is alſo frequently found producing many horns of a like kind with theſe, and of the ſame origin, all being owing to the puccrons, which make their way into the leaves, to breed their young there. *Reaumur*, *Hiſt. Inſect.*

BEACH-*Tree*, *fagus*, a large and beautiful tree, whoſe leaves ſomewhat reſemble thoſe of the horn-beam: the male flowers grow together in a round bunch, and are produced at remote diſtances from the fruit on the ſame tree: the fruit conſiſts of two or three triangular nuts, which are incloſed in a rough hairy rind, divided into four parts.

There is but one ſpecies of this tree at preſent known (except the two varieties with ſtriped leaves, which are accidental) though the planters would diſtinguiſh two or three ſorts; one of which they call the mountain Beach; and, as they ſay, affords a much whiter timber than the other, which they call the wild Beach: but as thoſe have never been diſtinguiſhed by the botaniſts, nor can I perceive any real difference amongſt all the trees of this kind I have yet ſeen, I rather think the difference in the colour of the wood is occaſioned by the place of their growth; which is often obſerved to be the caſe with moſt other ſorts of timber.

This tree is propagated by ſowing the maſt; the ſeaſon for which is any time from October to February; only obſerving to ſecure the ſeeds from vermin, when early ſowed; which, if carefully done, the ſooner they are ſown, the better, after they are fully ripe: a ſmall ſpot of ground will be ſufficient to raiſe a great number of thoſe trees from the ſeeds; but you muſt be very careful to keep them clear from weeds; and, if the plants come up very thick, you ſhould not fail to draw out the ſtrongeſt of them the autumn following, that thoſe left may have room to grow: ſo that, if you huſband a ſeed-bed carefully, it will afford a three years draught of young plants, which ſhould be planted in a nurſery; and, if deſigned for timber-trees, at three feet diſtance, row from row; and eighteen inches aſunder in the rows.

But if they are deſigned for hedges (to which the tree is very well adapted) the diſtance need not be ſo great; two feet, row from row, and one foot in the rows will be ſufficient. In this nurſery they may remain two or three years, obſerving to clear them from weeds, as alſo to dig up the ground between their roots, at leaſt once a year, that their tender roots may the better extend themſelves each way; but be careful not to cut or bruiſe their roots, which is injurious to all young trees; and never dig the ground in ſummer, when the earth is hot and dry; which, by letting in the rays of the ſun to the roots, is often the deſtruction of the young trees.

This tree will grow to a conſiderable ſtature, though the ſoil be ſtony and barren; as alſo upon the declivities of hills and chalky mountains, where they will reſiſt the winds better than moſt other trees; but then the nurſeries for the young plants ought to be upon the ſame ſoil; for, if they are raiſed in a good ſoil, and a warm expoſure, and afterwards tranſplanted into a weak barren ſituation, they ſeldom thrive, which holds true in moſt other trees; therefore I would adviſe the nurſery to be made upon the ſame ſoil where the plantation is intended: but of this we ſhall ſay more under the article NURSERY.

The tree is very proper to form large hedges, to ſurround plantations, or large wilderneſs-quarters; and may be kept in a regular figure, if ſheared twice a year, eſpecially if they ſhoot ſtrong; in which caſe, if they are neglected but a ſeaſon or two, it will be difficult to reduce them again. The ſhade of this tree is very injurious to moſt ſorts of plants which grow near it, but is generally believed to be very ſalubrious to human bodies.

The timber is of great uſe to turners, for making trenchers;

diſhes, trays, buckets; and likewiſe to the joiners for ſtools, bedſteads, coffers, &c. The maſt is very good to fat ſwine and deer; it alſo affords a ſweet oil, and hath, in ſome families, ſupported men with bread.

This tree delights in a chalky or ſtony ground, where it generally grows very faſt; and the bark of the trees, in ſuch land, is clear and ſmooth; and, although the timber is not ſo valuable, as that of many other trees, yet, as it will thrive on ſuch ſoils, and ſuch ſituations, where few better trees will grow, the planting of them ſhould be encouraged; eſpecially as the trees afford an agreeable ſhade, and the leaves make a fine appearance in ſummer, and continue green as long in autumn as any of the deciduous trees; therefore, in parks, and other plantations for pleaſure, this tree deſerves to be cultivated among thoſe of the firſt claſs; eſpecially where the ſoil is adapted to it.

The two ſorts with variegated leaves may be propagated by budding or grafting them upon the common Beach, obſerving not to plant them in a good earth; which will cauſe the buds or cyons to ſhoot vigorouſly, whereby the leaves will become plain; which often happens to moſt variegated plants.

This tree affords us two articles for trade, namely, its timber, and its fruit, or ſeed. The wood of the Beach is whitiſh, hard, dry, and crackles in the fire. In France it is commonly ſold in the foreſts, cut into boards, ſtakes, and ſhingles, to be afterwards uſed in making houſhold furniture, and other joiners work. The boards ought to be from eleven to twelve inches broad, thirteen lines thick, and ſix, nine, or twelve feet long.

The Beach-timber is alſo ſold in laths, which are ſmall thin boards, deſigned for the drawer and trunk-makers.

They likewiſe make of this wood ſtaves, ſaddle-bows, &c.

It is very uſeful for making the keel and inſide of ſhips.

Beach-wood is alſo uſed for making ſhovels, ſpoons, wooden-ſhoes, and other ſuch ſmall-wares.

Of the largeſt trunks of Beach-trees are made forms, and kitchen-tables, which are four, five, ſix, and ſeven inches thick, and of different breadths and lengths, according as the trunks are more or leſs thick and long.

Beach-wood alſo makes good fuel; for which reaſon, there is a great deal of it ſold in faggots, in cords of wood, in logs, &c.

The fruit or ſeed of the Beach-tree, which is a kind of nut, or acorn, called maſt, contains a kind of white and oily marrow, or pulp, of a ſweet taſte, and agreeable to eat; of which they make oil, very much eſteemed for frying, and for ſallads. This oil, which is very common in Picardy, and thoſe places where there are many Beach-trees, is extracted cold by expreſſion, after the ſhell of the maſt has been taken off, and the pith broke or bruiſed. There are ſome countries where hogs are fattened with Beach-maſts, as they are with acorns in other places.

The common people in France uſe that oil inſtead of butter; but moſt of thoſe who uſe a great deal of it, complain of pains and heavineſs in the ſtomach. M. Danty d'Iſnard has preſcribed a method to prevent thoſe inconveniencies. We muſt pour the oil of maſts, newly expreſſed, into ſtone pitchers, very cloſely ſhut; put them into the ground, and leave them there a year; after which time the oil will have loſt all its bad qualities.

BEAD-PROOF, a term uſed by our diſtillers, to expreſs that ſort of proof of the ſtandard ſtrength of ſpirituous liquors, which conſiſts in their having, when ſhaken in a phial, or poured from on high into a glaſs, a crown of bubbles, which ſtand on the ſurface ſome time after. This is eſtemed a proof that the ſpirit conſiſts of equal parts of rectified ſpirits and phlegm.

BEAM, or ROLLER, uſed by weavers, is a long and thick wooden cylinder, placed lengthways on the back part of the loom of thoſe who work with the ſhuttle. The threads of the warp of linen or woollen cloth, ſerges, and other woollen ſtuffs, are rolled upon the Beam, and enroll, as the work goes on. That cylinder, on which the ſtuff is rolled, as it is weaved, is alſo called the Beam or roller, and is placed on the fore-part of the loom.

BEAM *of a plough*, a name given by our farmers to the great timber of the plough, into which all the other parts of the plough-tail are infixed.

This is uſually made of aſh, and is ſtraight, and eight feet long in the common plough; but, in the four-coultered plough, it is ten feet long, and its upper part arched. The head of this Beam lies on the pillow of the plough, and is raiſed higher, or ſunk lower, as that pillow is elevated or depreſſed, by being ſlipped along the crow-ſtaves. Near the middle, it has an iron collar, which receives the tow-chain from the box; and the bridle-chain from the ſtake or gallows of the plough is fixed into it a little below the collar. Some inches below this, there is an hole, which lets through the coulter; and below that there are two other ſmall ones, through which the heads of the retches paſs. Theſe are the irons which ſupport the ſheat, and with it the ſhare. Farther backward ſtill is a large perforation, through which the body of the ſheat paſſes; and behind that, very near the extremity, is another hole, through which the piece called the hinder-ſheat paſſes. *Tull's Huſb.* See PLOUGH.

BEAM, in building (*Dict.*)—The proportions of Beams near London are fixed by ſtatute, as follows; a Beam, fifteen feet long, muſt be ſeven inches on one ſide its ſquare, and five on the other; if it be ſixteen feet long, one ſide muſt be eight inches, the other ſix; if ſeventeen feet long, one ſide muſt be ten inches, the other ſix: in the country they uſually make them ſtronger. Sir H. Wotton adviſes theſe to be of the ſtrongeſt and moſt durable timber.

Herrera tells us, that, in Fer. Cortez's palace, in Mexico, there were 7000 Beams of cedar; but he muſt certainly uſe the word Beam in a greater latitude than we do. In effect, the French, under poutre, Beam, take in not only the pieces which ſupport the rafters, but alſo thoſe which ſuſtain the joiſts of the cielings.

Some of their beſt authors have conſidered the force or ſtrength of Beams, and brought their reſiſtance to a preciſe calculation; particularly M. Varignon and M. Parent; the ſyſtem of the latter is as follows:

When, in a Beam breaking parallel to its baſe, which is ſuppoſed to be a parallelogram, two plans of fibres, which were before contiguous, are ſeparated, there is nothing to be conſidered in thoſe fibres, but their number, bigneſs, tenſion before they broke, and the lever by which they act; all theſe together making the ſtrength or reſiſtance of the Beam to be broke.

Suppoſe then another Beam of the ſame wood, where the baſe is likewiſe a parallelogram, and of any bigneſs, with regard to the other, at pleaſure; the height or thickneſs of each of theſe, when laid horizontal, being divided into an indefinite number of equal parts, and their breadth into the ſame number, in each of their baſes will be found an equal number of quadrangular cells, proportionable to the baſes whereof they are parts. Theſe then will repreſent little baſes, or, which is the ſame thing, the thickneſſes of the fibres to be ſeparated for the fracture of each Beam: and, ſince the number of cells is equal in each, the ratio of the baſes of both Beams will be that of the reſiſtance of their fibres, both with regard to number and thickneſs.

Now, the two Beams being ſuppoſed of the ſame wood, the fibres moſt remote from the points of ſupport, which are thoſe which break the firſt, muſt be equally ſtretched when they break. Thus the fibres, *v. gr.* of the tenth diviſion, are equally ſtretched in each caſe, when the firſt breaks; and, in whatever proportion the tenſion be ſuppoſed, it will be ſtill the ſame in both caſes; ſo that the doctrine is intirely free, and unembarraſſed with any phyſical ſyſtem.

Laſtly, it is evident, the levers whereby the fibres of the two Beams act, are repreſented by the heighth or depth of their baſes; and, of conſequence, the whole reſiſtance of each Beam is the product of its baſe, by its height; or, which is the ſame thing, it is the ſquare of the height, multiplied by the breadth; which holds, not only in caſe of parallelogramatic, but alſo of elliptic baſes.

Hence, if the baſes of two Beams be equal, though both their heighths and breadths be unequal, their reſiſtance will be as their heighths alone; and, by conſequence, one and the ſame Beam, laid on the ſmalleſt ſide of its baſe, will reſiſt more than when laid flat, in proportion as the firſt ſituation gives it a greater height than the ſecond; and thus an elliptic baſe will reſiſt more, when laid on its greateſt axis, than when on its ſmalleſt.

Since, in Beams equally long, it is the baſes that determine the proportion of their weights or ſolidities; and ſince, their baſes being equal, their heighths may be different; two Beams of the ſame weight may have reſiſtances differing to infinity; thus, if, in the one, the height of the baſe be conceived infinitely great, and the breadth infinitely ſmall, while in the other the dimenſions of the baſe are infinite; the reſiſtance of the firſt will be infinitely greater than that of the ſecond, though their ſolidity and weight be the ſame. If, therefore, all required in architecture were to have Beams capable of ſupporting vaſt loads, and, at the ſame time, be of the leaſt weight poſſible, it is plain they muſt be cut thin as laths, and laid edge-wiſe.

If the baſe of two Beams be ſuppoſed unequal, but the ſum of the ſides of the two baſes equal, *v. gr.* if they be either twelve and twelve, or eleven and thirteen, or ten and fourteen, &c. ſo that they always make twenty-four; and further, if they be ſuppoſed to be laid edge-wiſe, purſuing the ſeries, it will appear, that, in the Beam of twelve and twelve, the reſiſtance will be 1728; and the ſolidity or weight 144; and that in the laſt, or one and twenty-three, the reſiſtance will be 529, and the weight twenty-three; the firſt, therefore, which is ſquare, will have leſs than half the ſtrength of the laſt, with regard to its weight.

Hence M. Parent remarks, that the common practice of cutting Beams out of trees as ſquare as poſſible is ill huſbandry: he hence takes occaſion to determine, geometrically, what dimenſions the baſe of a Beam, to be cut off any tree propoſed, ſhall have, in order to its being of the greateſt poſſible ſtrength; or, which is the ſame thing, a circular baſe being given, he determines the rectangle of the greateſt reſiſtance that can be inſcribed; and finds, that the ſides muſt be nearly as ſeven to five, which agrees with obſervation.

Hitherto the length of the Beams has been ſuppoſed equal; if it be unequal, the baſes will reſiſt ſo much the leſs, as the Beams are longer.

To this it may be added, that a Beam ſuſtained at each end, breaking by a weight ſuſpended from its middle, does not only break at the middle, but alſo at each extreme; or, if it does not actually break there, at leaſt immediately before the moment of the fracture, which is that of the equilibrium, between the reſiſtance and the weight, its fibres are as much ſtretched at the extremes, as in the middle. So that, of the weight ſuſtained by the middle, there is but one third part which acts at the middle, to make the fracture; the other two only acting to induce a fracture in the two extremes.

A Beam may either be ſuppoſed laden only with its own weight, or with other foreign weights applied at any diſtance, or elſe only with thoſe foreign weights. Since, according to M. Parent, the weight of a Beam is not ordinarily above $\frac{1}{70}$ part of the load given it to ſuſtain, it is evident, that, in conſidering ſeveral weights, they muſt all be reduced, by the common rules, to one common center of gravity.

M. Parent has calculated tables of the weights that will be ſuſtained by the middle, in Beams of various baſes and lengths, fitted at each end into walls, on a ſuppoſition, that a piece of oak an inch ſquare, and a foot long, retained horizontally by the two extremes, will ſuſtain 315 *lb.* in its middle before it breaks, which it is found by experience it will. *See Mem. Acad. R. Scienc. An.* 1708.

BEAN, *faba*, in botany, the name of a genus of plants; whoſe characters are: the flower is of the papilionaceous kind, and from its cup there ariſes a piſtil, which finally becomes a large pod, containing large, flatted, and, in ſome degree, kidney-ſhaped ſeeds. To this it is to be added, that the ſtalks are firm and erect, and the leaves ſtand by pairs, on a middle rib, which is terminated by an odd one.

Mr. Tournefort has enumerated eight ſpecies of this plant, But we have only the four following ſorts, commonly ſowed in our Gardens. 1. The ſmall Liſbon. 2. The Spaniſh. 3. The Sandwich. And, 4. The Windſor Beans.

The firſt and ſecond ſorts are to be planted in October and November, under warm walls and hedges, where if they ſtand through the winter, they produce Beans early in the ſpring. They may alſo be raiſed very cloſe in beds, and covered with hoops and matts in the winter, and in the ſpring planted out; but there is ſome hazard in the tranſplanting, and they will be a fortnight, or more, later than thoſe which have ſtood the winter abroad.

The Liſbon Bean is preferred to the Spaniſh; and the curious ought to have freſh ſeed every two years from abroad, for they are apt to degenerate, though not in goodneſs, yet in their earlineſs.

The Spaniſh and Windſor Beans are not to be planted till Chriſtmas, but eſpecially the Windſor, which are ſubject, more than any other kind, to be hurt by the cold. Theſe Beans ſhould have an open ground, and be planted at the diſtance of two feet and a half, row from row, and four inches from one another in the rows; but, if the place is cloſely ſurrounded with hedges or walls, the diſtance muſt be greater, elſe the ſtalks will run high, but they will bear very little fruit.

The Sandwich Beans are hardier than the Windſor, and may be planted to come in between the early crops and them, and, though not much regarded at preſent, they are a very good Bean.

The firſt plantation of Windſor Beans ſhould be made in the middle of January; and, after that, a new plantation ſhould be made every three weeks, till the middle of May, that there may be a ſucceſſion of crops. *Miller's Gard. Dict.*

Beans, with a proper management, make one of the fineſt of all baits for fiſh. The method of preparing of them for this purpoſe is this: take a new earthen pot, glazed on the inſide, boil ſome Beans in it, ſuppoſe a quarter of a peck: they muſt be boiled in river water, and ſhould be beforehand ſteeped in ſome warm water, for ſix or ſeven hours. When they are about half boiled, put in three or four ounces of honey, and two or three grains of muſk: let them boil a little on, then take them off the fire, and uſe them in this manner: ſeek out a clean place, where there are no weeds, that the fiſh may ſee and take the Beans at the bottom of the water. Throw in ſome Beans at five or ſix in the morning, and in the evening, for ſome days. This will draw them together, and they may be taken in a caſting-net, vaſt numbers together.

BEAR, in zoology, denotes a well known quadruped of the cat kind, of ſome uſe in medicine, but more in commerce and ſport. See *Plate* VI. *fig.* 34.

Some diſtinguiſh two kinds of Bears, terreſtrial and marine; the former of which keep to the mountains; whereas the latter come out on the ice, as far as the middle of the North ſea. Some of this kind are found in Nova Zembla, of an incredible ſize.

Bear-ſkins are a ſort of furs, very much eſteemed, and there is a very large trade of them, whether they be ſkins of young Bears, or of old ones. The latter are commonly uſed to make houſings, or horſe-cloaths, or, in the more northern climes, for bags to keep the feet-warm, in the ſharpeſt cold of the winter. The ſkins of young Bears ſerve to make muffs, and other ſuch things for warmth or ornament.

Beſides the great quantity of Bears-ſkins which the fellmongers ſell, the druggiſts ſell alſo Bear's-fat, or greaſe, which they commonly get from Switzerland, Savoy, and Canada. That greaſe is a powerful remedy for the cure of the king's evil, and the rheumatiſm. It is alſo uſed with ſucceſs for curing the gout, and it is alſo employed in ſeveral Galenic compoſitions. Bear's-greaſe, in order to be of a good quality, muſt be choſen newly melted, greyiſh, clammy, of a ſtrong and pretty bad ſmell, and of a middling conſiſtence or thickneſs. That which is too white is adulterated, and mixed with common tallow.

BEA'RINGS, in heraldry, a term uſed to expreſs a coat of arms, or the figures of armories, by which the nobility and gentry are diſtinguiſhed from the vulgar, and from one another.

BEAST *of burden*, a name given to all four-footed animals, which ſerve to carry burdens and merchandizes on their backs. Thoſe that are moſt commonly uſed, are elephants, dromedaries, camels, horſes, mules, aſſes, the ſheep of Mexico and Peru, and the vicnua. There are alſo ſome places on the coaſt of Africa, where they uſe oxen; nay, even large dogs are ſometimes employed for that purpoſe, as may be ſeen in Flanders, and in ſome other countries.

Gold-BEA'TING.—Firſt a quantity of pure gold is melted, and formed into an ingot; this, by forging, is reduced to a plate about the thickneſs of a ſheet of paper, which plate is afterwards cut into little pieces, about an inch ſquare, and laid in the firſt and ſmalleſt mould, to begin to ſtretch them.

Theſe moulds are made of vellum, conſiſting of forty or fifty leaves, and, after they have hammered a while thus with the ſmalleſt hammer, they cut each of them into four, and put them into the ſecond mould of vellum, which conſiſts of two leaves, to be extended farther.

Then they are taken out again, and cut into four, and put into the third mould, which is made of bullock's gut, well ſcoured and prepared, and conſiſting of five hundred leaves, and beaten; then they are taken out and divided into four again, and laid in the laſt and finiſhing mould, which is alſo of bullock's gut, and containing five hundred leaves; and there they are beaten to the degree of thinneſs required.

The leaves, being thus finiſhed, are taken out of the mould, and diſpoſed in little paper books prepared with red bole, for the gold not to ſtick to; each book uſually containing twenty-five leaves. Theſe books are of two ſizes, twenty-five leaves of the ſmalleſt of which weigh but five or ſix grains: and twenty-five of the largeſt, nine or ten grains.

Gold is beaten more or leſs, according to the quality or kind of work it is deſigned for; that which is for the uſe of gold wire-drawers, to gild their ingots withal, is left much thicker than that for gilding picture frames, &c.

The gold-beaters uſe three hammers of different ſizes, of well poliſhed iron, ſomething in the form of mallets. The firſt, which weighs three or four pounds, ſerves to chaſe or drive; the ſecond, eleven or twelve pounds, which is to cloſe; and the third, which weighs fourteen or fifteen pounds, to ſtretch and finiſh.

BEATING *flax*, or *hemp*, is an operation in the dreſſing of theſe matters, contrived to render them more ſoft and pliant. *Hought. Collect.*

When hemp has been ſwingled a ſecond time, and the hurds laid by, they take the ſtrikes, and dividing them into dozens, and half dozens, make them up into large thick rolls, which, being broached on long ſticks, are ſet in the chimney corner to dry; after which they lay them in a round trough made for the purpoſe, and there with beetles beat them ſoundly, till that they handle, both without and within, as pliant as poſſible, without any hardneſs or roughneſs to be felt: that done, they take them from the trough, open and divide the ſtrikes as before, and, if any be found not ſufficiently beaten, they roll them up, and beat them over as before. *Dict. Ruſt.*

BEATING, in the paper works, ſignifies the Beating of paper on a ſtone, with a heavy hammer with a large, ſmooth head, and ſhort handle, in order to render it more ſmooth and uniform, and fit for writing. *Savar. Dict. Comm.*

BEAVER, (*Dict.*)—This creature is about four feet in length, and twelve or fifteen inches broad. His ſkin, in the northern regions, is generally black, but it brightens into a reddiſh tincture, in the temperate climates. He is covered with two ſorts of hair, one long, and the other a ſoft down; the latter, which is an inch in length, is extremely fine and compact, and accommodates the animal with a neceſſary warmth. The long hair preſerves the down from dirt and humidity. *See Plate* VI. *fig.* 35.

The Beaver, whether male or female, has four bags under his inteſtines, impregnated with a reſinous and liquid ſubſtance, which, when it is ejected, ſettles into a thick conſiſtence. See the article CASTOREUM in the Dictionary.

His teeth are ſtrong, and deeply riveted into his jaws, with a long and crooked root; with theſe he cuts as well the wood with which he builds, as that which furniſhes him with food. His fore feet reſemble thoſe of ſuch animals as hold what they eat with their paws, as apes, for inſtance, and rats, and ſquirrels; with theſe feet he digs, ſoftens, and works the clay, which is extremely ſerviceable to him. His hind feet are accommodated with membranes, or large ſkins, extending between his toes, like thoſe of ducks, and all other water-fowl: this makes it evident that the author of nature intended the creature ſhould be amphibious. His tail is long, a little flat, entirely covered with ſcales, ſupplied with muſcles, and perpetually lubricated with oil or fat: this animal, who is an architect from his nativity, uſes his tail inſtead of a hod, for the conveyance of his clay or mortar, and a trowel to ſpread and form it into an incruſtation; the ſcales prevent theſe materials from penetrating the tail with their coldneſs and humidity. But the ſcales, as well as the tail, would be injured by the air and water, were it not for the prevention of an oil, which he diſtributes all over them with his ſnout; the bags we have already mentioned, are undoubtedly the magazines of this fluid.

The Beavers inhabit the ſame manſion in great numbers, unleſs violent heats, or inundations, the purſuits of hunters, ſcarcity of proviſions, or the extraordinary increaſe of their offspring, obliges them to ſeparate. In order to raiſe themſelves a convenient abode, they chuſe a ſituation that abounds with ſuſtenance, and is waſhed by a rivulet, and where they may form a convenient reſervoir of water for their habitation. They begin with building a mole or cauſey, in which the water may riſe to a level with the firſt ſtory.

This cauſey, at the foundation, may contain ten or a dozen feet in thickneſs; it deſcends in a ſlope on the ſide next the water, which, in proportion to its elevation, gravitates upon the work, and preſſes it with a ſtrong tendency towards the earth. The oppoſite ſide is raiſed perpendicularly, like our walls; and the ſlope which at its baſis is twelve feet broad, diminiſhes towards the top, whoſe breadth does not exceed two feet: the materials of this work are wood and clay. The Beavers, with an admirable facility, cut the pieces of wood, ſome as thick as a man's arm, and others as large as the thigh, and from two to four, five, or ſix feet in length, and ſometimes more, in proportion to the aſcent of the ſlope. They drive the extremity of theſe, very near each other, into the earth, and take care to interlace them with other ſtakes, more ſlender and ſupple. But as the water, without ſome other prevention, would glide through the cavities, and leave the reſervoir dry, they have recourſe to a clay, which they perfectly know how to procure, and with which they cloſe up all the interſtices, both within and without, and this entirely prevents all evacuation. They continue to raiſe the dike proportionably to the water's elevation and plenty. They are likewiſe very ſenſible, that their materials are not ſo eaſily tranſported by land as by water, and therefore take the opportunity of it's increaſe to ſwim, with mortar placed on their tail, and ſtakes of wood between their teeth, to every place where they have occaſion for theſe materials. If the violence of the water, or the footſteps of hunters, who paſs over their work, damage it in any degree, they immediately repair the fracture, viſit all the edifice, and, with indefatigable application, refit and adjuſt whatever happens to be diſconcerted. But, when they are too frequently perſecuted by the hunters, they only work in the night, or entirely diſcontinue their labours.

When the cauſey, or dike, is compleated, they begin to form their cells, which are round, or oval apartments, divided into three partitions, raiſed one above another. The firſt is ſunk below the level of the dike, and generally full of water; the other two are formed above it. They raiſe this ſtructure, in a very ſolid manner, on the edge of their cauſey, and always in ſtories, that, in caſe the water ſhould aſcend, they may dwell in an higher ſituation. If they find any little iſland near the reſervoir, they fix their dwelling there, which is then more ſolid, and they are leſs incommoded with the water, in which they are capable of continuing but a ſhort time: but, if they are not favoured with this advantage, they drive ſtakes into the earth with their teeth, to fortify the building againſt the winds and water. At the bottom they ſtrike the two openings to the ſtream; one conducts them to the place where they bathe, and which they always keep very decent; the other is a paſſage to that quarter, where they carry out every thing that would ſoil or rot the upper apartments. There is a third aperture much higher, calculated to prevent their being ſhut up, when the ice hath cloſed the openings into the lower lodgments. They ſometimes build their houſes entirely on dry land, and ſink ditches, five or ſix feet deep, in order to deſcend to the water. They employ the ſame materials and induſtry in the ſtructure of their dwellings, as they uſe for the cauſey. The walls of the building are perpendicular, and two feet thick. As their teeth are more ſerviceable than ſaws, they cut off all the projections from the wood, that ſhoot out beyond the perpendicular of the wall; after which they work up a mixture of clay and dry graſs, into a kind of mortar, with which, by the aid of their tails, they rough-caſt the out and inſides of the work.

The edifice is vaulted within, and generally riſes in an oval figure. The dimenſions are proportioned to the number of the intended inhabitants. Twelve feet in length, and ten in breadth, are ſufficient for eight or ten Beavers. If the number increaſes, they enlarge the place accordingly. It has been aſſerted for a truth, that there have been found above an hundred of theſe creatures, in different lodgments, communicating with one another. But theſe populous ſocieties are very rare, becauſe they are too unmanageable and tumultuous, and the Beavers are generally better acquainted with their own intereſt. They aſſociate to the number of ten or twelve, and ſometimes a few more.

There are ſome Beavers, called terriers, who make their abode in caverns, dug in a riſing ground, either on the ſhore, or at ſome diſtance from the water, to which they ſcoop out ſubterraneous trenches from their caverns, which deſcend from ten to an hundred feet in depth. Theſe trenches furniſh them with retreats, ſituated at unequal heights, and wherein they enjoy a ſhelter from the water, when it riſes.

All theſe works, eſpecially in the cold regions, are compleated in Auguſt, or September, after which period, they furniſh themſelves with proviſions. During the ſummer ſeaſon, they regale themſelves with all the fruits and plants the country produces. In the winter, they eat the wood of the aſh, the plane, and other trees, which they ſteep in water, in quantities proportionable to their neceſſary conſumption; and they are ſupplied with a double ſtomach, to facilitate the digeſtion of ſuch a ſolid food, at two operations. They cut twigs from three to ſix feet in length; the large ones are conveyed by ſeveral Beavers to the magazine, and the ſmaller by a ſingle animal, but they take different ways; each individual hath his walk aſſigned him, to prevent the labourers from being interrupted by their mutual occaſions. The dimenſions of their pile of timber are regulated in proportion to the number of the inhabitants; and it has been obſerved, that the proviſion of wood for ten Beavers comprehended thirty feet in a ſquare ſurface, and ten in thickneſs. Theſe parcels of wood are not piled up in one continued heap, but laid acroſs one another, with interſtices between them, that they may the better draw out what quantity they want, and always take the parcel at the bottom, which lies in the water. They cut this wood into ſmall pieces, and convey it to their cell, where the whole family comes to receive their particular ſhare.

Merchants diſtinguiſh three ſorts of Beavers, though they are all the ſkins of the ſame animal: the new Beaver, the dry Beaver, and the fat Beaver.

The new Beaver, which is alſo called white Beaver, or Muſcovy Beaver, becauſe it is commonly kept to be ſent into Muſcovy, is that which the ſavages catch in their winter hunting. It is the beſt, and the moſt proper for making fine furs, becauſe it has loſt none of its hair by ſhedding.

The dry Beaver, which is ſometimes called lean Beaver, comes from the ſummer hunting, which is the time when theſe animals loſe part of their hair.

Though this ſort of Beaver be much inferior to the former, yet it may alſo be employed in furs; but it is chiefly uſed in the manufacture of hats. The French call it ſummer caſtor, or Beaver.

The fat Beaver is that which has contracted a certain groſs and oily humour, from the ſweat which exhales from the bodies of the ſavages, who wear it for ſome time. Though this ſort be better than the dry Beaver, yet is uſed only in the making of hats.

Beſides hats and furs, in which the Beaver's hair is commonly uſed, they attempted in France, in the year 1699, to make other manufactures with it; and, accordingly, they made cloths, flannels, ſtockings, &c. partly of Beaver's hair, and partly of Segovia wool. This manufactory, which was ſet up at Paris, in St. Anthony's ſuburb, ſucceeded, at firſt, pretty well; and, according to the genius of the French, the novelty of the thing brought into ſome repute the ſtuffs, ſtockings, gloves, and cloth, made of Beaver's hair. But they went out of faſhion of a ſudden, becauſe it was found, by experience, that they were of a very bad wear, and, beſides, that the colours faded very much: when they had been wet, they became dry and hard, like felt, which occaſioned the miſcarriage of the manufactory for that time.

When the hair has been cut off from the Beaver's ſkin, to be uſed in the manufactory of hats, thoſe ſkins are ſtill employed by ſeveral workmen; namely, by the trunk-makers, to cover trunks and boxes; by the ſhoe-makers, to put into ſlippers; and by turners, to make ſieves for ſifting grain and ſeeds.

Hot-BEDS, in gardening, are enriched with extraordinary plenty of manure, and ſheltered from the cold air, by ſtraw coverings, frames, and the like, ſerving to help forward the growth of plants, and force a vegetation, where either the ſeaſon, or the climate of itſelf, is not warm enough.

To make a Hot-Bed in February, for the raiſing of colliflowers, cucumbers, melons, radiſhes, or other tender plants or flowers, they provide a warm place, defended from all winds, by being incloſed with a pale or hedge, made of reed or ſtraw, and laid with freſh horſe-dung, ſix or eight days old, trodden down hard, and level on the top; over which they lay rich earth, three or four inches thick. When the extreme heat of the bed is over, which may be perceived by thruſting in the finger, then plant their ſeeds. This done, they ſet up forks, four or five inches above the bed, to ſupport a frame made of ſticks, and covered with ſtraw or baſs matt, to ſecure the ſeedlings from the weather. As the plants ſhoot in height, they earth them up; and, when able to bear the cold, tranſplant them into natural beds. *Bradley.*

BEE, *Dict.* — The ſting of the Bee is a very curious weapon, and, when examined by the microſcope, appears of a very ſurprizing ſtructure. It has a horny ſheath or ſcabbard, which includes two bearded darts. This ſheath ends in a ſharp point, near the extremity of which, a ſlit opens, through which, at the time of ſtinging, the two bearded darts are protruded beyond the end of the ſheath: one of theſe is a little longer than the other, and fixes its beard firſt, and, the other inſtantly following, they penetrate alternately deeper and deeper, taking hold of the fleſh with their beards, or hooks, till the whole ſting is buried in the fleſh; and then a venomous juice is injected through the ſame ſheath, from a little bag, at the root of the ſting, which occaſions an acute pain, and a ſwelling of the part, which ſometimes continues for ſeveral days. But this is beſt prevented, by enlarging the wound directly, to give it ſome diſcharge. Mr. Derham counted, on the ſting of a waſp, eight beards on the ſide of each dart, ſomewhat like the beards of fiſh-hooks; and the ſame number are to be counted on the darts of the Bee's ſting.

When theſe beards are ſtruck deep in the fleſh, if the wounded perſon ſtarts, or diſcompoſes the Bee, before it can diſengage them, the ſting is left behind ſticking in the wound; but, if he have patience to ſtand quiet, the creature brings the hooks down cloſe to the ſides of the darts, and withdraws the weapon; in which caſe, the wound is always much leſs painful. A waſp is not ſo liable to leave its ſting in the wound as a Bee, the beards of it being ſhorter, and the creature more vigorous and nimble in its motions.

To view the ſting of a Bee by the microſcope, the end of the tail is to be cut off, and then, touching it with a pin or needle, it will thruſt out the ſting and darts, which may be cut off with a nice pair of ſciſſars, and kept for obſervation: or, if a Bee be caught in a leather glove, its ſting will be left in the glove, the creature being unable to diſengage it from the leather. The bag, containing the poiſonous juice, may eaſily be found at the bottom of the ſting, and examined, it being commonly pulled out with it; and, if a living Bee be provoked to ſtrike with its ſting, againſt a plate of glaſs, enough of the liquor will be left on the glaſs, for examination; and the ſalts of it may be ſeen, forming themſelves into cryſtals. *Baker on the Microſcope.*

Mr. Dudley ſpeaks of a method of hunting, or finding of Bee's neſts, practiſed, of late years, in the woods of New England. It conſiſts in catching a Bee, then letting it fly, and obſerving the way it ſteers; this ſhews the hunter the courſe, or bearing of the neſt. To find the diſtance, he takes an off-ſet of an hundred perches, and lets fly another Bee; the angle, or point wherein theſe two courſes interſect, is the place of the neſt. *Phil. Tranſ.* N°. 367.

BEET, *beta*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the ſtaminous kind, conſiſting of ſtamina, ariſing from a five-leaved cup. Great numbers of theſe flowers are uſually collected into a ſort of head; and the cups finally become capſules, nearly of a globular figure, in which are contained the ſeeds.

Mr. Tournefort has enumerated two ſpecies of this plant.

All the ſpecies of this plant are propagated by ſowing their ſeeds in February, or March, in a looſe, deep ſoil, not over dunged. When they are come up, they muſt be hoed out, ſo as to leave them ten or twelve inches aſunder; for, if they have not room, the roots ſeldom grow large. It is a cuſtom, with the gardeners about London, to ſow carrots on the ſame ground with their Beets. The carrots are drawn off in the ſummer time, and the Beets have then ſufficient time to grow to their ſize. *Miller's Gard. Dict.*

BEE'TLE, in zoology. See the article SCARABÆUS.

Beetle, in a mechanical ſenſe, denotes a large wooden inſtrument, formed after the manner of the mallet, and uſed for driving piles, paliſades, wedges, and the like.

BE'ING, entity, or thing, ſomething which has an eſſence and exiſtence diſtinct from other things; it is conſidered as poſſible or actual: when poſſible, it is ſaid to have an eſſence or nature; ſuch were all things before their creation: when it is conſidered as actual, then it is ſaid to have exiſtence alſo; ſuch are all things which are created, and God himſelf the creator. Eſſence, therefore, is but the very nature of any Being, whether it be actually exiſting or no. A roſe in winter has an eſſence, in ſummer it has exiſtence alſo: it may not be improper to remark, that there is but one Being that includes exiſtence, in the very eſſence of it, and that is God, who therefore actually exiſts by natural and eternal neceſſity; but the actual exiſtence of any other Being is very diſtinct from its eſſence: for it may be, or may not be, as God pleaſes. Again, every Being is conſidered either as ſubſiſting in and by itſelf, and then it is called a ſubſtance; or ſubſiſts in and by another, and then it is called a mode, or manner of Being. Though few writers allow mode to be called a Being, in the ſame perfect ſenſe as the ſubſtance is; and ſome modes have evidently more of real entity or Being than others, See the article Mode. Mr. Locke ſays, there are but two ſorts of Beings that man knows and conceives. Firſt, ſuch as are purely material, without ſenſe, perception or thought, as the clipping of our beard, and paring or cutting our nails. Secondly, ſenſible, thinking, perceiving Beings. ſuch as we find ourſelves, which he calls cogitative; and cogitative exiſtence is a bleſſing to thoſe Beings only, which are endowed with perception, and is in a manner thrown away upon dead matter, any farther than as it is ſubſervient to Beings, which are conſcious of their own exiſtence. See the ſenſible ſcale of Beings, beautifully conſidered, by Mr. Addiſon, *Spect.* 219.

BE'LEMNITE, *or thunder-ſtone. Lapis Belemnites*, (*Dict.*)— The Belemnites is of the number of thoſe extraneous foſſils, which we have not yet been able to reduce to their kindred anomala: we only know that it is a petrifaction of an animal body, or part of an animal body; but, till we are much better acquainted with the creatures which inhabit the depths of the ſea, we are not to expect to find the mould in which every figured foſſil in the world has been caſt. See *Plate* VI. *fig.* 33.

The Belemnite is an oblong and ſlender body, ſomewhat pellucid, and of a browniſh or yellowiſh colour. It has ſeveral varieties in ſhape, which make ſo many ſpecies of it among the naturaliſts; but all agree in the main characters, and all are indifferently received as Belemnites in the ſhops.

The Belemnites are all compoſed of multitudes of thin coats, or cruſts, encircling one another, and are all of them of a tranſverſely ſtriated texture; they have always a hollow or cavity of a conic form, wide at the mouth, and tapering to a point at the bottom, placed at their large end; but this is uſually not exactly in the center, but on one ſide. In ſome, indeed, it grows ſo wide at the very extremity, as to take in the whole body of the Belemnite, and leave only a thin cruſt for its circumference. This cavity is frequently found empty, ſometimes it is filled up with earthy or ſtony matter, and ſometimes there is lodged in it a concamerated ſhell of a peculiar kind, which ſo exactly fits and fills it every way, that it is hard to doubt of its being the original inhabitant; though we know very well, that petrifactions of the ſame concamerated ſhell-fiſh are found in ſtone and earth, where there are no Belemnites. This is of the nature of thoſe foſſils, called orthoceratitæ, or ſtraight nautili, all which are, though common enough in their foſſil ſtate, as wholly unknown to us in their recent one, as the Belemnite itſelf. The inſide of the cavity in many of the Belemnites, in which it is found empty, is regularly marked with alternate ridges and furrows all the way round, ſuch as would exactly correſpond to the concamerated ſhell, found in the others, and plainly indicating that ſuch had once alſo been there.

The Belemnites have, in general, a ſingle crack or ſlit, running down the whole length of the body, or nearly ſo, in the form of a ſtraight line. Some we find, however, that have no mark of any fiſſure of this kind, and, on the other hand, ſome that have two or three of them inſtead of one; but the additional ones only begin at the apex, or end, and never run any great way up.

The uſual form of the Belemnites is that of a long and ſlender cone, tapering by degrees, from a not very large baſe, to an obtuſe point; and the general ſize is about the length and thickneſs of a finger, though there are vaſt numbers found much ſmaller, and ſome conſiderably larger. But, beſides theſe conic ones, there are ſome of a regularly cylindric form, and ſome others which are thickeſt near one of the ends, and grow gradually thinner and ſmaller, as they approach to both. Some are found of all the intermediate figures, between the cylindric and conic, and ſome are almoſt orbicular; theſe laſt are always very ſhort and ſmall: ſome of them taper off to a point very gradually, and others very abruptly, and ſome are, inſtead of being rounded, flatted on one ſide, and ſometimes on both; and we alſo ſometimes find them cruſhed and cracked by accidents, as the other petrifactions of animals frequently are. We find of them as far as to eight inches in length, and they ſometimes vary in colour from their uſual yellowiſh brown, and are found of a blackiſh or bluiſh grey, and ſometimes of a cheſnut colour, ſometimes of a darker or paler brown, with no admixture of yellow in it.

The Belemnites are found in almoſt all parts of the world, they are extremely common in Germany; we find them alſo in ſufficient plenty in England, and France and Italy abound with them. They are ſometimes brought to us from Syria, among the lapides Judaici, and very frequently among the coarſer ſtones from the Eaſt-Indies. Authors have called them, beſide their common name, by thoſe of dactyli idæi, and lapides lyncis, or lyncurii; but this laſt name has been an occaſion of error, and has occaſioned the Belemnite to be confounded with the hyacinth, which gem the ancients called by that name.

BELL (*Dict.*)— There is a curious obſervation in a paper of Mr. Reaumur's, in the Memoirs of the Paris Academy, relating to the ſhape moſt proper for Bells, to give them the loudeſt and cleareſt ſound. He obſerves, that as pots, and other veſſels, more immediately neceſſary to the ſervice of life, were doubtleſs made before Bells, it probably happened, that the obſerving theſe veſſels to have a ſound, when ſtruck, gave occaſion to making Bells, intended only for ſound, in that form; but that it does not appear that this is the moſt eligible figure; for lead, a metal which is, in its common ſtate, not at all ſonorous, yet becomes greatly ſo on its being caſt into a particular form, and that very different from the common ſhape of Bells. In melting lead for the common occaſions of caſting in ſmall quantities, it is uſually done in an iron ladle; and, as the whole is ſeldom poured out, the remainder, which falls to the bottom of the ladle, cools into a maſs of the ſhape of that bottom. This is conſequently a ſegment of a ſphere, thickeſt in the middle, and thinner towards the edges: nor is the ladle any neceſſary part of the operation, ſince, if a maſs of lead be caſt in that form in a mould of earth or ſand, in any of thoſe caſes it is found to be very ſonorous. Now, if this ſhape alone can give ſound to a metal which in other forms is perfectly mute, how much more muſt it neceſſarily give it to other metals naturally ſonorous, in whatever form? It ſhould ſeem, that Bells would much better perform their office in this than in any other form, and that it muſt particularly be a thing of great advantage to the ſmall Bells of common houſe-clocks, which are required to have a ſhrill note, and yet are not allowed any great ſize. Mr. Reaumur very judiciouſly obſerves, that, had our forefathers had opportunities of being acquainted with the ſound of metals in this ſhape, we ſhould probably have had all our Bells at preſent of this form. *Vid. Mem. Acad. Par. An.* 1726.

BE'LLOWS (*Dict.*)— This inſtrument is compoſed of two flat boards, ſometimes of an oval, and ſometimes of a triangular figure. Two or more hoops, bent according to the figure of the boards, are placed between them: a piece of leather, broad in the middle, and narrow at both ends, is nailed on the edges of the boards, which it thus unites together, as alſo on the hoops, which ſeparate the boards, that the leather may the eaſier open and fold again. A tube of iron or copper, and ſometimes of ſilver, for chamber Bellows, is faſtened to the undermoſt board, in which there are ſeveral holes; that tube is called the noſe, or nozel; finally, there is a piece of leather within the machine, which ſerves as a valve, or ſucker, and covers the holes in the under board, that the air, which comes in through thoſe holes, when the upper board is raiſed, may be expelled with force through the nozel, when that board is moved down.

Smiths and founders Bellows, whether ſingle or double, are wrought by means of a rocker, with a ſtring or chain faſtened thereto, which the workman pulls. The Bellows pipe is fitted into that of the tuvel. One of the boards is fixed, ſo as not to play at all. By drawing down the handle of the rocker, the moveable board riſes, and, by means of a weight on the top of the upper board, ſinks again. *Moxon, Mech. Exerc.*

The Bellows of forges, and furnaces of mines, uſually receive their motion from the wheels of a water-mill. Others, as the Bellows of enamellers, are wrought by means of one or more ſteps or treddles under the workman's feet. *Hought. Collect.*

BELLA'TRIX, in aſtronomy, a ruddy, glittering ſtar of the ſecond magnitude, in the left ſhoulder of Orion. Its longitude, according to Hevelius, for the year 1700, was 16°. 47′. 20″; and its latitude ſouthward 16°. 52′. 11″.

BE'NDING. Divers methods have been contrived for Bending timber, in order to ſupply crooked planks, and pieces for building ſhips: M. Daleſme ingeniouſly enough propoſed to have the young trees bent, while growing in the foreſt. The method of bending planks by a ſand-heat, now uſed in the king's yard at Deptford, was invented by Captain Cumberland. See SHIP-BUILDING.

The Bending of boards, and other pieces of timber for curved works in joinery, is effected by holding them to the fire, then giving them the figure required, and keeping them in this figure by tools for the purpoſe.

BENE'NAIM, BENENATH, BENENASCH, or BENENAT, in aſtronomy, the outermoſt ſtar of the ſecond magnitude, in the tail of the great Bear.

Its longitude, according to Hevelius, for the year 1700, was 22°. 39′. 24″, and its latitude 54°. 25′. 7″. north.

BE'RAMS, a coarſe cloth, all made with cotton thread, which comes from the Eaſt-Indies, and particularly from Surat. There are white plain Berams, and others ſtriped with colours. The white are about eleven yards long, and about a yard wide; the red are fifteen yards long, and ſomething leſs than a yard wide.

BE'RCHEROIT, or BERKEOITS, a weight uſed at Archangel, and in all the dominions of the czar of Muſcovy, to weigh ſuch merchandizes as are very heavy, or very bulky, ſuch as pot-aſhes, &c. The Bercheroit weighs 400 pounds of Muſcovy, which amount to about 364 pounds Engliſh avoirdupoiſe weight.

BE'RGAMO, a coarſe tapeſtry, which is manufactured with ſeveral ſorts of ſpun thread, as flocks of ſilk, wool, cotton, hemp, ox, cow, or goats hair. It is properly a weft of all thoſe ſorts of thread, the warp of which is commonly of hemp. It is wove on a loom, almoſt like linen cloth. Some pretend it was called Bergamo, becauſe the people of Bergamo in Italy were the firſt inventors of it.

French BE'RRY, *graine d'Avignon*, or *graine jaune*, is the fruit of a ſhrub called by the ancients lycium and pizacanta, frequent about Avignon, and in the ſouth parts of France; of conſiderable uſe among dyers and illuminers for a yellow colour.

This ſhrub grows in a rough ſtony ſoil. Its branches are beſet with prickles two or three inches long: its bark is blackiſh; its leaves ſmall and thick, like that of box, but diſpoſed like that of myrtle: its root yellow and woody: its Berry is green, bordering on yellow, of the ſize of a grain of wheat, bitter and aſtringent to the taſte. *Savar. Dict. Comm.*

BE'SISTAN, or BERSTAN, a name given at Conſtantinople, Adrianople, and in ſome other towns within the grand ſeignior's dominions, to thoſe places where the merchants have their ſhops, and expoſe their merchandize to ſale. Each ſort of merchant have their particular Beſiſtan, which muſt alſo be underſtood of the workmen, all thoſe of the ſame trade working in the ſame place. Theſe Beſiſtans are commonly large galleries, vaulted over, whoſe gates are ſhut every night. Sometimes the wardens and keepers of the Beſiſtans will anſwer for the merchandizes, on paying them a very moderate perquiſite for each ſhop.

BE'TEL, in botany, an Indian plant, in great uſe and eſteem throughout the Eaſt, where it makes a conſiderable article of commerce.

The Betel bears ſome reſemblance to the pepper-tree. Its leaves are like thoſe of ivy, only ſofter, and full of a red juice, which, among the orientals, is reputed of wonderful virtue for preſerving the teeth, and rendering the breath ſweet. The Indians are continually chewing theſe leaves, which renders their lips ſo red, and teeth black, a colour by them vaſtly preferred to the whiteneſs affected by the Europeans.

The conſumption of Betel leaves is incredible, no body, rich or poor, being without their box of Betel, which they preſent to each other by way of civility, as we do ſnuff. *Savar. Dict. Comm.*

BE'TILLES, muſlins, or white cotton cloths, manufactured in the Eaſt-Indies, particularly at Pondicherry. There are three ſorts of them.

The firſt, called only Betille, is ſomewhat coarſe. The piece is from 16 to 20 ells long, and $\frac{5}{6}$ of an ell wide, French meaſure.

The ſecond ſort, called Betille organdy, has a round grain, and is very fine. It meaſures 12 ells and $\frac{1}{2}$, by $\frac{3}{4}$ and $\frac{5}{6}$, French meaſure.

The third ſort, which is called tarantane Betille, is very clear, and is from 12 $\frac{1}{2}$ to 13 ells long, and $\frac{7}{8}$ wide. See MUSLIN.

Betilles. Theſe are alſo white cotton cloths, which uſed formerly to be imported into France, to be there dyed of ſeveral colours. Some are 16, and others 20 ells long, French meaſure. The red and white Betilles which come from Bengal, are pretty near of the ſame length and breadth.

B'ETONY, *Betonica*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the labiated kind: the upper lip is erect, imbricated, and bifid; and the lower is divided into three ſegments, the middle one being larger than the reſt, and bifid: the piſtil ariſes from the cup, and is fixed in the manner of a nail to the hinder part of the flower: this is ſurrounded by four embryo's, which afterwards become ſo many ſeeds, of an oblong form, to which the flower-cup ſerves as a capſule. The flowers of Betony uſually grow verticillately in ſhort ſpikes on the tops of the ſtalks.

The ſpecies of Betony, enumerated by Mr. Tournefort, are eight.

Betony is chiefly adminiſtered in the way of decoction, ſometimes of ſmoak, ſometimes as an ingredient of a cerat or plaiſter, hence called emplaſtrum de betonica. Some alſo give its juice boiled to the conſiſtence of honey, mixed with a little balſam of Peru, as a pectoral healer.

BE'ZANS, cotton cloths, which come from Bengal. Some are white, and others ſtriped with ſeveral colours.

BIA, a name given by the Siameſe to thoſe white ſhells which come from the Maldives, and which are called coris, or couries, almoſt throughout the Eaſt-Indies, where they ſerve for ſmall coin, or money. We ſhall give under its proper article a full account of that ſmall money of the Indies, which is current alſo in ſeveral parts of the African coaſt. See COURIES.

BI'DENS, in botany, the name of a genus of plants, the characters of which are theſe: the flower is uſually of the regular floſculous kind, compoſed of a number of ſmall floſcules, divided into ſeveral ſegments at their ends, placed on the embryo's, and contained in one common ſcaly cup. Sometimes there are alſo a number of ſemi-floſcules in the flower; but this is leſs common. The embryo's finally ripen into ſeeds, terminating in ſeveral prickly points. See *Plate* VI. *fig.* 36.

BIGHT, in the ſea language, denotes any part of a rope, as it is taken compaſſing, coiled up. When they cannot, or would not, take the end in hand, becauſe of the cables being coiled up; they ſay, give me the Bight, or hold by the Bight, i. e. by one of the flakes, which lies rolled up one over the other. *Manw. Seam. Direct. p.* 8. *Botel. Seam. Dial.* 4. *p.* 194.

BI'LANDER, in navigation, a ſmall flat-bottomed veſſel uſed in northern countries, with one large maſt and ſail, having its deck raiſed from head to ſtern, half a foot above the plat-board. *Ozan. Dict. Math.*

BI'LIOUS *Fever*. Dr. Pringle, in his Obſervations on the Diſeaſes of the Army, remarks, that the Bilious or putrid fever is epidemic in camps, eſpecially in low and marſhy countries, where the air, being full of moiſt and putrid effluvia, tends to relax the fibres and promote putrefaction. As to the ſymptoms of the Bilious fever, it always begins with chillneſs and laſſitude, pains of the head and bones, and a diſorder at the ſtomach. At night the fever runs high; the heat and thirſt are great; the tongue is parched; the head aches violently; the perſon gets no reſt, and often becomes delirious; but, generally in the morning, an imperfect ſweat brings on a remiſſion of all the ſymptoms. In the evening the paroxyſm returns, but without any cold fit, and is commonly worſe than the former: on the ſecond morning it remits as before. Theſe periods go on daily, until the fever changes inſenſibly, either into a confirmed or into an intermitting ſhape. Sometimes looſe ſtools carry off the fit, and ſupply the place of ſweats: however, though it reſembles an ague in many particulars, yet it is rare to meet with a real ague in the camp, unleſs the perſon has been ill of it before he took the field. The remiſſions uſually appear from the beginning, eſpecially if the patient has been plentifully blooded: but ſometimes there are no remiſſions for the laſt two or three days. Hæmorrhages of the noſe happen frequently in the height of the paroxyſm, and always bring on the remiſſion ſooner, and make it fuller. Vomiting or purging have the like effects. The fits are ſeldom preceded by ſhiverings, or any ſenſe of cold after the firſt attack; the pulſe is always full and quick during the paroxyſms, and in the remiſſions it ſtill indicates ſome degree of fever. The blood is florid, the craſſamentum is firm, in a large quantity, and ſinks in the ſerum. Whilſt the weather continues warm, the Bilious ſymptoms are moſt frequent, but, as winter approaches, the inflammatory ones prevail. See INFLAMMATORY *Fever*.

The doctor enumerates other ſymptoms, as crudeneſs of the urine, Bilious ſtools, coſtiveneſs, &c. and farther obſerves, that the infantry are more liable to it than the cavalry.

As to the cure of the camp-fever, before it becomes continued, it depends upon the proper uſe of evacuations, the neutral ſalts, and the bark. Bleeding he judges indiſpenſable; which he would have repeated once or oftener, according to the urgency of the ſymptoms. After bleeding it will be neceſſary to give an emetic, the beſt time for doing which is in the remiſſion of the fever, and rather ſooner after a paroxyſm than before one. He adds, however, that vomits do harm when the ſtomach is any wiſe inflamed; in which caſe they ought never to be given. Ipecacuanha is the ſafeſt and eaſieſt, but antimonials make the moſt efficacious vomit. If the body remains coſtive, it is neceſſary to open it with ſome lenient phyſic, and eſpecially if the bowels are affected with pains, or a teneſmus. He likewiſe recommends ſalt of wormwood, lemon-juice, ſpiritus mindereri, and the bark; which laſt ought not to be given till the urine breaks, and the intermiſſions take place. Bleeding and purging are alſo neceſſary before the bark ought to be given: it anſwers beſt in ſubſtance, adminiſtered in Rheniſh wine, after ſtanding a night in infuſion.

If, after remiſſion, or intermiſſions, the diſeaſe changes into a continued fever, bleeding becomes neceſſary, unleſs other ſymptoms forbid it; but whether there be room for bleeding or no, bliſters are not only uſeful, but the beſt remedy. To theſe may be joined neutral ſalts and diaphoretic powders. But, though a ſweat be the proper criſis, it ought never to be promoted by theriaca, or the like hot medicines; unleſs the pulſe ſhould ſink, and the petechiæ or other bad ſymptoms appear: in which caſe the warmer alexipharmics are neceſſary, as the diſeaſe has changed into a malignant fever. *Pringle's Obſerv. on the Diſeaſes of the Army.*

BILL, among mechanics, an iron inſtrument, flat and edged, in the form of a creſcent, and adapted to a handle. It is, beſides the ax, one of the chief inſtruments uſed by the wood-fellers. The gardeners uſe a bill to prune trees. Plumbers likewiſe have a ſort of Bills, to perform ſeveral parts of their work. Baſket-makers uſe alſo Bills to cut the largeſt pieces of cheſnut-trees, and other wood: for ſmaller pieces of oſier they employ only the working-knife.

BILL, in trade, both wholeſale and retail, as alſo among trades-people and workmen, ſignifies an account of merchandizes or goods delivered to a perſon, or of work done for one.

In thoſe Bills muſt be ſet down the ſums of money received on account, which ought to be deducted from the ſum total.

BILL *of Credit*, is a Bill which a merchant, or banker, gives to a perſon whom he can truſt, impowering him to receive money from the ſaid merchant or banker's correſpondents in foreign countries.

Though Bills of credit be different from Bills of exchange, yet they enjoy the ſame privileges, for the money paid in conſequence of them is recoverable by law.

A merchant, or banker, ought to be very well acquainted with the character of thoſe to whom he gives letters of credit, eſpecially if the ſum be not limited. It is adviſeable, therefore, as much as it is poſſible, to determine the ſum, that a perſon may exactly know what engagement he enters into.

There is another caution to be obſerved, which is, to acquaint the correſpondents who are to furniſh the money, with the departure of him who is to receive it, and to deſcribe his perſon as accurately as can be, or even to agree about ſome peculiar word or ſentence, by which the correſpondents may know that the perſon who applies to them for money, is really the identical perſon meant: for he may be killed, and his Bill of credit ſtolen, whereby another might perſonate him, and receive the money in his ſtead, which has frequently happened.

BILL *of Store*, is a licence granted at the cuſtom-houſe to merchants, whereby they have liberty to carry, cuſtom-free, all ſuch ſtores and proviſions, as they may have occaſion for during their voyage.

BINO'MIAL *(Dict.)*—Sir Iſaac Newton, in his Univerſal Arithmetic, has given us the two following theorems for reducing Binomials, conſiſting of rational and ſurd quantities, to more ſimple terms. 1. If A expreſſes the greater part of a quantity, and B the leſſer part: then will $\dfrac{A + \sqrt{AA - BB}}{2}$ be the ſquare of the greater part of the root; and $A - \sqrt{AA - BB}$ the ſquare of the leſſer part, to be added to the greater with the ſign of B. So that if the Binomial be $3 + \sqrt{8}$; (A being $= 3$, and $B = \sqrt{8}$) we ſhall have the ſquare root of $3 + \underset{4}{\sqrt{8}} = \underset{4}{1} + \sqrt{2}$. In like manner $\sqrt{32} - \sqrt{24} = \sqrt{18} - \sqrt{2}$. Secondly, if $A \pm B$ be a Binomial, whoſe greater part is A, and the index of the root to be extracted c, and n be found to be the leaſt number, whoſe power n^c can be divided by $AA - BB$, without a remainder, and Q be the quotient: and if $\sqrt[c]{\overline{A + B} \times \sqrt{Q}}$ be computed in the neareſt integral numbers, and the ſame be called r, and if $A\sqrt{Q}$ be divided by the greateſt rational diviſor, and the quotient be s, and if $\dfrac{r + \frac{n}{r}}{2s}$ in the neareſt integral numbers be t, then will $\dfrac{ts \pm \sqrt{ttss - n}}{\sqrt[2c]{Q}}$ be the root whoſe index is c, provided the root can be extracted. So that the cube root of $\sqrt{968} + 25$ will from hence be $2\sqrt{2} + 1$. $AA - BB$ being $= 343$, its diviſors 7, 7, 7; $n = 7$, and $Q = 1$. alſo the root of the firſt part of $\overline{A + B} \times \sqrt{Q}$, or $\sqrt{968} + 25$ being extracted, will be a little greater than 56; its cube root in the neareſt number 4; and ſo $r = 4$. Moreover, by extracting all that is rational from $A\sqrt{Q}$ or $\sqrt{968}$, it will be $22\sqrt{2}$: therefore $\sqrt{2}$ the radical part of it will be s, $\dfrac{r + \frac{n}{r}}{2s}$, or $\dfrac{5}{2\sqrt{2}}$ in the neareſt integral numbers is 2; therefore $t = 2$. Laſtly, ts is $2\sqrt{2}$. $\sqrt{ttss - n}$ is 1. and $\sqrt[2c]{Q}$ or $\sqrt[6]{1}$ is 1.

Sir Iſaac Newton has not thought fit to lay down a demonſtration of theſe two theorems, or rules, which are much more elegant and general than thoſe given us for extracting the roots of Binomials, in Van Schouten's Commentary upon Des Cartes's Geometry. But Mr. s'Graveſande, at the latter part of his Algebra, has been at the pains to give us a demonſtration of the latter of the ſaid theorems, judging, I ſuppoſe, the former to be ſo eaſy, as not to ſpend time about evincing its truth. In order to which, he premiſes eight lemma's, which are theſe:

1. If to any power whoſe index is c be raiſed the Bino-

mial $a + b$, and the terms of this power alternately taken (that is, the 1ſt, 3d, 5th, 7th, &c. and the 2d, 4th, 6th, 8th, &c.) be united into one ſum, and ſo the whole power be divided into two parts; the difference of the ſquares of the parts will be $\overline{aa - bb}|^c$.

2. If a and b repreſent numbers, whereof a is the greater, and the Binomial $\sqrt{a} + \sqrt{b}$ be raiſed to the power c, and this number be odd, this power will be a Binomial, one of whoſe members is multiplied by $\sqrt{a}$, and the other by $\sqrt{b}$; and theſe members will be the parts (lemma 1.) of which the greater is that which is multiplied by $\sqrt{a}$.

3. If, the ſame things being ſuppoſed, the number c be even, the power forms a Binomial, one of whoſe members is rational, and the other multiplied by $\sqrt{ab}$, the members will be alſo the parts mentioned in lem. 1.

4. Any power of a numerical Binomial $\sqrt{a} + \sqrt{b}$ has both its members poſitive; the power of a Binomial or apotome $\sqrt{a} - \sqrt{b}$ has one member negative; and the members themſelves do not differ, whether it be $+ \sqrt{b}$ or $- \sqrt{b}$.

5. If a Binomial $\sqrt{a} + \sqrt{b}$ be raiſed to a power whoſe index is c, the difference of the ſquares of the members of the power is $\overline{a - b}|^c$.

6. The root of a Binomial whoſe index is c, that is $\sqrt[c]{\;}$, cannot be extracted, unleſs the difference of the ſquares of the parts of the given Binomial has $\sqrt[c]{\;}$ rational.

7. If two continual decreaſing geometrical progreſſions have the middle term common, the difference between the firſt terms of the progreſſion will be greater than the difference between the laſt.

8. The $\sqrt[c]{\;}$ of a Binomial cannot be extracted, if c be an even number, unleſs the greater member of the given Binomial be rational.

BIRCH *Tree*, *betula*, in botany, a genus of trees, containing but one ſpecies. The leaves reſemble thoſe of the poplar; the ſhoots are very ſlender and weak; the juli or katkins are produced at remote diſtances from the fruits on the ſame tree; the fruit becomes a little ſquamous cone; the ſeeds are winged; and the tree caſts its bark every year.

This tree is propagated by ſuckers taken from the roots of old trees, which may be tranſplanted either in October or February; but October is to be preferred; for, if the ſpring ſhould prove dry, thoſe planted in February will many of them fail: it delights in a poor ſoil, and will grow in either moiſt ſpringy ſoils, or in ſtony or gravelly marſhes or bogs: when the young trees have been planted two years, you ſhould (if deſigned for underwood) cut them down within ſix inches of the ſurface, which will cauſe them to ſhoot out ſtrong and vigorous branches; but, if they are deſigned for large trees, it will be much better to let them ſtand three years, before you head them down; and, when you do it, cut them within three inches of the ground, that their ſtems may be ſtraight and handſome: but you muſt obſerve, when they begin to put out, whether they produce more than one ſhoot; which if they do, you muſt cut off all but the ſtrongeſt and moſt convenient ſhoot, which muſt be trained up for a ſtem.

The timber of this tree, though accounted the worſt of all others, yet it is not without its various uſes: the turners often uſe it, to make chairs, &c. and the huſbandmen, for making ox-yokes; it is alſo planted for hop-poles, hoops, &c. but, in places within twenty miles of London, it is kept often cut to make brooms, and turns to great account.

There are three or four other ſorts of this tree growing in the northern parts of Germany, Sweden, and Lapland, which are all of them rather ſhrubs than trees, the talleſt of them ſeldom riſing above ten feet high, the others about three or four feet; but, being of little uſe, I ſhall not enumerate them.

There is alſo a Birch-tree, which has been raiſed in the gardens lately, whoſe ſeeds came from America: the leaves of this ſort are larger than thoſe of the common Birch-tree; but this may be only from the plant's being young and vigorous; ſo cannot be pronounced different, by its preſent appearance.

The piercing and bleeding of Birch is performed thus: about the beginning of March, when the buds begin to be proud and turgid, and before they expand into leaves, with a chizel and a mallet cut a ſlit almoſt as deep as the pith, under ſome branch of a well ſpreading Birch; cut it oblique, and not long-ways, as a ſurgeon does a vein; and inſert a ſmall ſtone or chip, to keep the lips of the wound a little open; laſtly, to this orifice faſten a bottle, or other convenient veſſel, appendant, into which will diſtil a limpid and clear water, retaining an obſcure ſmack both of the taſte and odour of the tree. The miracle is, that, in the ſpace of twelve or fourteen days, as much juice may be gathered, as will outweigh the whole tree, body and roots.

The liquor or juice, thus procured, is uſed, in ſome northern countries, as a preſervative againſt the ſtone. Van Helmont extols a drink prepared with this juice, daucus-ſeeds, and brook-lime. Mr. Boyle, tells us, he has ſeen extraordinary medicinal effects of the juice itſelf, even when other remedies failed; ſo that he uſually provided a quantity of it every ſpring. He ſays, it may eaſily be preſerved, by pouring a little oil on the top of it; or by diſtillation; but that the beſt way is, to impregnate it with the fumes of ſulphur.

This juice is uſed both to make wine of, and to brew withal, being here employed in lieu of water; a barrel of malt will afford as much, and as good ale, as four with common water.

A great difference is found between the efficacy of that liquor which diſtils from the body, or parts of the tree nearer to the root, and that which weeps out from the more ſublime branches; the former being more crude and watery, the latter purer, and more refined.

Birch-wine is made by fermenting the vernal juice: formerly it was in great repute againſt all nephritic diſorders, but is left out in the modern London practice. *Quinc. Pharmac.*

BIRD *of Phœbus*, the raven, one of the ſouthern conſtellations, containing ſeven ſtars; five of the third magnitude, one of the fourth, and one of the fifth.

BIRDS, in heraldry, are figures frequently borne in arms.

Birds are eſteemed a more honourable bearing than fiſhes; and wild and ravenous Birds, than tame ones.

Birds, according to Leigh, are to be numbered as far as ten; according to Chaſſaneus to ſixteen; after which they are to be blazoned without number. When their bills and feet are of a different colour from the firſt, they are ſaid to be membered. Birds of prey are more properly ſaid to be armed.

Birds borne of their natural colour are to be blazoned by proper, without mention of the colour. In the blazoning of fowls much exerciſed in flight, if the wings be not diſplayed, they are ſaid to be borne cloſe, *e. gr.* he beareth an eagle, a hawk, or a ſwallow, cloſe. In the general, wherever a Bird is found in any action or poſture, to which nature does not ordinarily incline it, ſuch action or poſture is to be named, otherwiſe not. *Coat's Her. Dict.*

BIRD-LIME, among ſportſmen, a tenacious compoſition uſed in taking birds.

The common method of making it is to peel a good quantity of holly bark about midſummer; fill a veſſel with it, put ſpring water to it; boil it till the grey and white bark ariſe from the green, which will require twelve hours boiling; then take it off the fire, drain the water well from it, ſeparate the barks, lay the green bark on the ground in ſome cool cellar, covered with any green rank weeds, ſuch as dock thiſtles, hemlock, &c. to a good thickneſs; let it lie ſo fourteen days, by which time it will be a perfect mucilage; then pound it well in a ſtone mortar, till it becomes a tough paſte, and that none of the bark be diſcernable; next, after waſh it well in ſome running ſtream, as long as you perceive the leaſt motes in it: then put it into an earthen pot to ferment; ſcum it for four or five days, as often as any thing riſes, and, when no more comes, change it into a freſh earthen veſſel, and preſerve it for uſe in this manner: take what quantity you think fit, put it into an earthen pipkin, add a third part of capons or gooſe greaſe to it, well clarified, or oil of walnuts, which is better; incorporate them on a gentle fire, and ſtir it continually till it is cold, and thus it is finiſhed.

To prevent froſt; take a quarter of as much oil of petroleum as you do gooſe greaſe, and no cold will congeal it: the Italians make theirs of the berries of the miſletoe-tree treated after the ſame manner, and mix it with nut-oil, an ounce to a pound of lime, and, taking it from the fire, add half an ounce of turpentine, which qualifies it alſo for the water.

When the twigs, or cords, are to be put in places ſubject to wet, the common Bird-lime is apt to have its force ſoon taken away. It is neceſſary, therefore, to have recourſe to a particular ſort, which, from its property of bearing water unhurt, is called water Bird-lime; and is prepared thus:

Take a pound of ſtrong and good Bird-lime, waſh it thoroughly in ſpring water, till the hardneſs is all removed; and then beat it well, that the water may be clean ſeparated, ſo as not a drop remains; add to it as much capon's greaſe as will make it run. Then add two ſpoonfuls of ſtrong vinegar, one ſpoonful of oil, and a ſmall quantity of Venice turpentine. Let the whole boil for ſome minutes over a moderate fire, ſtirring it all the time. Then take it off; and, when there is occaſion to uſe it, warm it, and cover the ſticks well with it. This is the beſt ſort of Bird-lime for ſnipes, and other birds that love wet places.

The moſt ſucceſsful method of uſing the common Bird-lime is this: cut down the main branch or bough of any buſhy tree, whoſe twigs are thick, ſtraight, long, and ſmooth, and have neither knots nor prickles. The willow and the birch-tree afford the beſt of this kind. Let all the ſuperfluous ſhoots be trimmed off, and the twigs all made neat and clean; they muſt all be well covered with the Bird-lime, within four inches of the bottom; but the main bough, from which they grow, muſt not be touched with the lime. No part of the bark, where the lime ſhould come, muſt be left bare; but it is a nice matter to lay it on properly, for, if it be too thick, it will give the birds a diſtaſte, and they will not come near it; and, if there be too little of it, it will not hold them when they are there. When the buſh is thus prepared, it muſt be ſet up in ſome dead hedge, or among ſome growing buſhes near the outſkirts of a town, a farmer's back-yard, or the like, if it be in ſpring; for theſe places are the reſort of ſmall birds at that time. If it be uſed in ſummer, the buſh muſt be placed in the midſt of a quick-ſet-hedge, or in groves, buſhes, white-thorn trees, near fields of corn, hemp, flax, and the like; and, in the winter, the proper places are about ſtacks of corn, hovels, barns, and the like. When the lime buſh is thus planted, the ſportſman muſt ſtand as near it as he can, without being diſcovered; and with the mouth, or otherwiſe, make ſuch ſort of notes, as the birds do when they attack, or call to one another. There are bird-calls to be bought for this uſe; but the moſt expert method is to learn the notes of call of the ſeveral birds, and imitate them by a ſort of whiſtling. When one bird is thus enticed to the buſh, and hung faſt, the buſineſs of the ſportſman is not to run up to take it, but to be patient; for it will hang itſelf more faſt, by its ſtruggling to get away; and its fluttering will bring more to the buſh; ſo that ſeveral may be taken together. The time of the day of this ſport is from ſun-riſe to ten o'clock, and from one to ſun-ſet. Another very good method of bringing the birds together is by a ſtale; a bat makes a very good ſtale, but it muſt be faſtened, ſo as to be in ſight at a diſtance. An owl is a ſtill better ſtale, for this bird never goes abroad, but it is followed by all the ſmall birds in the neighbourhood. They will gather together in great numbers about it, and, having no convenient place to ſit on, but the lime buſh, will be taken in great numbers. If a living owl or bat is not to be had, the ſkin ſtuffed will ſerve the purpoſe, and will laſt twenty years. Some have uſed the image of an owl carved in wood, and painted in the natural colours, and it has been found to ſucceed very well.

A method of deſtroying ſmall birds in great numbers by lime twigs is this: take two or three hundred ſmall twigs, about as thick as ruſhes, and three or four inches long; ſtick theſe on the tops of ten or a dozen cocks of hemp, or other produce of the field, cut and cocked up. There are generally in theſe fields of hemp vaſt numbers of linnets, and other ſmall birds, feeding on the ſeeds; the whole field is to be beat over, after the twigs are planted, and the birds will naturally ſettle on the cocks, and many dozen of the ſeveral kinds will be taken at once.

Another method of taking great numbers in the winter ſeaſon is this: take a number of wheat ears, with the ſtraws about a foot long to them; melt ſome good Bird-lime gently over the fire, adding one fourth part of its weight of ſome light fat, ſuch as the greaſe of fowls, or the like. When this runs thin, cover the ſtraws with it for ſix inches below the ears. Then take into a field, where the ſmall birds reſort in flocks, as they do at this ſeaſon of the year, a quantity of theſe limed ſtraws, and a peck or two of chaff; ſpread the chaff over a large ſpace of ground, and among it place the limed ſtraws, ſticking them in the ground at the bottom, and letting the ears droop down. When the place is thus planted, the ſportſman muſt beat the neighbouring fields and hedges; and the birds being diſturbed will riſe, and they will naturally make their way to where they ſee the chaff. They will then ſoon be pecking at the ears of corn; and, as the limed ſtraws will ſoon begin to ſtick to them, they will mount up into the air with them; but, in their flight, the ſtraws ſoon get under their wings, and faſten them together; ſo that they can no longer fly, but fall ſtruggling to the ground.

As ſoon as they begin to fall, the ſportſman's buſineſs is to watch, not to run to take them up, for, in a little time, more will be entangled; and, with patience, ſometimes five or ſix dozen may be taken in this manner at a time. This method ſucceeds better, as the weather is more and more ſevere; and beſt of all, when the ground is covered with ſnow. The ſame place will ſerve for many repeated flights. The limed ſtraws are to be taken away, as ſoon as the firſt flight is taken, and the place new bated with chaff; the birds may then be left to feed with freedom; and the next morning, the limed ſtraws being ſet up again, they will be caught in greater numbers, than at the firſt attempt.

BIRD's-NESTS, in natural hiſtory, a kind of ſpice very much eſteemed in China, and throughout all the Eaſt-Indies; it is to be found in Tonquin and Cochinchina, but more particularly in the kingdom of Campa or Champa, which is ſituated between both. The birds which make thoſe neſts to lay their eggs, and hatch their young ones in, are pretty much like the ſwallows: in coupling time, there iſſues from their bills a clammy foam or glutinous matter, which is the only material they build their neſts with; they faſten them to the rocks, by applying to them that glutinous ſubſtance; by ſeveral layers the one over the other, the former becomes dry. Theſe neſts are of the form of a middle-ſized ſpoon, but the brims are higher.

There are ſo many of theſe kinds of neſts, that they gather every year ſeveral hundred weight of them, which are almoſt all carried into China, where they are ſold for five taels per hundred weight, which amounts to about a hundred Spaniſh ducats. They are thought to be good for the ſtomach and the head, and give a delicious taſte to the meat ſeaſoned with them.

BI'RMINGHAM *Hard-ware-men*, or dealers in the city of London, in Sheffield and Birmingham wares, are ſo called, becauſe they principally trade in, and moſtly wholeſale, all ſorts of tools, ſmaller utenſils, toys, buckles, buttons, in iron, ſteel, braſs, &c. made in London, and the great trading towns of Birmingham in Warwickſhire, and Sheffield in Yorkſhire, where many thouſands of artiſans, in different branches, are conſtantly employed, but for the moſt part in the ſmithery and cutlery ways.

There are but few of theſe in London; yet almoſt all of them carry on a moſt extenſive trade, and are reputed wealthy. It is not eaſy to conceive, much leſs to deſcribe, the numerous articles that paſs through their hands: therefore, a youth, deſirous to ſerve an apprenticeſhip to this buſineſs, ſhould be ready and acute, not want a good memory, write a plain hand, know arithmetic, and ſomewhat of book-keeping.

BI'SCUIT, or BISKIT, a general name for that bread which is made for voyages by ſea, eſpecially for long voyages.

Biſket, in order to be good, ſhould be made ſix months before it is put on board a ſhip; it muſt be of good wheat flour, thoroughly cleaned from bran.

Water and Biſket are the moſt neceſſary proviſions in the fitting out of ſhips, and, if either of theſe two be loſt or ſpoiled, the crew languiſh away, and often periſh moſt miſerably, eſpecially if they happen to be bound for a very long voyage.

Manner of making Sea BISCUITS.— The flour is firſt wet in the kneading-trough with a ſufficient quantity of water, and covered for ſome time with a cloth. It is then well kneaded, and the dough divided into pieces of about three ounces each. Theſe pieces are again kneaded ſingly, and laid in rows; and, after having ſome flour ſhaken over them, others are laid upon them, till the whole quantity to be baked at once is finiſhed. The pieces of dough are then flatted into cakes, pricked with an inſtrument for that purpoſe, and placed regularly in the oven; where they ſtand about half an hour, and are then drawn out of the oven, and carried into the ſtore-room.

The Manner of making Sea BISCUIT *in France.*— In order to make the leaven, which the French put in their Biſket, a piece of dough weighing about twenty pounds, from the leaven of the laſt oven full, ſhould be prepared, which is done, we will ſuppoſe, between eleven and twelve at noon. At four of the clock in the afternoon, the baker puts that dough into the kneading-trough, and pours over it about five gallons of very clean water, a little more than luke-warm, but hotter in winter than in ſummer; he dilutes afterwards with the quantity of flour neceſſary to conſume all that water, ſo as to make a dough neither too ſoft nor too hard. This new maſs of dough weighs commonly about ſixty pounds. In this condition the baker puts it in a corner of the kneading-trough, ſurrounding it on all ſides with flour to ſupport it. When it has been riſing five or ſix hours, the ſame operation is repeated, by adding water and flour to the dough, which increaſes it by about thirty pounds.

About one or two o'clock the next morning, which is the time when the baker would knead, he adds thirty pounds more to the paſte, which makes a maſs of 120 pounds; of this he takes half to ſerve as leaven for the next baking, and at the ſame time kneads the remaining ſixty pounds in the kneading-trough for the firſt oven full, and, for the other bakings, he is to make the reſt of the day, he increaſes the leaven at once with ſixty pounds, which he puts into a tub or bucket, in order to continue the ſame alternately, except that for the laſt oven full he adds but twenty pounds to the leaven, which is to ſerve for beginning the ſame operation the next day.

The kneader takes water out of the kettle or copper which he uſed for the leavens, and dilutes that which he would employ into a whitiſh and thick water; and, putting flour to it two or three times, he kneads it quickly and very ſtrongly with his fiſts, going from the right to the left, and beginning again from one end to the other, and from the left to the right, he reduces it to one ſingle maſs. After this, he flattens it with the palms of his hands, and divides it into four parts: then he flattens them again, and handles them and kneads them with all his might one after another; afterwards he puts them again one upon another, and, having cleaned his kneading-trough, he puts the whole into one maſs, turning and kneading it ſtill. After which he cuts it again into four parts, which having rejoined for the laſt time, he takes the dough out of the kneading-trough, and puts it upon a table, where another workman turns it ſeveral times during a quarter of an hour, till it be very firm and dry.

As ſoon as the dough is in the above-mentioned condition, it muſt immediately be made into cakes. Each cake muſt weigh fourteen ounces of dough, that, when baked, it may weigh eight, or at moſt nine ounces.

The dough is cut into pieces of that weight, which pieces are afterwards turned upon the table with the hands into balls, to make it harder ſtill: then it is flattened with a kind of rolling-pin, the middle of which is thicker than the two ends, obſerving, however, to make the cake ſomething hollow in the middle; as for the edges, they muſt be even, and be above one third part of an inch thick.

The cake being thus formed, they make the mark, a croſs, or ſome other figure, upon it, with an inſtrument for that purpoſe; after which they turn it on the other ſide, laying it upon the table, as near as poſſible to thoſe already made; finally, a little before they put it into the oven, they prick it four or five times with an iron inſtrument that has three points.

Before they prick the cakes and put them into the oven, they muſt let them reſt half an hour upon the table, or even more, if need be, that they may have time to riſe, which the baker ought to know and direct.

At Breſt, they put the cakes into the oven, as ſoon as they are pricked, without letting them reſt or riſe, becauſe they pretend they are ſufficiently furniſhed with leaven, and in that caſe they do not cover them.

For the firſt oven full, they muſt begin to heat the oven, as ſoon as they begin to work the dough with the rolling-pin; and they know that the oven is hot, when the roof of it is of a whitiſh aſh colour. But, for the other oven full, they do not warm the oven; but after they have rolled the dough, or a little ſooner or later, according as the baker thinks fit, or as the dough requires it, and the oven is not to be quite ſo white.

It muſt be obſerved, that for the firſt oven full they may heat the oven with green wood, becauſe it has time to dry and burn: but, for the others, the drieſt wood is beſt, becauſe the dough requires to be ſoon put into the oven, leſt it ſhould dry too much.

After the fire is taken out of the oven, and it has been well ſwept, the baker thruſts the cakes into the oven, the one after the other, on an iron or wooden ſhovel, obſerving to place them regularly, ſo that there may be no void ſpace between them. He afterwards ſhuts the oven very cloſe, and puts a few ſhovels full of live coals againſt the door; a quarter of an hour after he opens the oven, to ſee whether the Biſkets begin to colour: if he find them ſufficiently coloured, he leaves the oven open for half a quarter of an hour, during which he takes away the coals from before the door, which he ſhuts again. When the cakes have remained in the oven a full quarter of an hour longer, he takes out ſome of the cakes which were firſt put in, and breaks them to ſee whether they be baked. When they are ſo, the edges are reddiſh within; and the little which remains in the middle, is ſpongy but dry. They put their hand upon that crumb, and, if they obſerve any moiſture in it, it is a ſign that the cakes are not baked enough; and they muſt leave them in the oven, as long as they judge it neceſſary to dry up all the moiſture.

As ſoon as the Biſkets are taken out of the oven, they carry them out into the ſtore-room, which has been well cleaned and warmed, during four days. The ſtore-rooms, to be good, ſhould be built over the ovens, wainſcotted at top and bottom, and on all ſides, and the joints of the boards well caulked.

BISTORT, *Biſtorta*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the apetalous kind, conſiſting of a number of ſtamina, which ariſe from a cup, divided into ſeveral ſegments at the edge: the piſtil becomes afterwards a ſeed, uſually of a triangular figure, and contained in a capſule, which was before the cup of the flower. See *Plate* VI. *fig.* 37.

To this it is to be added, that the flowers are diſpoſed in ſpikes; and the roots are large and fleſhy, oddly twiſted or contorted, and furniſhed with a number of ſmall fibres, like hairs. There are alſo ſome ſpecies of Biſtort, in which, beſides the common flowers and ſeeds, there are certain tubercles, which have their roots, and rudiments of leaves.

The roots of the common Biſtort are a ſtanding medicine in the ſhops; they are given in decoction, and ſometimes in powder, as an aſtringent, and generally in conjunction with the tormentil root. They give a bright red colour to the common hartſhorn drink, and add conſiderably to its virtue. It is good in diarrhœas, and hæmorrhages of all kinds.

Some alſo commend it as an alexipharmic, and ſudorific.

BITTACLE, a ſea term, ſignifying a frame with two ſtories, placed in the ſteerage, before the place where the ſteerſman ſtands, by the miſſen-maſt; it is all made of boards faſtened together with wooden pegs, without any iron, to prevent the direction of the needle of the compaſs, which is incloſed in it, from being altered by the proximity of that metal. They alſo put a watch or clock in it, with a candle or lamp to light the ſteerſman.

In large ſhips, beſides this Bittacle, they have another for the pilot or mate.

BITTERN, in zoology, the name of a bird of the heron kind called by authors ardea ſtellaris: and by ſome taurus, botaurus, butorius, and ocnus.

In Engliſh, the butter-bump, and mire-drum. It is nearly of the ſize of a common heron; its head is ſmall and narrow; its crown is black; and there is alſo a black ſpot on each ſide, near the angle of the mouth. Its throat and ſides are reddiſh, variegated with black tranſverſe lines; the neck is covered with very long feathers, which make it appear much thicker and ſhorter than it really is; its belly is of a duſky white, with a caſt of browniſh red, and its back is variegated with a pale reddiſh brown and black. It makes a very remarkable noiſe, which it repeats either three or five times. It is heard only in the building-time, which begins in February. The common people, from the ſingularity of the noiſe, think the bird, in order to make it, ſticks its beak in a reed, or in the mud. It is commonly found in ſedgy and reedy places, near the waters, and ſometimes in hedges. Towards autumn, this bird flies very high in an evening after ſun-ſet, riſing with a ſpiral aſcent, till quite out of ſight; and, as they riſe, they make an odd noiſe, not at all like their uſual note. This they repeat alſo very often, as they are on the wing in the night; and hence they are called by ſome, though improperly, the night-raven. It builds on the ground, and lays five or ſix eggs, which are roundiſh, and of a greeniſh white. When wounded, and going to be taken, it ſtrikes at the perſon's eye, and ought carefully to be guarded againſt.

BITTS, are two perpendicular pieces of timber in the fore part of the ſhip, bolted to the gun-deck and orlop beams, their lower ends ſtepping in the foot waaling, the heads of which are braced with a croſs piece, and, when ſeveral turns of the cable are taken over them, is for ſecuring the ſhip at anchor; there are generally two pair of them; beſides, there are others upon the upper deck, which are fixed by the main and fore maſt, and called the top-ſail ſheet and jeer Bitts.

Currier's BLACK, ſignifies a teint or dye laid on tanned leather; of which there are uſually two, the firſt made of galls, ſour ale, and old iron; the ſecond of galls, copperas, and gum arabic.

BLACK-*Bird*, *merula*, in zoology. See the article MERULA.

BLACK *Land*, in agriculture, a term by which the huſbandmen denote a particular ſort of clayey ſoil, which, however, they know more by its other properties than by its colour, which is rarely any thing like a true Black, and often but a pale grey. This, however pale when dry, always blackens by means of rains; and, when ploughed up at thoſe ſeaſons, it ſticks to the plough-ſhares, and, the more it is wrought, the muddier and duſkier-coloured it appears. This ſort of ſoil always contains a large quantity of ſand, and uſually a great number of ſmall white ſtones.

BLACK *Flux*, in minerology, a flux uſed in the aſſaying of ores, and is made as follows: take one part of nitre, and two parts common tartar; reduce each to powder, mix them together, and deflagrate the whole in a crucible, by lighting the mixture a-top; which thus turns to a kind of alkaline coal, that is to be pulverized, and kept in a cloſe glaſs, to prevent its diſſolving, as it would do in a moiſt air.

This flux is of general uſe; and, to have it ready at hand, ſhortens the buſineſs of making aſſays in metallurgy; and renders the operation more exact, than when crude tartar and nitre are employed; becauſe the deflagration might thus carry off ſome part of the ore, and defraud the account. For the ſame reaſon, the mixture is here directed to be fired at top; otherwiſe a conſiderable part might be loſt in the deflagration, which would prove much more tumultuous and violent, if the matter was thrown into a red-hot crucible. *Shaw's Chem. Lectures.*

BLACK *Tin*, in minerology, a denomination given to the tin-ore when dreſſed, ſtamped, and waſhed ready for the melting-houſes, where it is refined into a pure metal.

It is prepared into this ſtate by means of beating and waſhing; and, when it has paſſed through ſeveral baddles or waſhing-troughs, it is taken up in the form of a Black powder like fine ſand, called Black tin.

BLADE, in botany, that part of the flower, or florid attire of a plant, which ariſes out of the concave of the ſheath, and, at the top, uſually divides into two parts, which are covered with globules of the ſame nature as thoſe of the apices, but not ſo copious.

The Blade runs through the hollow of the ſheath and baſe, and is faſtened to the convex of the ſeed-caſe, having its head and ſides beſet with globules, which, through a glaſs, appear like turnip-ſeeds, and which, in ſome plants, grow cloſe to the blade, and in others adhere to it by little pedicles, or foot-ſtalks. Theſe globules, as the Blade ſprings up from within the ſheath, are ſtill rubbed off, and ſo ſtand like a powder on both. In ſome plants, as knap-weed, they ſeem alſo to grow on the inſide of the ſheath, as appears on ſplitting it with a pin. The head of a Blade is divided uſually into two; but ſometimes, as in cichory, into three parts, which, by degrees, curl outward, like ſcorpion-graſs.

BLADE, in commerce, a thin, ſlender piece of metal, either forged by the hammer, or run and caſt in moulds, to be afterwards ſharpened to a point, edge, or the like.

BLADE *of a Chiſſel*, is the iron or ſteel part, as diſtinguiſhed from the wooden handle.

BLADE *of Mace, or Cinnamon*, among apothecaries, are little ſlips or ſlices of thoſe barks.

BLADE *of an Oar*, is the flat part which is plunged into the water in rowing. On the length of this does the force and effect of the oar depend.

BLADE *of a Saw*, the thin part wherein the teeth are cut, which, to be good, muſt be ſtiff, yet bend equally into a regular bow all the way, without yielding more in one place than another.

BLADE-*Mill*, is that contrived for grinding iron-tools, as ſcithes, reaping-hooks, axes, chiſſels, and the like, to a bright edge.

BLA'NCHING, in gardening, an operation performed on certain ſallets, roots, &c. as of cellery and endives, to render them fairer and fitter for the table. The time for Blanching of cellery is about the middle of June, when ſome of the firſt ſowing will be fit to plant out in trenches for this purpoſe. Theſe trenches are to be cut by a line eight or ten inches wide, and about as many deep; into which they put their plants, after having firſt pruned off the tops and roots. As they grow large, they earth them up within four or five inches of their tops, and ſo continue to do at ſeveral times, till whitened ſufficiently for uſe; which they will not ordinarily be till ſix weeks after earthing them up. For endive, as ſoon as it is well grown, they tie up ſome of it to whiten; and continue every fortnight, as long as it laſts, to tie up freſh parcels.

BLANCHING is alſo a term uſed by the people who cover thin plates of iron with tin, for that part of the work, which conſiſts in dipping the plates into the melted tin, in order to the covering of them. The people who do this part of the buſineſs are hence called Blanchers.

BLA'NKET, in commerce, a warm woolly ſort of ſtuff, light and looſe woven, chiefly uſed in bedding.

The manufacture of Blankets is chiefly confined to Witney in Oxfordſhire, where it is advanced to that height, that no other place comes near it. Some attribute a great part of the excellency of the Witney Blankets to the abſterſive, nitrous water of the river Windruſh, wherewith they are ſcoured; others rather think they owe it to a peculiar way of looſe ſpinning, which the people have thereabouts. Be this as it will, the place has engroſſed almoſt the whole trade of the nation for this commodity; inſomuch that the wool fit for it centers here from the furthermoſt parts of the kingdom. There are ſaid to be at leaſt threeſcore blanketers in this town, who, amongſt them, have at leaſt 150 looms, and employ 3000 perſons, from children of eight years old, who work out about a hundred packs of wool per week.

BLA'STING, among miners, a term for the tearing up rocks, which they find in their way, by gunpowder. The method of doing which is this: they make a long hole, like the hollow of a large gun-barrel, in the rock they would ſplit; this they fill with gun-powder, then they firmly ſtop up the mouth of the hole with clay, except a touch-hole, at which they leave a match to fire it. A ſmall quantity of powder does great things this way.

BLEA, in vegetables, is that part of a tree which lies immediately under the bark, and between that and the hard wood, and is the firſt progreſs of the alteration of the bark into wood, by the natural growth and ſtrengthening of the fibres.

BLEE'DING, according to Dr. Pringle, is the moſt indiſpenſable of all remedies in inflammatory diſeaſes; to the delaying of which too long, or not repeating it, are chiefly owing the bad conſequences of colds, as dangerous fevers, rheumatiſms, and conſumptions. He obſerves farther, that, in general, young practitioners are apt to be too ſparing in letting blood, by which means many lives are loſt: for a ſurgeon may be aſſured a ſoldier will never complain of a cough, or pains with inflammatory ſymptoms, wherein Bleeding is not neceſſary; and from the ſizineſs of the blood, and continuance of the complaints, he is to judge of the neceſſity of repeating it, which, in caſe of a ſtitch, or difficult breathing, is never to be delayed. In inflammatory caſes, from twelve to fifteen ounces may be taken for the firſt Bleeding, and ſomewhat leſs for all the reſt; and, when it is neceſſary to exceed this quantity, it may be proper to follow Celſus's rule, in minding the colour of the blood whilſt it flows, and when it is of a blackiſh caſt, which is always the caſe in difficult breathing and great inflammations, to let it run till it becomes more florid. In all caſes where plentiful Bleeding is indicated, it is beſt to do it in bed, to prevent fainting; and we may obſerve, that a perſon will bear the loſs of a much greater quantity of blood, if the ſtream is ſmall, than by a large orifice, which ſome have thought neceſſary for making a more ſpeedy revulſion.

Bleeding is highly neceſſary in the phrenitis, ophthalmia, quinſy, rheumatiſm, cough, hectic fits, and, in general, in all inflammatory caſes. *Pringle's Obſerv. on the Diſeaſes of the Army.*

It is to be obſerved, however, that, in malignant and putrid diſorders, Bleeding frequently renders them more malignant, and therefore to be omitted, or at leaſt not repeated, unleſs there appear evident marks of inflammations. See PHLEBOTOMY *Dict. and Suppl.*

BLEND-*Metal iron*, a coarſe ſort of iron from Staffordſhire mines, uſed for making nails and heavy ware; in ſome places alſo for horſe-ſhoes. *Plott, Nat. Hiſt. of Staffordſhire.*

BLEYME, in farriery, an inflammation in a horſe's hoof, occaſioned by blood putrified in the inner part of the coffin towards the heel, between the ſole and the coffin-bone.

There are three ſorts of Bleymes; the firſt, bred in ſpoiled wrinkled feet with narrow heels, are uſually ſeated in the inward or weakeſt quarter; the ſecond, beſides the uſual ſymptoms of the firſt, infects the griſtle, and muſt be extirpated, as in the cure of a guitter bone; the third is occaſioned by ſmall ſtones and gravel between the ſhoe and the ſole. For a cure, they pare the foot, let out the matter, if any, and dreſs the ſore, like the prick of the nail. *Dict. Ruſt. T. 1. in Voc.*

BLIGHT (*Dict.*)— There is nothing ſo deſtructive to a fruit-garden as Blights; nor is there any thing in the buſineſs of gardening which requires more of our ſerious attention, than the endeavouring to prevent or guard againſt this great enemy of gardens.

In order, therefore, to remedy this evil, it will be neceſſary firſt to underſtand the true cauſes of Blights: and, although many curious perſons have attempted to explain the cauſes of them, yet very few of them have yet come near the truth, except the reverend and learned Dr. Hales, who hath, in his curious book, intitled, Vegetable Statics, given us ſome accurate experiments upon the growth and perſpiration of plants; together with the various effects the air has upon vegetables; that, by carefully attending thereto, together with diligent obſervations, we need ſeldom to be at a loſs how to account for the cauſes of Blights, whenever they may happen.

Blights are often cauſed by a continued eaſterly wind, for ſeveral days together, without the intervention of ſhowers, or any morning dew, by which the perſpiration of the tender bloſſoms is ſtopped; ſo that, in a ſhort time, their colour is changed, and they wither and decay: and if it ſo happens, that there is a long continuance of the ſame weather, it equally affects the tender leaves; for their preſpiring matter is hereby thickened, and rendered glutinous, cloſely adhering to the ſurfaces of the leaves, and becomes a proper nutriment to thoſe ſmall inſects, which are always found preying upon the leaves and tender branches of fruit-trees, whenever this Blight happens.

The beſt remedy for this diſtemper, that I have yet known to ſucceed, is, gently to waſh and ſprinkle over the trees, from time to time, with common water (that is, ſuch as hath not had any thing ſteeped in it) and the ſooner this is performed (whenever we apprehend danger) the better; and, if the young and tender ſhoots ſeem to be much infected, waſh them with a woollen cloth, ſo as to clear them, if poſſible, from all this glutinous matter, that their reſpiration and perſpiration may not be obſtructed; and if we place ſome broad flat pans or tubs of water near the trees, that the vapours exhaled from it may be received by the trees, it will keep their tender parts in a ductile ſtate, and greatly help them; but, whenever this operation of waſhing the trees is performed, it ſhould be early in the day, that the moiſture may be exhaled before the cold of the night comes on; eſpecially if the nights are froſty: nor ſhould it be done when the ſun ſhines very hot upon the wall, which would be ſubject to ſcorch up the tender bloſſoms.

Another cauſe of Blights in the ſpring is, ſharp hoary froſts, which are often ſucceeded by hot ſunſhine in the day-time; which is the moſt ſudden and certain deſtroyer of fruits that is known: for the cold of the night ſtarves the tender parts of the bloſſoms, and the ſun riſing hot upon the walls before the moiſture is dried from the bloſſoms (which, being in ſmall globules, collects the rays of the ſun) a ſcalding heat is thereby acquired, which ſcorches the tender flowers, and other parts of plants.

But there is another ſort of Blight, againſt which it is very difficult to guard our fruit-trees; this is ſharp pinching froſty mornings, which often happen at the time when the trees are in flower, or while the fruit is very young, and occaſion the bloſſoms or fruit to drop off; and, ſometimes, the tender parts of the ſhoots and leaves are greatly injured thereby.

The only method yet found out to prevent this miſchief, is, by carefully covering the walls, either with matts, canvas, reeds, &c. which being faſtened ſo as not to be diſturbed with the wind, and ſuffered to remain on during the night, by taking them off every day, if the weather permits, is the beſt and ſureſt method that hath yet been uſed in this caſe; which, although it has been ſlighted, and thought of little ſervice by ſome, yet the reaſon of their being not ſo ſerviceable, as has been expected, was, becauſe they have not been rightly uſed, by ſuffering the trees to remain too long covered; by which means, the younger branches and leaves have been rendered too weak to endure the open air, when they are expoſed to it; which has often proved of worſe conſequence to trees, than if they had remained intirely uncovered.

Whereas, when the covering before-mentioned has been performed, as it ought to be, it has proved very ſerviceable to fruits; and many times, when there has been almoſt a general deſtruction of fruits, in the neighbouring gardens, there has been a plenty of them in ſuch places where they have been covered; and, though it may to ſome ſeem very great, yet, if theſe coverings are fixed near the upper part of the wall, and are faſtened to pullies, ſo as to be drawn up, or let down, it will be ſoon and eaſily done; and the ſucceſs will ſufficiently pay the trouble.

But there is another ſort of Blight, that ſometimes comes later in the ſpring, viz. in April or May, which is often very deſtructive to orchards, and open plantations, and againſt which we know no remedy. This is what is called a fire-blaſt, which, in a few hours, hath not only deſtroyed the fruit and leaves, but, many times, parts of trees, and, ſometimes, whole ones, have been killed by it.

This is ſuppoſed to be effected by volumes of tranſparent flying vapours, which, among the many forms they revolve into, may ſometimes approach ſo near to an hemiſphere, or hemicylinder, either in their upper or lower ſurfaces, as thereby to make the beams of the ſun converge enough to ſcorch the plants or trees they fall upon, in proportion to the greater or leſs convergency of the ſun's rays.

The learned Boerhaave, in his Theory of Chemiſtry, obſerves, That thoſe white clouds, which appear in ſummer-time, are, as it were, ſo many mirrors, and occaſion exceſſive heat; theſe cloudy mirrors are ſometimes round, ſometimes concave, polygonous, &c. when the face of the heavens is covered with ſuch white clouds, the ſun, ſhining among them, muſt, of neceſſity, produce a vehement heat; ſince many of his rays, which would otherwiſe, perhaps, never touch our earth, are hereby reflected to us: thus, if the ſun be on one ſide, and the clouds on the oppoſite one, they will be perfect burning-glaſſes.

I have ſometimes, continues he, obſerved a kind of hollow clouds, full of hail and ſnow; during the continuance of which, the heat was extreme; ſince, by ſuch condenſation, they were enabled to reflect more ſtrongly: after this came a ſharp cold, and then the clouds diſcharged their hail in great quantities; to which ſucceeded a moderate warmth. Frozen concave clouds, therefore, by their great reflexions, produce a vigorous heat; and the ſame, when reſolved, exceſſive cold.

Whence (as Dr. Hales obſerves) we ſee, that blaſts may be occaſioned by the reflexions of the clouds, as well as by the above-mentioned refraction of denſe tranſparent vapours.

Againſt this enemy to fruits, &c. as hath been ſaid, there is no guard to our plantations, nor any remedy to cure it: but as this more frequently happens in cloſe plantations (where the ſtagnating vapours from the earth, and the plentiful perſpirations from the trees, are pent in for want of a free air to diſſipate and diſpel them; which are often obſerved, in ſtill weather, to aſcend in ſo plentiful a manner, as to be ſeen by the naked eye, but eſpecially with reflecting teleſcopes, ſo as to make a clear and diſtinct object become dim and tremulous) than in thoſe that are planted at a greater diſtance, or are not ſurrounded with hills or woods; this directs us, in the firſt planting of orchards, &c. that we ſhould allow a greater diſtance between the trees, and make choice of clear healthy ſituations, that the air may freely paſs between the trees, to diſſipate thoſe vapours before they are formed into ſuch volumes, whereby the circumambient air will be clear, and leſs ſubject to injuries; as alſo the fruits which are produced in this clearer air, will be much better taſted than thoſe that are ſurrounded with a thick rancid air; for, as fruits are often in a reſpiring ſtate, ſo they conſequently, by imbibing a part of theſe vapours, are rendered crude and ill-taſted; which is often the caſe with a great part of our fruits in England. *Miller's Gard. Dict.*

BLIND, deprived of the ſenſe of ſight.

Blind is alſo uſed in ſpeaking of veſſels which are not perforated.

Thus the chemiſts ſay, a Blind alembic; that is, one which has no aperture. A tube is ſaid to be Blind, when it is cloſed at top.

Blind, or Blinde, among mineraliſts, a kind of lead marcaſite, by our miners called mock-ore, mock-lead, and wild-lead.

Blinde is a mineral maſs, flaky, gloſſy, and breaking in angles, much like the potters lead ore, only of a colour more duſky, and approaching to black. In it are veins of a yellow ſhining marcaſite, with a little white ſpar, and on one ſide a greeniſh æruginous matter. On a trial by the fire, it yielded a very little copper, leſs lead, and no tin. It is very obſtinate, ſeveral attempts having been made with the alcaline fluxes to run it, in vain.

BLOCK-*Makers*.—Blocks are very material articles in a ſhip's rigging; and the making of them, and many other things, for the uſe of ſhipping, is a pretty handicraft enough, in which there is more ingenuity than ſome people imagine; and a very uſeful employ, though not a great number of maſters in it; for, as the Blocks are what the ſhips ropes are faſtened to, and run in by the help of the pullies fixed therein, if they are not made exactly to fit one another, the tackling will work but heavily, to the great hindrance of buſineſs, and fatigue of the ſeamen, &c.

They require ten pounds, or more, with a lad to be an apprentice; their hours are from ſix to eight, working altogether dry, and under cover; and the wages are fifteen or eighteen ſhillings a week.

This will take four hundred pounds, at leaſt, to ſet a maſter up well.

The ſhivers and pins in large Blocks are generally made of lignum vitæ, by turning them in a lathe. See TURNING.

BLOOD (*Dict.*)—In order to aſcertain the colour of the different parts of corrupted Blood, Dr. Pringle made the following experiment: he took a freſh quantity, without any inflammatory cruſt, and divided it into the craſſamentum, the ſerum with a few red globules in it, and the pure ſerum. The phials containing theſe ſeveral liquors were put into a furnace, where they ſtood ſome days, till they became thoroughly putrid.

The craſſamentum was changed from a deep crimſon to a dark livid colour; ſo that, when any portion of it was diluted with water, it appeared of a tawny hue: of the ſame colour was the ſerum, in which the red globules remained: but the pure ſerum, after becoming turbid, dropped a white purulent ſediment, and changed into a faint olive-green.

From this experiment he concludes, that the ichor of ſordes, and that of dyſentery fluxes, conſiſt of the ſerum tinged with a ſmall quantity of red Blood putrified; and that, when the ſerous veſſels are of a tawny caſt, we are not to refer that colour to inflammation, but to a ſudden ſolution of ſome of the red globules mixed with the ſerum.

A few drops of this putrid craſſamentum was mixed with the recent urine of a healthy perſon, which it immediately changed into a flame-coloured water, common in fevers and in the ſcurvy. After ſtanding an hour or two, the ſame gathered a cloud, reſembling what is ſeen in the crude urine of perſons in acute diſtempers.

As to a green ſerum, it is, perhaps, never to be ſeen in the veſſels of a living body, ſince it is not to be ſuppoſed that a perſon could ſurvive ſo great a change of the blood. In foul ulcers, indeed, and in other ſores, where the ſerum is left to ſtagnate long, the matter is found of a greeniſh colour, and is then always acrimonious. But the effects of a green ſerum are no where to be ſo much dreaded, as in the caſe of an aſcites, where it is collected in ſo large a quantity: of which we had, ſome time ſince, almoſt a fatal inſtance in Mr. Cox, ſurgeon at Peterſburg, who, upon tapping a woman but a few hours after death, was ſo affected with the poiſonous ſteams of a green ſerum, that he was preſently ſeized with a peſtilential fever, and narrowly eſcaped with his life.

In regard to the ſediment which the ſerum dropped on becoming turbid, and which reſembled well digeſted matter, the doctor thinks it a terreſtrial ſubſtance, intended for the nouriſhment or reparation of the ſolids; in which opinion he was the more confirmed, by obſerving it in the urine of men in perfect health; and therefore concludes, that the pus, or digeſted matter, of ſores, is nothing but this ſubſtance ſeparated from the ſerum of the blood: and hence it is, that all large ulcers are extremely weakening, from the great expence of blood in furniſhing this ſubſtance: hence alſo it is, that iſſues are of more conſequence for making drains, than one would expect from the viſible evacuation: as near as the doctor could gueſs, an ounce of ſerum, after ſtanding ſome days, not furniſhing more of this matter than what might be produced in the daily diſcharge of a large pea-iſſue, or from a ſeton.

There are frequent inſtances of the tawny colour of the ſerum, the reſolution of the craſſamentum, and even of the offenſive ſmell of blood recently drawn. And, indeed, if we reflect how putreſcent blood is in a heat equal to that of the human body, we may be convinced, that no ſooner is the perſpiration by the lungs impeded, than a corruption begins in the whole maſs; which, if not timely prevented, brings on ſome putrid diſeaſe. If the acrimony is great and ſudden, a fever or flux will enſue; but, if the accumulation is ſo ſlow, that the body grows habituated to the putrefaction, a ſcurvy prevails. This is the caſe in long voyages, on board unventilated ſhips; in marſhy countries; and, in a leſſer degree, in all northerly climates, in moſt ſituations. *Pringle on the Diſeaſes of the Army.*

BLOW-*Pipe*, among jewellers and other artificers, is a glaſs tube, of a length and thickneſs at diſcretion, wherewith they quicken the flame of their lamp, by blowing through it with their mouth. It is uſed in works of quicker diſpatch, which do not need the bellows.

BLOWING *of a flower*, among floriſts, an artificial proceſs, in order to bring a flower to diſplay itſelf with greater perfection and beauty than it would arrive at in the natural way of Blowing. The uſual method is thus: about April, when the flower-ſtems begin to put forth, or ſpindle, as the gardeners call it, they place by each flower a ſtraight ſtick four feet long, and tie the ſpindles to it, as they ſhoot. As ſoon as the flower-buds appear, they leave only one of the largeſt on each flower-ſtem to bloſſom. About ten days before the flowers open themſelves, the round-podded kinds will begin to crack their huſks on one ſide; when the careful gardener, with a fine needle, ſplits or opens the huſk on the oppoſite ſide to the natural fraction; and, about three or four days before the complete opening of the flower, cuts off, with a pair of ſciſſars, the points on the top of the flower-pod, and ſupplies the vacancies or openings on each ſide the huſk with two ſmall pieces of vellum, or oil cloth, ſlipped in between the flower-leaves on the inſide of the huſk; by which means the bloſſom will diſplay its parts equally on all ſides; and be of a regular figure. Beſides this care, when the bloſſom begins to ſhew its colours, they uſe to ſhade it from the extreme heat of the ſun with a trencher-like board, or other device of the like nature, faſtened to the ſtick which ſupports it; for the flowers, as well as fruits, grow larger in the ſhade, and ripen and decay ſooneſt in the ſun. *Bradl. new Improv. Gard.*

BLUE *Azure*, in chemiſtry.—This colour may be drawn from ſilver: but Boyle and Henckel juſtly obſerve, that this happens only according to the proportion of copper, found mixed in this metal. The following is the ſhorteſt proceſs of making it: diſſolve ſal gem, ſalt of tartar, and roche allum, in the ſtrongeſt double-diſtilled vinegar; ſuſpend, over the vinegar ſo prepared, thin plates of ſilver; and bury the veſſel in the husks of grapes. Every three days remove the plates, and wipe off the Blue, which will be formed on them. Another method: put laminæ of ſilver, as thin as paper, into a pint of the ſtrongeſt vinegar; add to it two ounces of ſal armoniac, well pulverized; put this into a glazed earthen pot, carefully ſtopped; bury this in horſe-dung for fifteen or twenty days; at the end of which time you will find the laminæ covered with a fine azure Blue.

Another method.—Take an ounce of ſilver diſſolved in ſpirit of nitre, two ſcruples and an half of ſal armoniac, and as much vinegar as will be ſufficient to precipitate the ſilver. Decant the vinegar, put the precipitated matter into a bottle well corked, and let it ſtand for a month, and you will have a fine azure Blue.

Azure Blue is alſo extracted from copper, quickſilver, and lead: to extract it from copper, take of verdigriſe and ſal armoniac, of each three ounces; mix theſe two ingredients with water wherein tartar has been diſſolved; make up the maſs into a ſoft paſte; put the whole into a veſſel well ſtopped, and let it ſtand ſtill for ſome days, and the operation will be finiſhed.

Another.—Take æs uſtum and lees of wine, of each two ounces; ſulphur, one ounce; pulverize the ſulphur and æs uſtum; pour vinegar or urine upon them; put the mixture in a glazed pot, well ſtopped, and let it ſtand fifteen days.

BLUE *Enamel*, in chemiſtry, is a very beautiful Blue colour, of great uſe to enamellers.

Neri, in his Art of making Glaſs, has given us the following method of preparing it:—Take four pounds of the fritt, or matter, of which the enamel is made (ſee ENAMEL) four ounces of zaffer pulverized, and forty-eight grains of æs uſtum, or copper three times calcined; theſe three ingredients being mixed carefully together, put them into the furnace of a glaſs-houſe in a white glazed pot; when the mixture is thoroughly melted, it muſt be poured into clean water, to purge it from any filth; and then melted again, and again quenched in clean water, to purify it. This operation, repeated two or three times, will produce very fine Blue enamel.

Kunckel, in his Remarks on Neri, obſerves it is ſcarce poſſible to preſcribe the exact quantity of zaffer neceſſary to make Blue enamel. It is, therefore, beſt to begin with a little, by way of experiment; and, if the Blue be too light, to increaſe the quantity of zaffer, but cautiouſly; if it be too deep, more fritt of the enamel muſt be added. By varying the quantities of the ingredients properly, every different ſhade of the Blue may be produced: as, for example, if we would make a light Blue, we muſt alter the quantities given before, and then take four pounds of the fritt of enamel, two ounces of æs uſtum, and only forty-eight grains of zaffer; mix theſe ingredients well together, and obſerve the ſame directions in their melting and cleanſing as before. All theſe operations are very nice, and require a particular attention; for, without it, effects are produced quite contrary to our expectation; which Kunckel acknowleges happened to him in the operation of the light Blue we have juſt mentioned. He tried this method of Neri's, and, as he did not ſucceed, thought this author miſtaken; but, on repeating the operation with more nicety, found his ill ſucceſs owing to his inattention, in having kept the ingredients too long in the furnace.

The coarſer the grain of the enamel, the Blue is more lively, and approaches to the violet, like the azure; but the beſt enamel is the fineſt ſky-blue. The grain of this blue is ſo coarſe, that it is not made uſe of without great difficulty, except in water colours, or put into ſtarch, with which it mixes very well. They call it powder-blue, becauſe, in order to make a fine ground for a Turkiſh Blue, it is thrown on a white, covered with oil, as thick as poſſible. This is immediately ſpread with a feather, or light bruſh; but care muſt be taken firſt to dry the Blue well on a paper before the fire. It muſt be laid on to a proper thickneſs, left there till the bottom is quite dry; by which means the white imbibes as much as it can; afterwards it muſt be ſhaken off; and what does not adhere to the white, is taken off by a feather or light bruſh. This is a lively colour, and laſts a long time, though expoſed to the weather.

Enamel, which is ſo much the finer the paler it is, is made uſe of in water-colours and freſco, but not in oil, becauſe it turns black, unleſs mixed with a great deal of white.

Ultramarine BLUE.—The baſis of this colour is lapis lazuli, which makes it very dear; beſides, the operations, neceſſary to procure it, are both tedious and expenſive. See LAPIS *Lazuli* in the Dictionary.

In order to know whether the lapis lazuli be of a good quality, and proper to produce a fine Blue, put bits of it into a coal fire, and make them red-hot; if they do not ſplit by the calcination, and, when they are taken and grown cold, loſe nothing of the brightneſs of their colour, it is a proof of the goodneſs of the lapis. There is alſo another method of trying it: heat bits of the lapis, on a plate of iron red-hot and quench them in the ſtrongeſt white-wine vinegar: if the lapis lazuli be really good, it will not loſe its colour by this operation. After being aſſured of the goodneſs of the lapis, proceed thus to make the ultramarine Blue: heat it ſeveral times red-hot, and conſtantly quench it in water; or, which is better, in ſtrong vinegar. The oftener this operation is repeated, the more eaſily it may be pulverized; this being done, pound the pieces of the lapis, levigate them on a porphyry ſtone, moiſtening them with water, vinegar, or ſpirits of wine; continue to levigate the whole, till it is reduced to an impalpable powder; then waſh it in water, dry it, and put it up where it may be kept clean from duſt. Then take clean linſeed oil, yellow bee's-wax, black and yellow reſin, of each one pound; maſtic, two ounces; warm the linſeed-oil gently; mix the other ingredients, by ſtirring the mixture well, as it boils over the fire, which ſhould be for the ſpace of half an hour; after which paſs this mixture through a linen cloth, and let it ſtand to be cool. To eight ounces of this paſte put four ounces of the lapis, prepared as above; knead the maſs well for a conſiderable time; when the powder is well incorporated, pour warm water on the maſs, and knead it again, which will become of a Blue colour; then let it ſtand ſtill for ſome days, till the colour ſubſides to the bottom of the veſſel; decant the water, and dry the powder, which is the ultramarine.

There are ſeveral methods of making this paſte; but we ſhall content ourſelves with giving only one more: take yellow reſin, virgin's wax, turpentine, maſtic, frankincenſe, and linſeed-oil, of each two ounces; melt theſe together in a glazed diſh, according to the directions given in the preceding operation. Kunckel recommends the following method of making this fine Blue, and aſſures us he has practiſed with ſucceſs.

After having broke the lapis lazuli into pieces about the bigneſs of a pea, calcine it, quench it in the ſtrongeſt vinegar, and reduce it into a very fine powder: then take virgin's wax, and black reſin, of each half the weight of the powder of the lapis; melt them together in a glazed earthen pot; throw in the powder by degrees, mixing it carefully, and ſtirring the ingredients well; pour this mixture into clean water; let it continue there eight days; at the end of which time, fill a large glaſs veſſel with water, as warm as the hand can bear; take a clean cloth, and knead the maſs till the water is very much tinged; then take out the maſs, and put it in another veſſel of the ſame kind, knead it in like manner; and ſo continue the operation, till the colour be totally expreſſed from the maſs. In three or four days the ultramarine will ſubſide to the bottom of the veſſels; but that contained in the firſt water, is by far the moſt valuable: thus the ſame maſs will produce three or four ſorts of ultramarine; but the fineſt is produced in very ſmall quantities.

There are other methods of making ultramarine Blue; but, as the difference conſiſts only in the paſtes, with which the pulverized lapis is mixed, we thought it needleſs to mention them. It is known whether the ultramarine Blue be genuine by its weight; for the counterfeit is lighter; and, beſides, it loſes its colour before the fire.

BLUE *aſhes* are very much uſed in water-colours; ſome are very lively; but in oil they grow dull and greeniſh; for they are ſomething of the nature of verdigriſe; and, the more oil you put to them, the colour becomes weaker. They are found in the form of a ſoft ſtone, in places where there are copper mines; and water only is made uſe of in levigating them, to reduce them to a fine powder. This kind of Blue ought to be uſed principally in water-colours, ſeen by candle-light, as in ſcene-painting; for, though a great deal of white be mixed with it, it appears very beautiful, notwithſtanding it has a greeniſh caſt, quite contrary to enamel, which looks bright by day, and dull by candle-light.

Some of theſe Blue aſhes look as beautiful as ultramarine; but, by mixing them with a little oil, the difference is eaſily diſcovered; for they acquire no body of colour from the mixture, whereas the ultramarine becomes much higher on being mixed with oil.

BLUE. Mr. Boyle has given us the following method of making

ing tranſparent Blue, nearly equal to ultramarine. The principal ingredient of this beautiful colour is the cyanus, or Blue corn-bottle flower, which abounds almoſt in every cornfield, and may eaſily be had, during four of the ſummer-months; and may be gathered by children about the ſkirts or verges of corn-fields, without doing any damage to the corn.

This flower has two Blues in it, one of a pale colour in the larger outward leaves, and the other of a deeper Blue, that lies in the middle of the flower.

Both theſe will do, being ſeparated from the buttons or caſes, in which they grow; but the deep Blue leaves in the middle produce by much the beſt colour; which may be obſerved, by rubbing the leaves, while they are freſh, ſo hard upon a piece of good writing-paper, as to preſs out the juice, and it will yield an excellent colour, which will not fade, as has been found by the experience of two or three years.

This part of the flower is, therefore, the principal and what may be depended upon; which ſhould be picked from the reſt of the flower-leaves, the ſame day, if it may be, or the next; or at leaſt as ſoon as poſſibly can be.

A good quantity of theſe middle leaves being procured, preſs out what juice you can from them, and add to it a little alum, and you will have a laſting, tranſparent Blue, of as bright a ſtaining colour as can be deſired, ſcarce inferior in beauty to ultramarine, and is durable.

As for the outward flower-leaves which are paler, it is not certain that they will anſwer the end; but, upon ſome trials being made, that may alſo be known.

Let the flowers be gathered about the beginning of June, or in July or Auguſt; and ſome may be found in May; but the preparation of the colour, by picking out the middle deep Blue flower-leaves, and preſſing out the juice, muſt be performed with all the expedition poſſible, or they will loſe their perfections.

It is very probable, that, if the chives of theſe blue corn-bottle-flowers were cured in the ſame manner as ſaffron is, they would produce a much greater body of colour, from which a tincture might be drawn with more eaſe, than if preſſed raw or freſh from the field.

Blue *of turnſole.* This blue is proper to paint on wood, and is made of the ſeed of the plant from which it has its name. They uſe four ounces of turnſole, which they boil, for an hour, in three pints of water. There is a famous Blue uſed in callico-printing, made from turnſole; for which, ſee Calico-*Printing.*

Blue.—To give the Blue to linens ſignifies, with the whitſters, or bleachers, to dip it into water, wherein they have diſſolved a little ſtarch with ſmalt, or Dutch azure. They commonly give two Blues to cambrics: the firſt is the bleaching Blue, given by the whitſters, and the other the ſtiffening Blue, given by the merchants.

Blue is alſo uſed in the bleaching of ſilks, to give them that bluiſh caſt, which heightens their whiteneſs and luſtre. Silks are blued, by dipping them in a tub of cold water, in which a little ſoap and indigo have been diluted.

Blue *Dyes* are rendered more lively and bright, if the ſtuff, after being dyed, and well waſhed, be dipped into lukewarm water; but it is much better done, by fulling the dyed ſtuff with melted ſoap, and waſhing it afterwards very clean.

Very deep Blues are brightened by boiling the ſtuffs once in clear water, and then putting them into a decoction of cochineal; but the azure and lighter Blues would loſe their colour, and become grey, if they were put into ſuch a decoction.

Stuffs, dyed Blue, paſs immediately from white to that colour, without any other preparations but what they have undergone at the fuller's mill.

Blue *Japan*, is made in the following manner: take gum-water, what quantity you pleaſe, and white-lead, a ſufficient quantity; grind them well upon a porphyry. Then take iſing-glaſs ſize, what quantity you pleaſe, of the fineſt and beſt ſmalt a ſufficient quantity, mix them well; to which add of your white-lead, before ground, ſo much as may give it a ſufficient body; mix theſe together to the conſiſtence of paint.

With this mixture do over your work, and repeat this three or four times, till you ſee your Blue lies with a good fair body, letting it dry thoroughly between each time; if the Blue be too pale, put any more ſmalt into the ſize, without white-lead.

Then rub it very ſmooth, and go over it again with a ſtronger Blue; and, when it is thoroughly dry, waſh it twice over with the cleareſt iſing-glaſs-ſize alone; then cover it, and let it dry two days.

Then warm the piece gently before the fire, and, with a clean pencil, waſh your work over with the fineſt white varniſh, repeating it ſeven or eight times, and then let it dry two days as before; then repeat again your waſhes ſeven or eight times in the like manner.

Then let it ſtand to dry for a week, and then poliſh it as before directed; and, laſtly, to give it a poliſhed and gloſſed appearance, clear it up with lamp-black and oil.

You may make the colour either light or deep, according to your fancy; if it have but a ſmall proportion of the lead, it will be deep; but, if it has a larger, it will be lighter.

Alſo the ſize for laying Blues, white, or any other colour, ought not to be too ſtrong, rather weaker, and juſt ſufficient to bind the colours and make them ſtick on the work; for, if it be two ſtiff, it will be apt to crack and fly off; and the reaſon of waſhing twice, with clear ſize, is to keep the varniſh from ſinking into, or tarniſhing the colours.

A **Blue** *colour for painting or ſtaining glaſs.*—Take, of fine white ſand, twelve ounces; zaffer and minium, of each three ounces; reduce them to a fine powder in a bell-metal mortar; then put this powder into a very ſtrong crucible, cover it and lute it well; and, being dry, calcine over a quick fire for an hour; then take out the matter, and pound it well in the mortar, as before; then, to ſixteen ounces of this powder, add fourteen ounces of nitre, powdered; mix them well together, and put them into the crucible again, cover and lute it, and calcine for two hours in a very ſtrong fire.

Take it out, and grind it as before; then add to it a ſixth part of nitre, and calcine again, as before, for three hours more; then take out the matter with an iron ſpatula red-hot, leſt it ſhould ſtick; it being very clammy, and not eaſily emptied.

Pruſſian **Blue**, a very fine Blue colour, made in the following manner:

Take, of crude tartar and nitre, each four ounces, pulverize and mix them together; and, by decrepitation, bring them to a fixed ſalt; which, being powdered hot, add to it four ounces of thoroughly dried ox-blood, reduced to fine powder: calcine the mixture in a cloſe crucible, whereof it may fill two-thirds: then, lightly, grind the matter in a mortar, and throw it hot into two quarts of boiling water; boil them together for half an hour; afterwards ſtrain off the liquor, waſh the black remaining ſubſtance with freſh water, and ſtrain as before; continuing to do thus till the water poured off becomes inſipid: put the ſeveral liquors together, and evaporate them to two quarts: now diſſolve an ounce of green vitriol, firſt calcined to whiteneſs, in ſix ounces of rain-water, and filtre the ſolution: diſſolve alſo half a pound of crude alum, in two quarts of boiling water; and add this to the ſolution of vitriol, taken hot from the fire; pouring to them likewiſe the firſt lixivium, whilſt thoroughly hot, in a large veſſel: a great ebullition, and a green colour, will immediately enſue. Whilſt this ebullition continues, pour the mixture out of one veſſel into another, and afterwards let it reſt; then ſtrain the liquor through a linen cloth, and let the matter or pigment remain in the ſtrainer; from whence put it, with a wooden ſpatula, into a ſmall new pot; pour upon it two or three ounces of ſpirit of ſalt; and a beautiful Blue colour will immediately appear. Let the matter be now well ſtirred; then ſuffered to reſt for a night; afterwards thoroughly edulcorate it by repeated affuſions of rain water; allowing a proper time for the precipitate to ſubſide; and thus, at length, it will become exquiſitely Blue. Laſtly, let it drain upon a linen ſtrainer, and dry it gently; by all which means, it becomes the pigment that goes by the name of the Pruſſian Blue.

The ſucceſs of the experiment has a great dependence on the calcination. The crucible is firſt to be ſurrounded with coals, at ſome diſtance, that it may grow gradually hot, and the matter leiſurely flame and glow. Let this degree of heat be continued, till the flame and glowing decreaſe; then raiſe the fire again, that the matter may glow with an exceeding white heat, and but little flame appear above the crucible. The lixiviums ſhould be very hot, and mixed together with the utmoſt expedition.

The method of making this Pruſſian Blue in perfection has been held and purchaſed as a very valuable ſecret, both in England, Germany, and elſewhere; but it is now got into ſeveral hands. Its proceſs is very extraordinary, and could ſcarce be derived, a priori, from any reaſoning about the nature of colours. It is allowed an excellent Blue pigment, and by ſome preferred to ultramarine; though its durability might have been ſuſpected, from the vegetable and animal matters uſed in its preparation, if the colour did not ſeem wonderfully fixed by the operation.

Stone or powder **Blue**, uſed in waſhing of linen, is the ſame with ſmalt, either in the lump or powdered.

When the ſmalt is taken from the pot, it is thrown into a large veſſel of cold water; this makes it more tractable, and eaſily powdered. Afterwards, when examined after cooling, it is found to be mixed with a greyiſh matter, reſembling aſhes, which they call eſchel. This grey matter is ſeparated by waſhing; and then the Blue ſubſtance is powdered and ſifted through fine ſieves, to bring it to what we call powder Blue. *Phil. Tranſ.* No. 396.

BLU'ING *of iron*, a method of beautifying that metal, ſometimes practiſed; as for mourning buckles, ſwords, and the like. The manner is thus: take a piece of grindſtone, or whetſtone, and rub hard on the work, to take off the black ſcurf from it; then heat it in the fire, and, as it grows hot, the colour changes by degrees, coming firſt to a light, then to a darker gold colour, and, laſtly, to a Blue. Sometimes alſo they grind indigo and ſallad-oil together; and rub the mixture on the work with a woollen rag, while it is heating, leaving it to cool of itſelf. *Neve, Build. Dict.*

Among ſculptors we alſo find mention of Bluing a figure of bronze, by which is meant the heating of it, to prepare it for the application of gold-leaf, becauſe of the bluiſh caſt it acquires in the operation. *Felib. Princ. Archit.*

BLUFF-*head*, or BLUFF-*headed*, in the ſea language, is when a ſhip has but a ſmall rake forward on, being built with her ſtern too ſtreight up.

BOAR.—The wild Boar, among the huntſmen, has ſeveral names, according to its different ages; the firſt year, it is called a pig of the ſaunder; the ſecond, it is called a hog; the third, a hog-ſteer; and the fourth, a Boar; when leaving the ſaunder, he is called a ſingler.

The Boar generally lives to twenty-five or thirty years, if he eſcapes accidents. The time of going to rut is in December, and laſts about three weeks. They feed on all ſorts of fruits, and on the roots of many ſorts of plants; the roots of fern, in particular, ſeem a great favourite with them: and, when they frequent places near the ſea-coaſts, they will deſcend to the ſhores, and demoliſh the tenderer ſhell-fiſh in very great numbers. Their general place of reſt is among the thickeſt buſhes that can be found; and they are eaſily put up out of them, but will ſtand the bay a long time. In April or May they ſleep more ſound than at any other time of the year; and this is therefore the ſucceſsful time for taking them in the toils. When a Boar is rouzed out of the thicket, he always goes from it, if poſſible, the ſame way by which he came to it; and, when he is once up, he will never ſtop till he comes to ſome place of more ſecurity. If it happens, that a ſaunder of them are found together, when any one breaks away, the reſt all follow the ſame way. When the Boar is hunted in the wood, where he was bred, he will ſcarce ever be brought to quit it; he will ſometimes make towards the ſides, to liſten to the noiſe of the dogs; but retires into the middle again, and uſually dies or eſcapes there. When it happens, that a Boar runs a-head, he will not be ſtopped, or put out of his way, by man or beaſt, ſo long as he has any ſtrength left. He makes no doubles or croſſings, when chaced; and, when killed, makes no noiſe, if an old Boar; the ſows and pigs will ſqueak, when wounded.

The ſeaſon for hunting the wild Boar begins in September, and ends in December, when they go to rut. If it be a large Boar, and one that has lain long at reſt, he muſt be hunted with a great number of dogs, and thoſe ſuch as will keep cloſe to him; and the huntſman, with his ſpear, ſhould always be riding in among them, and charging the Boar as often as he can, to diſcourage him: ſuch a Boar as this, with five or ſix couple of dogs, will run to the firſt convenient place of ſhelter, and there ſtand at bay, and make at them, as they attempt to come up with him.

There ought always to be relays alſo ſet of the beſt and ſtauncheſt hounds in the kennel; for, if they are of young eager dogs, they will be apt to ſeize him, and be killed or ſpoiled before the reſt come up. The putting collars with bells about the dogs necks is a great ſecurity for them, for the Boar will not ſo ſoon ſtrike at them, when they have theſe, but will rather run before them. The huntſmen generally kill the Boar with their ſwords or ſpears; but great caution is neceſſary in making the blows, for he is very apt to catch them upon his ſnout or tusks; and if wounded, and not killed, he will attack the huntſmen in the moſt furious manner. The places to give the wound with the ſpear, are either between the eyes, in the middle of the forehead, or in the ſhoulder; both theſe places make the wound mortal.

When this creature makes at the hunter, there is no avoiding him but by courage and addreſs; if he flies for it, he is ſurely overtaken and killed; if the Boar comes ſtraight up, he is to be received at the point of the ſpear; but, if he makes doublers and windings, he is to be watched very cautiouſly, for he will attempt getting hold of the ſpear in his mouth; and, if he does ſo, nothing can ſave the huntſman, but another perſon attacking him behind; he will, on this, attack the ſecond perſon, and the firſt muſt then attack him again; two people will thus have enough to do with him; and, were it not for the forks of the Boar-ſpears, that make it impoſſible to preſs forward upon them, the huntſman, who gives the creature his death's wound, would ſeldom eſcape falling a ſacrifice to his revenge for it.

The modern way of Boar-hunting is generally to diſpatch the creature by all the huntſmen ſtriking him at once; but the ancient Roman way was, for a perſon, on foot, armed with a ſpear, to keep the creature at bay; and, in this caſe, the Boar would run of himſelf upon the ſpear, to come at the huntſman, and puſh forward till the ſpear pierced him through.

The hinder claws of a Boar are called guards.

In the corn he is ſaid to feed; in the meadows, or fallow fields, to rout, worm, or fern; in a cloſe, to graze.

The Boar is farrowed with as many teeth as he will ever have, his teeth increaſing only in bigneſs, not in number; among theſe there are four called tuſhes, or tusks, the two biggeſt of which do not hurt, when he ſtrikes, but ſerve only to whet the other two loweſt, with which the beaſt defends himſelf, and frequently kills, as being greater and longer than the reſt. *Gent. Rur.* p. 1, 7, and 119. *Trev. Dict. Univ.* tom. 4.

It is very remarkable, that theſe creatures, in the Weſt-Indies, are ſubject to the ſtone, in a very remarkable manner; few of them are abſolutely free from it; yet ſcarce any have the ſtones of any conſiderable ſize. It is common to find a great number in the ſame bladder, and they are uſually of about a ſcruple weight, and are angular, and that with great regularity, each having five angles. *Phil. Tranſ.* N°. 36.

Among the ancient Romans, Boar's fleſh was a delicacy: a Boar, ſerved up whole, was a diſh of ſtate. *Pitiſc. Lex. Ant.* tom. 1. p. 123. voc. *Aper.*

The Boar was ſometimes alſo the military enſign borne by the Roman armies, in lieu of the eagle. *Salmuth. ad Pancirol.* tit. 53. p. 278.

Among phyſicians, a Boar's bladder has been reputed a ſpecific for the epilepſy. *Friend's Hiſt. of Phyſ.*

The tusk of the wild Boar ſtill paſſes with ſome as of great efficacy in quinſies and pleuriſies. *Alleyn's Diſpenſ.*

BOB *of a pendulum*, the ſame with its ball, except that the former is uſed in ſpeaking of ſhort pendulums, the latter of long ones.

BO'BBING, or BOBBIN, in the manufactory of lace, a little piece of turned wood, whereon thread is wound, to be uſed in the weaving of bone-lace. *Hought. Collect.*

BO'CCA, in glaſs-making, the round hole in the working furnace, by which the metal is taken out of the great pots, and by which the pots are put into the furnaces. This is to be ſtopped with a cover made of earth and brick, and removeable at pleaſure, to preſerve the eyes of the workmen from the violence of the heat. *Neri's Art of Glaſs.*

BO'DY (*Dict.*)—The exiſtence of Bodies is a thing incapable of being demonſtrated: the order in which we arrive at the knowledge of their exiſtence, ſeems to be this.—We firſt find we have ſenſations: then obſerve we have not thoſe ſenſations, when we pleaſe: and thence conclude, we are not the abſolute cauſe thereof, but that there is required ſome other cauſe for their production. Thus we begin to know, that we do not exiſt alone, but that there are ſeveral other things in the world together with us.—But this, Dr. Clarke owns, comes far ſhort of a demonſtration of the exiſtence of a corporeal world: he adds, that all the proof we have of it is this, that God would not create us ſuch, as that all judgments we make about things exiſting without us, muſt neceſſarily be falſe. If there be no external Bodies, it follows, that it is God who repreſents the appearance of Bodies to us; and that he does it in ſuch a manner, as to deceive us.—Some think this has the force of a demonſtration: "It is evident God cannot deceive us; it is evident he does deceive and delude us every moment, if there be no Bodies; it is evident, therefore, there muſt be Bodies.—But the minor of this argument may be denied without any ſuſpicion of ſcepticiſm.

"In effect, were it poſſible for Bodies, i. e. ſolid, figured, &c. ſubſtances to exiſt without the mind correſponding to thoſe ideas we have of external objects, yet how were it poſſible for us to know it? Either we muſt know it by ſenſe, or reaſon: as for our ſenſes, by them we have only the knowledge of our ſenſations or ideas: they do not inform us that things exiſt without the mind, or unperceived, like thoſe which are perceived. It remains, therefore, that, if we have any knowledge at all of external things, it muſt be by reaſon inferring their exiſtence from what is immediately perceived by ſenſe. But how ſhall reaſon induce us to believe the exiſtence of Bodies without the mind, when the patrons of matter themſelves deny that there is any neceſſary connection betwixt them and our ideas? In effect, it is granted on all hands, and what happens in dreams, phrenzies, deliriums, extaſies, &c. puts it beyond diſpute, that we might be affected with all the ideas we have now, though there were no Bodies exiſting without, reſembling them. Hence, it is evident, the ſuppoſition of external bodies is not neceſſary for the production of our ideas." *Berkeley's Princ. of Human Knowledge, p.* 59.

"Granting the materialiſts their external Bodies, they, by their own confeſſion, are never the nearer knowing how our ideas are produced; ſince they own themſelves unable to comprehend in what manner Body can act upon ſpirit, or how it is poſſible it ſhould imprint any idea on the mind. Hence the production of ideas or ſenſations, in our minds, can be no reaſon why we ſhould ſuppoſe Bodies or corporeal ſubſtances; ſince that is equally inexplicable with or without the ſuppoſition. In ſhort, though there were external Bodies, it is impoſſible we ſhould ever come to know it; and, if there were none, we ſhould have the ſame cauſe to think there were that we now have." *Id. Ibid. p.* 60, 61.

"Try, whether you can conceive it poſſible for a ſound, or figure, or motion, or colour, to exiſt without the mind, or unperceived.—If you can but conceive it poſſible for one extended, moveable ſubſtance, or, in general, for any one idea to exiſt otherwiſe, than in a mind perceiving it; I ſhall readily give up the cauſe." *Id. Ibid. p.* 63.

"It is worth while to reflect a little on the motives which induced men to ſuppoſe the exiſtence of material ſubſtance; that ſo, having obſerved the gradual ceaſing and expiration of thoſe motives, we may withdraw the aſſent grounded on them. Firſt, therefore, it was thought that colour, figure, motion, and the reſt of the ſenſible qualities did readily exiſt without the mind; and for this reaſon it ſeemed neceſſary to ſuppoſe ſome unthinking ſubſtratum or ſubſtance, wherein they did exiſt, ſince they could not be conceived to ſubſiſt by themſelves. Afterwards, in proceſs of time, men being convinced that colours, ſounds, and the reſt of the ſenſible ſecondary qualities had no exiſtence without the mind; they ſtripped this ſubſtratum of theſe qualities, leaving only the primary ones, figure, motion, *&c.* which they ſtill conceived to exiſt without the mind, and conſequently to ſtand in need of a material ſupport. But having ſhewn above, that none, even of theſe, can poſſibly exiſt otherwiſe than in a ſpirit, or mind, which perceives them, it follows, that we have no longer any reaſon to ſuppoſe the being of matter." *Id. Ibid. p.* 118, 119.

For the colours of Bodies: Sir Iſaac Newton ſhews that Bodies appear of this or that colour, as they are diſpoſed to reflect moſt copiouſly the rays of light originally endued with ſuch colours. But the particular conſtitutions whereby they reflect ſome rays more copiouſly than others, remain yet to be diſcovered. However, ſome of the laws and circumſtances thereof he delivers in the following propoſitions.

1. Thoſe ſurfaces of tranſparent Bodies reflect the greateſt quantity of light, which have the greateſt refracting power, i. e. which intercede mediums, that differ moſt in their refractive denſities: and, in the confines of equally refracting mediums, there is no reflection. 2. The leaſt parts of almoſt all natural Bodies are in ſome meaſure tranſparent; and the opacity of thoſe Bodies ariſes from the multitude of reflections cauſed in their internal parts, &c. 3. Between the parts of opake and coloured Bodies are many ſpaces, either empty, or replete with mediums of different denſities; as water between the tinging corpuſcles wherewith a liquor is impregnated, air between the aqueous globules that conſtitute clouds or miſts: and even ſpaces void both of air and water, between the parts of hard Bodies, are not wholly void of all ſubſtance. 4. The parts of the Bodies and their interſtices muſt be leſs than of ſome definite bigneſs, to render them opake and coloured. 5. The tranſparent parts of bodies, according to their ſeveral ſizes, reflect rays of one colour, and tranſmit thoſe of another, for the ſame reaſon that thin plates or bubbles do reflect or tranſmit thoſe rays; and this appears to be the ground of all their colour. 6. The parts of Bodies, on which their colours depend, are denſer than the medium which pervades their interſtices. 7. The bigneſs of the component parts of natural Bodies may be conjectured from their colours, on this principle, that tranſparent corpuſcles, of the ſame thickneſs and denſity with a plate, do exhibit the ſame colour. 8. The cauſe of reflection is on the impinging of light on the ſolid or impervious parts of Bodies, as commonly believed. 9. Bodies reflect and refract light, by one and the ſame power, variouſly exerciſed, in various circumſtances.

Body *of a coach*, a word uſed by joiners and coach-makers. With joiners, it ſignifies the bare cage or wooden frame of a coach, which the coach-makers are afterwards to line with leather on the outſide, and with ſtuff on the inſide: with coach-makers, it ſignifies the coach thus lined, before it be put on the wheels and on carriage.

Body is likewiſe ſaid of the materials which compoſe a ſtuff, or ſome other manufactured work. The Body of a woollen cloth; the Body of a ſerge; the Body of paper; the Body of velvet. In all thoſe ſenſes, traders ſay, the Body of this paper is too weak; the Body of this cloth, or of this ſerge, is good; the Body of this velvet is too looſe, or too thin.

Body *of reſerve*, in the military art, a draught or detachment of a number of forces out of an army, who are to engage in caſe of neceſſity.

BOG (*Dict.*)—When the ground is drained, it is then, and no ſooner, proper to begin the improvement of the ſoil. Firſt, continue to plant as many potatoes in the dry land as in this ſeaſon you can, for it is unexceptionable huſbandry, equal to a ſummer-fallow.

Next, fallow all the reſt of the ground this very ſeaſon, and as ſoon in it as poſſible: for, beſides the benefits of the fallow itſelf, by the plowings you may ſave a good deal of expence of levelling the ground, the plowed earth being eaſily thrown from the high places to the low; and the next plowings will always raiſe more earth on places where any was taken away. Plow not only all you can this year, but plow up the reſt, every inch of it, that the plough can touch, as ſoon as by the draining it ſubſides, and becomes ſo firm, that it can bear the labouring cattle; that, without loſs of time, you may get into the clover-huſbandry: for ground, yielding grain and graſs, from graſs-ſeeds ſown alternately, will very probably give more free profit than when it is conſtantly yielding either the one or the other, if the huſbandry for both be equally good.

Where you cannot uſe the plough, employ the ſpade, and make your fallow compleat. Then conſider which parts are fit for wheat, which for rye, and which want the aſſiſtance of dung for the one or for the other; and at any expence put your ground once in good heart, in confidence that, if it were, the method of huſbandry I am to direct, will keep it in as good order, or make it better, with ſmall expence of dung, in all time thereafter, though you keep it annually under the ſock or ſcythe: for land in heart and ſtrength is, I am much diſpoſed to think, as much improved by ſome crops judiciouſly taken, as weak worn out land is by a ſummer fallow, at leaſt ſuch a ſham fallow as is too often made, without any crop at all, unleſs it get dung.

When your ground is in all reſpects in good order, ſow wheat on the ſtrongeſt, and winter rye on the ligheſt parts of your ſoil, for the firſt crop of grain: for the ſecond, ſow peaſe; for they meliorate the ground, when they have proved a good crop, and you may expect it. Immediately after the peaſe are cut, and cut them high, plow down the ſtubble, without allowing cattle to eat it; and, after two ſpring-plowings, ſow barley and the great clover, with only a ſmall mixture of rye-graſs; becauſe clover is an enricher, and rye-graſs impoveriſhes the ground, and fouls it. After the barley is cut, allow no cattle to enter your incloſure, except in very dry weather, leſt they poatch the ground with their feet, and deſtroy the young clover. If you would keep them out in dry weather as well as wet, and allow the graſs to rot among the ſtubble, by the dreſſing it would improve the ground, and keeping the roots of the clover-plants warm through winter, your advantage would be greater than though your cattle eat it.

Next year cut it twice, and put cattle upon the fog or eddiſh. The following year cut it only once, and, when it is begining to flower, roll it down, plow it in, and harrow the ground, to cloſe the ſeams, that the ſwaird may rot the better, and be ready for wheat or winter rye, upon another plowing. If it be not fit for theſe, it will anſwer well for barley: and ſow peaſe for the ſubſequent crop; for two crops of white grain, running, impoveriſh ground, and make dung neceſſary. After the peaſe, ſow barley, clover, and rye-graſs, and manage as directed; and ſo go on with this courſe of huſbandry without variation. If you do, I hope your ground will have little need of manure. But, if you find it neceſſary, and can get time, I adviſe you to ſow it upon the young clover, among the barley ſtubble in the month of September: fifteen or twenty horſe-loads may ſerve an acre; and will not only encourage the clover, but will incorporate itſelf with, and meliorate the earth, and ſo prepare it for ſucceeding crops; and, if you ſee cauſe to uſe it further, a gentle liming may be profitably and harmleſsly repeated upon the young clover every fifth year: for the peaſe, clover, and tilling down of the clover as directed, will be ſufficient dunging to make the lime work; and, it being thus laid upon the ſurface, there to lie, and incorporate itſelf with the ground, for the ſpace of two years before it again ſuffer the plough, the hazard of ſubſiding below the reach of the plough, which lime is ſubject to, is prevented. Or you may ſow ſoot, pigeon's dung, or aſhes, in leſſer quantities, in proportion to the hotneſs of their different natures, and the hotneſs or coldneſs of the quality of the different parts of your ſoil.

BOHEA, one of the kinds of tea brought from China. *See* Tea *in the Dictionary.*

BOI'LER.—The Boiler, in the alum works, is a veſſel, in which the liquor is evaporated to a conſiſtence, and is made of lead. The general ſize is about eight feet ſquare, and they contain about twelve tons each.

They make them in this manner: firſt they lay long pieces of caſt iron, twelve inches ſquare, as long as the breadth of the Boiler, and about twelve inches diſtance from one another. Theſe are placed twenty-four inches above the ſurface of the fire. On theſe maſſy bars of iron they lay, croſs-wiſe, the common flat bars of iron, as cloſe as they can lie together, and then make up the ſides with brick work. In the middle of the bottom of this Boiler is laid a trough of lead, wherein they put at firſt about an hundred pounds weight of the rock. They uſe Newcaſtle coals in the boiling; and, if they find the liquor not ſtrong enough, they add more of the rock at times, as it boils. *Phil. Tranſ.* N°. 142.

BOI'LERY, or Boilary, in the ſalt-works, denotes a ſalt-houſe, pit, or other place where ſalt is made.

BOI'LING (*Dict.*)—The phænomenon of Boiling may be thus accounted for: the minute particles of the fuel being detached from each other, and impelled in orbem, with a great velocity, (i. e. being converted into fire) paſs the pores of the containing veſſel, and mix with the liquid. By the reſiſtance they here meet withal, their motion is deſtroyed; i. e. they communicate it wholly to the quieſcent water; hence ariſes, at firſt, a ſmall inteſtine motion in the water, and, from the continued action of the firſt cauſe, the effect is increaſed, and the motion of the water continually accelerated: ſo that the water, by degrees, becomes ſenſibly agitated. But now the particles of the fire, ſtriking on thoſe in the loweſt ſurface of the water, will not only give them an impulſe upwards, contrary to the laws of æquilibrium, but will likewiſe render them ſpecifically lighter than before, ſo as to determine them to aſcend according to the laws of æquilibrium: and this, either by inflating them into little veſicles, by the attraction of the particles of water round them; or by breaking and ſeparating the little ſpherules of water, and ſo increaſing the ratio of their ſurface to their ſolid content. There will therefore be a conſtant flux of water from the bottom of the veſſel to the top, and conſequently a reciprocal flux from the top to the bottom: i. e. the upper and under water will change places; and hence we have the reaſon of that phænomenon, of the water's being hot at top ſooner than at bottom.

Again, an intenſe heat will diminiſh the ſpecific gravity of water, ſo as not only to make it mount in water, but alſo in air; whence ariſe the phænomena of vapour and ſmoak: though the air, incloſed in the interſtices of the water, muſt be allowed a good ſhare in this appearance: for that air, being dilated, and its ſpring ſtrengthened by the action of the fire, breaks its priſon, and aſcends through the water into the air; carrying with it ſome of the contiguous ſpherules of water, ſo many as ſhall hang in its villi, or can adhere immediately to it.

The particles of air in the ſeveral interſtices of the fluid maſs thus expanded, and moving upwards, will meet and coaleſce in their paſſage; by which means great quantities of the water will be heaved up, and let fall again alternately, as the air riſes up, and again paſſes from the water: for the air, after coalition, though it may buoy up a great heap of water, by its elaſticity while in the water, yet cannot carry it up together with itſelf into the atmoſphere; ſince, when once got free from the upper ſurface of the water in the veſſel, it will unbend itſelf in the atmoſphere, and ſo its ſpring and force become juſt equal to that of the common unheated air. Add to this, that, were the ſpring and motion of the air ſufficient to carry up the water with it, yet it would not have that effect, but the water would run off at the extremities of the air; all, except ſo much as ſhould be either entangled in its villi, or immediately adhere to its ſurface by attraction: and hence we ſee the reaſon of the principal phænomenon of Boiling, viz. the fluctuating of the ſurface of the water.

Water, only lukewarm, boils very vehemently in the recipient of an air-pump, when the air is exhauſted: the reaſon is obvious; for, the preſſure of the atmoſphere being taken off from its ſurface, the air included in the interſtices of the water, dilated by a feeble heat, has ſpring enough to heave up the water, and diſengage itſelf.—When the water ceaſes Boiling, it is again excited thereto by pouring cold water upon the recipient; and, when it boils the moſt vehemently, ceaſes by pouring on hot water; the reaſon whereof is ſcarce gueſſed at.

Boiling *of ſilk with ſoap*, is the firſt preparation in order to dying it. Thread is alſo boiled in a ſtrong lixivium of aſhes, to prepare it for dying.

Boiling, is alſo a method of trying or eſſaying the goodneſs or falſeneſs of a colour or a dye, by Boiling the ſtuff in water with certain drugs, different according to the kind or quality of the colour to try whether or no it will diſcharge, and give a tincture to the water.

With this intention, red, crimſon ſilks are boiled, with alum, and ſcarlets with ſoap, in a quantity equal to the weight of the ſilk.

BOLE, in natural hiſtory, a kind of earth conſtituting a diſtinct genus of foſſils, and containing many different ſpecies, uſed principally in medicine. The characters of this genus are, that the earths of it are moderately coherent, ponderous, ſoft, not ſtiff or viſcid, but in ſome degree ductile, while moiſt; compoſed of fine particles, ſmooth to the touch, eaſily breaking between the fingers, readily diffuſible in water, and freely and eaſily ſubſiding from it. *Hill's Hiſt. Foſſ.*

BOLT *of a lock*, is the piece of iron, which, entering the ſtaple, faſtens the door; being the part which is moved backwards and forwards by turning the key.

Of theſe there are two ſorts; one ſhuts of itſelf by only putting to the door, and is called a ſpring-Bolt; the other, which only moves when the key opens and ſhuts it, is called a dormant Bolt. *Moxon, Mech. Exer.*

BOLTERS, or **Boulters**, a kind of ſieves for meal, having the bottoms made of woollen, hair, or even wire. *Hought. Collect.*

Bolting, or **Boulting**, the act of ſeparating the flour from the bran, by means of a ſieve or bolter.

Bolting-*mill*, a verſatile engine for ſifting with more eaſe and expedition. The cloth round this is called the boulter.

BOMB (*Dict.*)—The ſhell being filled with gun-powder, the fuſee is driven into the vent, or aperture, and faſtened with a cement made of quick-lime, aſhes, brick-duſt, and ſteel filings, worked together in a glutinous water; or of four parts of pitch, two of colophony, one of turpentine, and one of wax. This tube is filled with a combuſtible matter, made of two ounces of nitre, one of ſulphur, and three of gunpowder-duſt, well rammed. To preſerve the fuſee, they pitch it over, but uncaſe it, when they put the Bomb into the mortar, and cover it with gunpowder-duſt, which, having taken fire by the flaſh of the powder in the chamber of the mortar, burns all the time the Bomb is in the air; and, the compoſition in the fuſee being ſpent, it fires the powder in the Bomb, which burſts with great force, blowing up whatever is about it; the great height the Bomb goes in the air, and the force with which it falls, makes it go deep into the earth.

Fig. 6. and 7. *plate* XXXV, in the Dictionary, may ſerve to give a more exact idea of the Bomb.

Fig. 6. exhibits a Bomb as it appears to the eye; *fig.* 7. its ſection or profile.

To prove whether it be ſtaunch, after heating it red-hot on the coals, it is expoſed to the air, ſo as it may cool gently; for, ſince fire dilates iron, if there be any hidden chinks or perforations, they will thus be opened and enlarged; and the rather, becauſe of the ſpring of the included air continually acting from within. This done, the cavity of the globe is filled with hot water, and the aperture well ſtopped; and the outer ſurface waſhed with cold water and ſoap: ſo that, if there be the ſmalleſt leak, the air, rarified by the heat, will now perſpire, and form bubbles on the ſurface.

If no defect be thus found in the globe, its cavity is filled with whole gunpowder; a little ſpace, or liberty, is left, that when a fuſee or wooden tube, of the figure of a truncated cone, is driven through the aperture, and faſtened with a cement made of quick-lime, aſhes, brick-duſt, and ſteel filings, worked together in a glutinous water; or, of four parts of pitch, two of colophony, one of turpentine, and one of wax; the powder may not be bruiſed. This tube is filled with a combuſtible matter, made of two ounces of nitre, one of ſulphur, and three of gunpowder-duſt, well rammed.

This fuſee, ſet on fire, burns ſlowly, till it reach the gunpowder, which goes off at once, burſting the ſhell to pieces with incredible violence; whence the uſe of Bombs in beſieging towns.

Special care, however, muſt be taken, that the fuſee be ſo proportioned, as that the gunpowder do not take fire before the ſhell arrives at the deſtined place; to prevent which, the fuſee is frequently wound round with a wet clammy thread.

A Bomb, thrown out of a mortar eighteen inches one-third diameter, contains twelve pounds of powder in its chamber. Its thickneſs is two inches all over, except at the breech, where it is two inches five-ſixths thick.

The aperture of the touch-hole on the outſide ſhould be one inch two-thirds; it contains forty-eight pounds of powder; and, before it is loaded, weighs ſomewhat above 490 pounds. It has two handles near the touch-hole.

A mortar-piece of twelve inches one-half diameter muſt have eighteen pounds of powder, for a proper charge; its Bomb muſt be eleven inches two-thirds diameter, the ſhell of one inch one-third thick all over, except at the breech, where it ſhould be one inch two-thirds thick. The aperture of its touch-hole, on the outſide, one inch one-third; it contains fifteen pounds of powder, and weighs, beſides its load, about one hundred and thirty pounds.

Bombs thrown from mortars of twelve inches one-fourth, twelve inches one-third, and ſo on to twelve inches one-ſecond diameter, obſerve the ſame proportion when the mortars are loaded with twelve and eight pounds of powder. The proportion is the ſame with regard to the Bomb of the common mortar, twelve inches diameter, whoſe charge is from five to ſix pounds of powder.

The Bomb thrown by a mortar eight inches one-third diameter, which carries one pound twelve ounces of powder, muſt be eight inches diameter, ten-twelfths of an inch thick, except at the breech, where it muſt be one inch one-twelfth thick. The aperture of its touch-hole one inch diameter on the outſide; its charge is four pounds of powder, and, before loaded, weighs thirty-five pounds.

The Bomb, thrown by a mortar ſix inches one-fourth diameter, which carries one pound three-fourths of powder, or rather ſix inches diameter, five-ſixths of an inch thick all over, except at the breech where it is eleven-twelfths of an inch, or an inch thick; its touch-hole is five-ſixths of an inch on the outſide, its charge three pounds and an half of powder, and weighs, before loaded, about twenty pounds. Thoſe Bombs are commonly made without handles.

In ſome caſes the quantity of powder may be leſſened, as ſome Bombs are only deſigned to demoliſh buildings, without ſetting them on fire, or drop ſhort of an army: for then the intention of the deed is only to make the Bomb burſt: conſequently there is no occaſion for more powder than is neceſſary to produce this effect. According to M. Belidore's treatiſe on the Arms and Machines in uſe before the Invention of Gun-powder, three pounds of powder are ſufficient to burſt a Bomb of twelve inches diameter: and one pound of powder will have the ſame effect on a Bomb of eight, from whence we may conclude that eight or ten pounds of powder are ſufficient to load a Bomb of eighteen inches diameter, inſtead of forty-eight pounds, the common charge.

BOMBA'RDING, the act of attacking a city or fortreſs, by throwing bombs into it, in order to ruin or ſet on fire the houſes and magazines, and do other miſchiefs.

BOMBA'ST, in matters of diction, a ſtyle too high and pompous for the ſubject and occaſion; or words too big and ſounding for the ſenſe and meaning.

BOMBASI'NE, in commerce, a kind of ſilk-ſtuff manufactured at Milan, and thence ſent into France and other countries.

BOMBY'LIUS, in natural hiſtory, the name of the common humble-bee, of which we have a great variety of ſpecies, many of them very beautiful.

BOMBYLO'PHAGES, *Humble-bee-eater*, in natural hiſtory, the name of a fly of the tipula or father-long-legs kind, which is larger and ſtronger than the common kinds; and loving honey, without knowing how to extract it from the flowers, it ſeizes on the humble-bees, and deſtroys them, in order to get at the bag of honey which they contain. It is of a blackiſh colour in the body; its head is of a bright red, and the eyes very large and prominent. It is chiefly found in mountainous places.

BOND, a deed, by which a perſon obliges himſelf to perform certain acts; ſuch as to pay a certain ſum, or to anſwer for another, or to ſerve an apprenticeſhip with a maſter.

In England, a Bond is a deed or obligatory inſtrument in writing, whereby a perſon binds himſelf to another, to pay a ſum of money, or do ſome other act, as to make a releaſe, ſurrender an eſtate, for quiet enjoyment; to ſtand to an award, ſave harmleſs, perform a will, &c. It contains an obligation with a penalty annexed, and a condition which expreſsly mentions what money is to be paid, or what other things are to be perfomed, and the limited time for the performance thereof, for which the obligation is peremptorily binding.

It may be made upon parchment or paper, though it is uſually on paper, and be either in the firſt or third perſon: and the condition may be either in the ſame deed or in another; and ſometimes it is included within, and ſometimes indorſed upon the obligation; but it is commonly at the foot of the obligation.

BONI'TO, in zoology, the name of a fiſh, of the tunny or trachurus kind, and called by ſome curvata pinima. It is a large ſea fiſh, with a long, broad, and thick body: its eyes are large, as are alſo its gills, and the greater part of its body is free from ſcales.

BO'NNY, in minerology, a name given by our miners to a bed of ore found in many places in hills, not forming a vein, nor communicating with any other vein, nor terminating in ſtrings, as the true veins do: it is a bed of ore of five or ſix fathom deep, and two, or ſomewhat leſs than that, in thickneſs, in the largeſt ſort; but there are ſmaller, to thoſe of a foot long. They have their trains of ſhoad-ſtones from them, and often deceive the miners, with the expectation of a rich lead vein. They differ from the ſquats only in being round beds of ore, whereas they are flat. *Philoſ. Tranſ.* N°. 69.

BOOK (*Dict.*)— *Caſh* Book. This is the firſt and moſt important of the auxiliary books. It is ſo called, becauſe it contains, in debtor and creditor, all the caſh that comes in, or goes out, of a merchant's ſtock. The French call it, alſo, the Book of caſh and of notes (livre de caiſſe & le bordereau) becauſe, beſides an account of the caſh received and paid, it contains alſo notes of the ſeveral ſpecies of the money, or coin, that comes in, or goes out.

When a merchant does not keep that Book himſelf, he has it kept by a clerk or book-keeper, whom they ſtile caſhier.

In this Book they write all the ſums which are daily received and paid. The receipts on the debtor ſide, the perſons of whom it was received, for what, and on whoſe account, and in what ſpecie; and the payments on the creditor ſide, mentioning alſo the ſpecie, the reaſon of the payment, to whom, and for whoſe account they are made.

The better to conceive the nature of this Book, it is to be obſerved, that in buſineſs, where caſh happens to be an account which has numerous articles, it is convenient to keep a particular account thereof in a Book diſtinct from the ledger, and for this reaſon called the caſh Book. This is formed in all reſpects like the caſh accounts in the ledger, with a debtor and creditor ſide, in which all the caſh received and given out is entered, either in a ſimple ſtile, or in that of the ledger: but, which way ſoever the narrative is made, every article muſt be duly entered on the oppoſite ſide of the correſponding account in the ledger, with a reference to the ledger account of caſh: for ſuch an account there muſt alſo be, into which the ſums of the debtor and creditor ſides of the particular account muſt be transferred once a week, or month, as is found moſt convenient. Thus in the caſh Book, the ſums being written down againſt them, ſay, transferred to the ledger, and mark the folio; and in the ledger account enter the ſum, with the date of the transfer, debtor to, and creditor by ſundry accounts, as per caſh Book. The caſh account in the ledger is neceſſary for the balance of the whole; and the conveniency of the ſeparate account of all the particulars is, that we have them all together in one continued account: whereas, the rule of the ledger being not to allow more than one folio for one account, till that be filled up, the account might hereby lie in ſeveral folio's.

Book *of Debts or Payments*, is a Book in which is written down the day on which all the ſums become due, either to be received or paid, by bills of exchange, notes of hand, merchandizes bought or ſold, or otherwiſe; that, by comparing receipts and payments, one may in time provide the neceſſary funds for payments, by getting the bills, notes, &c. due, to be paid, or by taking other precautions.

Book *of Numero's, or Wares*. This Book is kept, in order to know eaſily all the merchandizes that are lodged in the warehouſe, thoſe that are taken out of it, and thoſe that remain therein. Its form is commonly long and narrow, as of half a ſheet of paper folded lengthways. Every page is ruled with tranſverſal and parallel lines, about an inch diſtant from each other, with two other lines from top to bottom, the one next the margin, and the other next the ſums.

Within the oblong ſquares formed by thoſe lines, they write on the left page the volume of the merchandizes, that is to ſay, whether it be a bale, a cheſt, a ton, &c. their quality, as pepper, cloves, honey, ſoap, &c. and their quantity, or weight; and overagainſt it, on the ſides of the margin, the numbers which the bales, cheſts, &c. are marked with, as received into the warehouſe.

On the right hand they follow the ſame method for the diſcharge of the merchandizes which are ſent out of the warehouſe, putting, overagainſt each article on the left, firſt, in the margin, the date when the merchandizes were carried out of the warehouſe; next, in the oblong ſquares, the names of thoſe to whom they were ſold or ſent; and, finally, what quantity of each was ſent out, in caſe the whole were not.

Book *of Invoices*. This Book is kept to preſerve the journal from eraſures, which are unavoidable in drawing up the accounts of invoices of the ſeveral merchandizes received, ſent out, or ſold, wherein one is obliged to enter very minute particulars; it is alſo deſigned to render thoſe invoices eaſier to find, than they can be in the waſte Book or journal. The invoices which muſt be entered here are thoſe of the merchandizes bought, or ſent away, for the account of another.

Thoſe of merchandizes which one ſells by commiſſion.

Thoſe of ſuch merchandizes as are in partnerſhip, of which others have the management.

Laſtly, all the accounts which are not immediately cloſed, and which one would not open on the ledger.

This Book contains an account, or invoices, of all the goods which a perſon ſhips off, either for his own account, or for others in commiſſion, according to the bills of lading, with the whole charges till on board, every invoice following after another, in order as they happen.

Book *of Accounts current*. This book is kept in the form of debtor and creditor, like the ledger; it ſerves to draw up the accounts which are to be ſent to correſpondents, in order to ſettle them in concert, before they are balanced in the ledger: it is properly a duplicate of the accounts current, which is kept to have recourſe to occaſionally.

Book *of Commiſſions, Orders, or Advice*. In this Book are entered all the commiſſions, orders, and advices, a perſon receives from his correſpondents.

The margin of this Book ought to be very broad, that there be room to write overagainſt each article the neceſſary notes, or remarks, concerning their execution. Some only croſs each article, after it has been executed.

Book *of Acceptances, or of Draughts*. This Book is deſigned as a regiſter of all the bills of exchange, which our correſpondents adviſe us by their letters they have drawn upon us.

They are thus regiſtered, to the end that, when the bills are preſented, a merchant may know whether he has orders to accept them, or not.

Book *of Remittances*. In this Book are regiſtered all the bills of exchange, as they are remitted by the correſpondents, to require the payment thereof, when due.

Book *of Expences*, is a Book in which is ſet down a particular account of all the expences, either in their houſhold, or for commercial affairs, which, at the end of every month, they caſt up, and ſet down the ſum total, either in the waſte Book or in the journal, or rather in the caſh Book.

This Book, being a ſeparate account of all the expences of living, ſerves to keep both the profit and loſs account, and alſo the caſh Book, more diſtinct; the greater and more conſiderable articles are to be placed here particularly, but the ſeveral ſmall articles of daily diſburſements only in totals; though what denominations, and how general or particular the articles of this Book ought to be made, muſt be left to every one's choice: all that is neceſſary to obſerve here is, that the caſh paid out on ſuch accounts muſt be carefully entered here, and then once a week, or month, be transferred to the caſh Book, and to the profit and loſs account in the ledger, which is debtor to caſh for it.

Book *of Copies of Letters*. This Book ſerves to keep copies of all the letters relating to buſineſs, which a merchant writes to his correſpondents, that he may have recourſe to them upon occaſion, and know exactly what he wrote, and what orders he gave to them.

Book *of Paſſage*, is a ſmall regiſter, long and narrow, in which a merchant opens a particular account, to each of his correſpondents, of the poſtage paid for them, which is afterwards caſt up, when he thinks proper, and they are entered in the journal and ledger accordingly.

Book *of Veſſels*, or the ſhip's Book. This Book is kept by the way of debtor and creditor, an account being opened for every ſhip. On the debtor's ſide is ſet down all the expences for victualling, fitting out, wages, &c. and, on the creditor's ſide, all that the ſhip has produced, either for freight or otherwiſe: the total of each is afterwards entered in the journal, making the veſſel debtor and creditor.

BOOK *of Workmen.* This Book is particularly uſed by thoſe traders who have manufactures, and is kept in debtor and creditor, there being an account for every workman that is employed. On the debtor ſide are ſet down the materials which are given to them for manufacturing, and, on the creditor's ſide, the work which they bring home, after it is manufactured.

Bank BOOK. Beſides all the above-mentioned Books, in thoſe cities where there is a public bank, as London, Venice, Hamburgh, Amſterdam, the merchants who keep caſh therein are obliged to keep a bank Book, which is likewiſe by way of debtor and creditor. Herein they ſet down all the ſums which they pay to, or receive from the bank; by which means they can eaſily know, in a very little time, how they ſtand with the bank, that is to ſay, how much caſh they have there.

The ſame may be obſerved with regard to thoſe merchants or other perſons, who keep their caſh at a banker's, which is much practiſed in London.

Month BOOK. This is alſo one of the auxiliary Books kept by ſome merchants. It is numbered in folio's, like the ledger, and divided into ſpaces, on the top of each of which are the names of the twelve months in the year, January, February, &c. allowing a whole folio, or what you pleaſe, to each month; and a different ſet of twelve ſpaces, for every different year. On the left hand page enter the payments to be made to you in that month, and, on the right hand page, the payments you are to make. Make a column likewiſe on the left hand of every page, in which write the day of payment, and after this the name of the debtor or creditor, and draw the ſum into the money columns. This does not differ much from the debt Book above-mentioned.

BOOK *of Rates.* This is a Book eſtabliſhed by parliament, ſhewing at what value goods that pay poundage, ſhall be reckoned at the cuſtom-houſe.

BOOK-*Keeper*, is, or ought to be, a perſon properly qualified to keep ſuch accounts as he is required to do, in a methodical and correct manner. The title is principally given to the chief clerks of merchants, and other eminent traders, and they generally ~~keep the~~ journal and ledger, all the other auxiliary Books being kept by the younger gentlemen clerks, or by others under the Book-keeper.

BOOM, in marine fortification, a chain, cable, &c. ſtretched a-croſs the mouth of harbour, or river, to hinder the enemy's ſhips from coming in.

To lay a BOOM.—Provide a great number of wooden battlings or ſpars of about 20, 30, or 40 feet long, more or leſs, and between 5 and 10 inches diameter: Then moor two boats, having a ſheet anchor in each, in the place near one ſide of the river where it is intended the Boom ſhall begin; bend two cables to theſe anchors, and round them place the ſpars or poles, frapping on each with rattling ſtuff, or better with four inch rope, until the Boom is 7, 8, 9, 10, or more feet diameter (according to the hands employed) the cables being in the middle; next, with iron hoops riveted together, worm the Boom, and drive through the hoop a nail into almoſt every ſpar: after having wrought a good birth from the anchors drop them, and continue the work till it is brought near the other edge of the river, and there drop two anchors more with the cables bent to them: then, over all, laſh the ſpare-yards and top-maſts with the top-chains, ſo far as the channel goes.

To that part of the cable in the channel that makes the Boom, let other cables be faſtened, and theſe bent to anchors laid down the ſtream; over the clinch of theſe cables let battlings or ſpars be wrought for near ten fathoms down the ſtream, that the enemy may not cut theſe cables: theſe will be ſerviceable when the enemy's ſhips come ſtemlings againſt it; for, if he force it in one place, the whole will not be opened by that fracture.

In places where wood is ſcarce, and proper ſpars are not to to readily had; or in caſes where there is not time ſufficient be prepare them; it may be found ſufficient to laſh two cables together with old ropes, laſhing to them the oars, top-maſts, and yards, and worming the whole about with iron hoops; and let every part be well covered with pitch, and ſmall gravel ſtrewed on it while the pitch is warm. A Boom ſo prepared cannot be eaſily cut.

If on any particular occaſion it ſhould be found convenient and ſafe to open the paſſage, it may be done by tripping the anchors that are on one ſhore and thoſe down the ſtream, whereby the boats may ſwing down the ſtream upon the ebb, and upon the flood the Boom may be relaid, if the enemy appear in ſight, which he muſt do the firſt of the tide, for upon the ebb there is no danger of his coming; becauſe, if the wind be right in, a prudent enemy will not venture againſt the tide, a ſhip then making ſuch wild ſteerage; and, ſhould ſhe ground, ſhe muſt lie there till flood, which may prove fatal to her from the batteries aſhore; and againſt both wind and tide the enemy cannot come in. On the contrary, ſhould the Boom be carried up the flood, and the enemy appear at the beginning of the next flood, the Boom cannot be relayed till the ebb, and before that time the enemy may have accompliſhed his deſign.

If there be good ſtore of timber at hand, then a ſtockado may be made by driving ſeveral rows of piles in the channel before the Boom; or ſhould the depth of water be too great for this work, the trees may be uſefully applied, by making a raft to ride before the Boom by good anchors, obſerving that the cables are ſo made faſt, that the enemy cannot come to cut them: theſe rafts will be of ſingular uſe in putting the enemy into diſorder, by laying rubbiſh upon them to make fires of when the enemy appears, which will put him into ſome conſternation, and perhaps may cauſe him to come to an anchor, and loſe time or his tide; and this may be done each flood, obſerving not to have the ſmoak drive into the works, which might give the enemy too great an advantage.

To lay a BOOM *in a ſtreight Channel.*—Suppoſe the wind, for the moſt part, to blow obliquely acroſs the river or channel on the ſtarboard quarter, going up the river: now, if the Boom be laid directly thwart the channel, the ſhips coming with the tide or flood and a leading gale will run ſtemlings againſt it, and ſo hazard its breaking, by ſtriking with a force that comes direct; whereas, could the Boom be laid obliquely thwart the river, nearly in a line with the wind, ſo as the ſhip muſt take it with her bow, the blow would be diverted by the ſhip's caſting; becauſe, in this poſition the enemy cannot run ſtemlings againſt it; for in ſailing up the river, the ſhip muſt be near before the helm; and to bring her head to the Boom, the helm muſt be put down, and then it is ten to one whether ſhe come to ſo nicely as to take the Boom: not to mention the miſtakes, in a confuſion, committed by the man at the helm, and him upon the cond, nor the ſmoak; for excluſive of all theſe, it may be taken for granted, the ſhip would caſt alongſide the Boom: then the batteries at the end of the Boom on the larboard ſide would take fore and aft, while the oppoſite batteries on the ſtarboard ſide, playing on his broad-ſide with double round and partridge, muſt make a great ſlaughter among his men cutting at the Boom. And, ſhould he not ſwing alongſide the Boom, but lie ſtemling againſt it, then will the batteries on the ſtarboard ſide of the river, which are to be made above the weather end of the Boom, take him fore and aft, while thoſe on the larboard ſide, againſt the leeward end, play on his broad-ſide.

The ſhips within the Boom, which it is to protect, ſhould be moored in a kind of half-moon, with their broad-ſides flanking the Boom. And ſeveral old ſhips, or thoſe the leaſt uſeful, may be ſunk, as ſoon as a ſignal, ſignifying that the Boom will be cut, is made at one of the forts which defend it; for this purpoſe, thoſe ſhips ſhould have large ſcuttles ready cut: and for a further ſecurity, it would be very proper to have a ſmall Boom to divert the enemy, that the ſhips may be ſunk in the channel before he boards them.

As to the reſt of the ſhips, they are left to their commanders judgment; and, if there is no other remedy, the people may get aſhore to windward, if they can, and there make the beſt defence in their power againſt the enemy's boats and fire-ſhips. From duly weighing the whole of theſe circumſtances, it will be found that the chief ſtrength is in the Boom; therefore, if a double, triple, or fourfold Boom was laid, if the materials could be procured, and the value of the ſhipping and cargoes were of ſufficient importance, it would make the place ſo much the ſtronger, and the enterprize of the enemy more hazardous. In ſtretching theſe Booms, the trouble of many anchors may be ſpared, by making all the cables faſt to the firſt, and ſo letting them float in a bight, and by a ſmall anchor ride upon the ebb, to keep clear of one another.

To ſet up a BOOM *in the bend of a River.*—From the point formed by a bend, ſtretch two Booms acroſs the channel, one towards the middle of the oppoſite bight, and the other ſo much higher, as to lie directly thwart the channel, leaving a kind of angular ſpace between them.

Next the point from whence the two Booms ſtretch, erect a proper fort or battery to command the channel both below and above the bend.

On the other ſide the river, erect another fort or battery againſt the bight a little above the end of the lower Boom, and ſo diſpoſed, that its cannon may rake the channel coming up to the Boom, as well as command both the Booms.

A Boom being thus diſpoſed, it is a great chance if a ſhip anſwer her helm ſo timely in bearing or loofing about the point as to take it ſtemlings, and if ſhe ſtrike it with her bow, ſhe caſts; and in either caſe ſhe will be raked fore and aft by one fort, and have her broad-ſide battered by the other.

Let ſome old veſſels be fitted up for fire-ſhips, and placed between the two Booms; from each ſhip let two hauſers be carried aſhore, one on each ſide, and fixed to cramps ſet up; ſo that, as ſoon as paſſed the firſt Boom, theſe ſhips being ſet on fire, and heaved in their way, nothing can hinder the enemy's deſtruction: as ſoon as fire is ſet to the train, the boat may pull aſhore, under covert of the ſhip, without any apparent danger; for ſuch will be the enemy's conſternation, that they will ſoon leave firing. The hauſers may be faſtened to cramps below the water line, that they be not burnt, nor in ſight of the enemy to cut them. If the fire-ſhip is clapped aboard the weathermoſt ſhip, they may be both heaved together aboard another to leeward.

The ſhips to be defended may be moored in a half-moon, with their broad-ſides ſo laid, as to batter the enemy when he attempts the Boom: and, if other works than what are here directed be judged neceſſary, they muſt be adapted to the ſituation of the place.

When no ſtrong attacks by land are to be feared, the mooring of ſhips behind a point is beſt, on account of laying the Boom: now, ſhould the Boom be forced, which muſt be upon the flood, a fire-ſhip, inſtead of falling on board a ſhip thus moored, will by the tide be hurried beyond her; and, if the place is any ways favourable to the ſhips moored there, it will be found impracticable to board a ſhip thus moored, with ſuch a wind and tide as the enemy muſt have to break the Boom, unleſs he expoſe his boats in carrying out an anchor to warp over, which will be a very dangerous attempt, or ſome unaccountable accident intervene.

It may be objected, that ſhips thus moored cannot bring their broad-ſides to bear upon the enemy when coming to force the Boom; and that they may be battered by the enemy over the point. To this it may be anſwered, firſt, it is no matter whether the broad-ſides do or not, for perhaps it might be the beſt way to get the guns aſhore, if there is time, to be there uſed; and to put the ſmaller ſort only on the lower deck, and turned to flank the Boom. Secondly, the enemy will have but an uncomfortable birth in lying to batter the ſhips over the point, as they will have to deal with the fire from the fortifications on ſhore. What is here ſaid, is only to be underſtood when five or ſix ſhips are to be defended; for the wake of a point could not hold any conſiderable fleet.

BORA'GO, *Borrage*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, of a rotated form; the cup is divided into ſeveral ſegments, and from it there ariſes a piſtil, which is fixed in the manner of a nail to the middle part of the flower, and ſurrounded with four embryo's, which are afterwards changed into as many ſeeds. Theſe are of the ſhape of the head of a ſnake, and are contained in the cups, which become much inlarged, till they are perfectly ripe.

The common borrage has long held its rank as a cordial of the firſt claſs, though perhaps it would not be eaſy to ſay on what foundation. Its flowers are of the number of the four cordial ones of the ſhops, and it has been recommended as a medicine of great efficacy in malignant and peſtilential fevers, and againſt the bites of poiſonous animals.

BO'RAK, among Mahometans, a fabulous animal, ſuppoſed to be of a middle kind, between an aſs and a mule, whereon their prophet was carried in his nocturnal flight from Jeruſalem into the heavens.

BO'RAX (*Dict.*)—*Method of refining* BORAX. It is no wonder that all Europe did not fall into the way of purifying Borax for medicinal and other uſes at once, ſince there is no ſalt in the world in which the proceſs for doing that is ſo troubleſome. The common methods will indeed diſſolve it in water, and evaporation will ſeparate it again, but that not in a form fit for ſale, or in large and fair cryſtals. This is only to be done by a proceſs, like that by which it is originally prepared from the water of the mines. When it has been diſſolved, and the ſolution properly evaporated, it is not to be expoſed to the cold air in a ſtill place as other ſalts are in order to the cryſtalling, but it is to be kept in the hot veſſels, and covered cloſe down in them, and the fire is to be continued under them, though only in a gentle degree. By this means we are able to imitate here the ſun's heat in the countries where it is produced, and the clay cover, which the people who work it, extend over it, at the time when it is to cryſtallize; and the effect is the ſame: the ſalt ſhoots into large cryſtals about the ſides of the veſſel, and about braſs wires, let down from the lid into the liquor.

The Borax is by this means purified from a great deal of its fatty matter, the ſeparating of which renders the operation very offenſive, but it is not yet pure; it is yellow and foul even in thoſe cryſtals. Theſe are to be ſeparated from the liquor, and again diſſolved in a lixivium of pot-aſhes and lime; and then, on being ſet to ſhoot again in the ſame manner as before, it forms itſelf into thoſe pure and pellucid cryſtals which we meet with in the ſhops.

They, when perfectly formed, as they ſeldom are indeed, except by a very nicely managed evaporation, are of an octohædral figure, and very pellucid. They are of a very rude and irregular ſhape, as they generally ſhoot, and, the proceſs of recryſtallizing them not being eaſily hit upon by thoſe who had not been informed of the manner of it, many have ſought a long time in vain to find what was the true figure of the ſalt.

Borax is of great uſe in the collecting the particles of any metal over the fire, and running them into a maſs; and this, with very little diminution of their weight. Dirt or aſhes, though in ever ſo ſmall a quantity, will certainly hinder ſome ſmall particles of gold or ſilver from running together into a maſs over the fire; but, if they are ſo diſpoſed by a very ſtrong fire as to meet into a regulus, a great part of the metal will always adhere to the dirt that is thrown away. The leſs perfect metals not only ſuffer the above-mentioned accidents, but, their ſurfaces being greatly increaſed, copper and iron turn intirely into ſcoriæ, and are deſtroyed, and lead and tin are ſo in great part. It is therefore very detrimental when theſe baſer metals are mixed in any, even in ever ſo ſmall a quantity, with gold or ſilver; for, in the melting, there come upon the ſurfaces light ſcoriæ, in which part of the gold or ſilver is retained, as in the pores of a ſpunge, and prevented from running into a regulus.

To remedy this miſchief, Borax is added, becauſe, as it helps the melting of metals and of all bodies by fire, its bringing the whole maſs into a quick fuſion gives the metals an oportunity to ſink together in a maſs to the bottom, and vitrifies the lighteſt ſcoriæ, throwing them off to the ſurface; and this uſe of this ſalt is not reſtrained to gold and ſilver, but takes place as well in regard to iron as copper.

This ſalt alſo cauſes metals to melt in a much leſs fire than they otherwiſe would, and is of very ſingular uſe in preſerving the leſs perfect metals while in fuſion. It flows over them and covers their ſurface, while tortured in the fire, as if it were with a kind of very thin glaſs, which defends them againſt the combined force of the fire and air, ſo deſtructive to the imperfect metals.

The aſſayers have a cuſtom of rubbing with Borax the inſides of veſſels, in which the more precious metals are to be melted, which always fills up the ſmall cavities in their ſides, that might otherwiſe take in a part of the metals. When gold is melted with Borax alone, it makes it pale; but this is obviated by adding a ſmall quantity of nitre, or of ſal armoniac. Care muſt be taken, however, not to add both theſe ſalts together, becauſe they would cauſe a detonation.

The above-mentioned uſe of Borax has cauſed it to be reckoned, by ſome writers, among the reducing bodies; that is, ſuch bodies as reſtore metals, however deſtroyed, to their priſtine form: but this is an error; for Borax does not reduce the deſtroyed metals, but only the ſcattered particles of them, while they yet retain their true metallic form. *Cramer's Art of Aſſaying.*

BORDA'T, a ſmall narrow ſtuff, which is manufactured in ſome parts of Egypt, particularly at Cairo, at Alexandria, and at Damieta.

The Bordats of Cairo are ſold for about 18 medimns per piece, thoſe of Alexandria for about 24, and thoſe of Damieta for 25 or 26.

BO'RDERS, (*Dict.*)—Borders are of four ſorts: thoſe are the moſt common, that are continued about parterres without any interruption; and wrought with a gentle riſing in the middle, like an aſs's back, and planted with low ſhrubs and flowers.

The ſecond ſort of Borders are ſuch as are cut into compartments, at convenient diſtances, by ſmall paſſages, and being alſo raiſed in the middle, as before-mentioned, are likewiſe ſet off with ſhrubs.

The third ſort are ſuch as are laid even and flat, without flowers, having only a verge of graſs in the middle; being edged with two ſmall paths, raked ſmooth, and ſanded. Theſe are ſometimes garniſhed with flowering ſhrubs, and flowers of large growth; or with vaſes and flower-pots placed regularly along the middle of the verge of graſs.

The fourth ſort are quite plain, and are only ſanded, as in the parterres of orangery; and are filled with caſes ranged in a regular order along thoſe Borders, which are edged with box on the ſides next to the walks; and on the other, with verges and graſs-work next the parterre. Sometimes a yew is planted between each caſe, which makes the Border appear richer, and the parterres handſomer, during the winter ſeaſon.

Borders are either made ſtraight, circular, or in cants; and are turned into knots, ſcrolls, voluces, and other compartments.

Floriſts alſo make Borders either long walks, or detached; and in theſe they raiſe their fineſt and choiceſt flowers. Theſe are frequently encompaſſed with Border-boards painted green, which makes them look exceeding neat.

But, in large parterres, this is not to be expected; ſince, if they be ſtocked with flowers ſucceeding one another in their ſeveral ſeaſons, it is ſufficient, ſo that nothing appears bare and naked.

It is uſual to diſcontinue the Borders at the ends next to the houſe, that the embroidery and riſe of the parterre may not be hidden by the ſhrubs and flowering plants, and that the deſign may be better judged of.

And ſometimes there are branched out of it foliage, palm-leaves, and ſhells ſporting among the ſands.

Since the modern taſte of gardening has been introduced into England, all the French taſte of parterres, ſcroll Borders, and fret work in box, has been juſtly baniſhed our gardens; therefore I have only mentioned them here, to expoſe the taſte of thoſe architect-gardeners, who have no idea of the noble ſimplicity of an open lawn of graſs, properly bounded by plantations; but, inſtead of this, divide that part of the garden, near the houſe, into various forms of Borders edged with box, and ſand or gravel-walks leading about them; by which the ground is cut into many angles, ſcrolls, &c. which is very hurtful to the eye of a judicious perſon: therefore, where flowers are deſired, there may be Borders continued round the extent of the lawn, immediately before the plantations of ſhrubs; which, if properly planted with hardy flowers to ſucceed each other, will afford a much more pleaſing proſpect than the ſtiff Borders made in ſcrolls and compartments, after the French manner, can poſſibly do.

Theſe Borders may be made ſix or eight feet wide, in proportion to the extent of the garden, and ſize of the lawn: for a ſmall lawn ſhould not have very broad Borders; nor ought a large lawn to be bounded by ſmall Borders; ſo that a due proportion ſhould be always obſerved in the laying out of gardens. *Miller's Gard. Dict.*

BO'RING, the act of perforating a ſolid body, or making a hole throughout its whole length or thickneſs.

Boring of maſts, from top to bottom, is propoſed by Dr. Hook as a means of ſtrengthening and preſerving them; as this would make them dry and harden the better, and prevent their cleaving and cracking: for want hereof, the outſide drying, when the inſide does not, the former ſhrinks faſter than the latter can keep it company; the conſequence of which is eaſy to foreſee. *Hought. Collect.*

Boring *of Water-pipes.* The method of Boring alder-poles for water-pipes is thus: being furniſhed with poles of a fit ſize, horſes, or truſſels, are procured of a due height, both to lay the poles, and reſt the augre on in Boring; they alſo ſet up a lath, whereby to turn the leſſer ends of the poles, and adapt them to the cavities of the greater ends of others, in order to make the joint ſhut each pair of poles together. The outer or concave part is called the female, and the other, or inner, the male part of the joint. In turning the male part, they make a channel or ſmall groove in it, at a proper diſtance from the end; and, in the female part, bore a ſmall hole to fit over this channel; they then bore through their poles, ſticking up great nails at each end, to guide them right; but they commonly bore a pole at both ends; ſo that, if it be crooked one way, they can nevertheleſs bore it through and not ſpoil it. *Neve, Build. Dict.*

A Machine for **Boring** *Pipes.*—*Plate* V, *fig.* 9. is a perſpective view of this machine. A, is the water-wheel, on the axis of which there is another wheel B, of a ſmaller diameter. This turns the upright wheel or lantern C, on the axis of which is a cog-wheel D, which turns two ſmall wheels E and F; the firſt E, which is vertical, turns the augre; and the ſecond F, which is horizontal, cauſes the carriage to advance, by the help of the two arms H and I. The firſt, H, draws the wheel G, and the other, I, puſhes it in a contrary direction.

As the augre muſt be near twelve feet long, the weight of it muſt be ſupported, to hinder it from bending, that it may pierce the wood uniformly. L, L, repreſent two ſupporters. Theſe ſupporters, in order to give no obſtruction to the augre, may be made as follows: C, C, *fig.* 7, 8, are two pieces, which muſt be faſtened to ſome of the timber work of the mill; theſe encompaſs a ſmall plank hung by a cord, at the bottom of which are fixed the pieces *b*, *b*, with joints at the places *e*, *e*; and, that they may not move out of the vertical plane, they are accompanied with tenons *f*, *f*, made in the quarter of a joined circle of the thickneſs of the plank *a*, that they may work freely: on the ſide of one of theſe pieces is fixed a ſpring *g*, in order to hinder them from uniting, by forcing them to enter below into a mortiſe made about the thickneſs of the end of a rule; then theſe two pieces make but one bored with a hole, through which the augre is to paſs. See *fig.* 7.

Fig. 6. ſhews the cord which is faſtened to the plank *a*, and goes on the two pullies *b*, *b*; at the other end of this cord there is hung a weight *e*, reſting on the piece N, which is ſupported at one end by the piece O, and fixed at the other by a joint to the lever K, which has its center of motion fixed to a piece of wood H; ſo that, leaning againſt the extremity M of the leaver, the piece N quits the ſupport O, the weight ſinks down, and draws up the piece *a*; then the ſides *b*, *b*, *fig.* 8. quit the mortiſe *d*, and the ſpring *g* ſeparates them; ſo that the ſupporter does not hinder in the leaſt the motion of the augre. *Belidor's Hydraulics.*

Boring in farriery, an operation ſometimes practiſed for the cure of horſes whoſe ſhoulders are wrenched. The method is thus: they cut a hole in the ſkin through the middle of the ſhoulder, and, with the ſhank of a tobacco-pipe, blow it as a butcher does a ſhoulder of veal; then they run a cold flat iron, like a horſeman's ſword-blade, eight or ten inches up, between the ſhoulder-blade and the ribs, which they call Boring; after that, they burn him round his ſhoulder with a hot iron. *Burd. Gent. Farr.*

Boring, among miners: ſee MINEROLOGY in the Dictionary.

BORSE'LLA, in the glaſs-works, an inſtrument wherewith they extend or contract the glaſs at pleaſure.

BOSQUE'TS *, (*Dict.*)—Boſquets are groves, or ſmall plantations of trees.

* The word is derived from *Boſchetto*, Italian, a diminutive of *Boſco*, a wood or grove.

Theſe ſmall compartments in gardens, are formed of trees, ſhrubs, or tall large-growing plants, planted in quarters; and are either diſpoſed regularly in rows, or in a more wild and accidental manner, according to the fancy of the owner: theſe quarters are commonly ſurrounded with ever-green hedges, and the entrances formed into regular porticoes with yews, which are by far the beſt and moſt proper trees for this purpoſe. In the inſide of theſe quarters may be made ſome walks, either ſtraight or winding; which, if the quarters are large, ſhould be ſix or eight feet broad, and may be laid with turf, and kept well mowed and rolled, which will render the walking much eaſier and pleaſanter than if the walks are only the common earth, which in ſmaller quarters cannot be otherwiſe; for, if the trees are cloſe, and the walks narrow, ſo as to be ſhaded and over-hung by the trees, the graſs will not grow.

Theſe quarters may be alſo ſurrounded with hedges of lime, elm, horn-beam, or Beach; which ſhould be kept well ſheared, and not ſuffered to riſe too high; that the heads of the trees may be fully ſeen over them, and the ſtems only hid from the ſight, when in the walks on the outſide of the quarters.

In planting of theſe Boſquets you ſhould obſerve to mix the trees, which produce their leaves of different ſhapes, and various ſhades of green, and hoary or mealy leaves, ſo as to afford an agreeable proſpect: beſides, there is a great variety of different fruits, which theſe trees produce in autumn; which, although of little or no uſe, that we know of, yet have a very good effect, in affording an agreeable variety for ſome time after the leaves are gone; as the euonymus, or ſpindle-tree, the opulus, or marſh-elder, the cock-ſpur-hawthorn, with many other ſorts, too numerous to mention in this place. But I would adviſe never to mix ever-greens with deciduous trees; for, beſides the ill effect it hath to the ſight, eſpecially in winter, they ſeldom thrive well together; ſo that thoſe quarters where you intend to have ever-greens, ſhould be wholly planted therewith; and in the other parts mix as many varieties of different trees, which caſt their leaves, as you can conveniently; and alſo plant ſome of the largeſt-growing flowers (eſpecially near the outſide of the quarters) which will add greatly to the variety, if they have but air enough to grow; but if any of the ever-green trees are mixed with the deciduous, it ſhould be only to border the wood.

Theſe Boſquets are proper only for ſpacious gardens, being expenſive in their firſt making, as alſo in keeping. *Miller's Gard. Dict.*

BOTA'LE *Foramen*, in anatomy, an aperture in the heart of a fœtus, whereby the blood is enabled to circulate, with going into the lungs, or the left ventricle of the heart.

BO'TANIST, a perſon who underſtands the nature, hiſtory, and diſtinction of vegetables, on ſettled and certain principles, and can call every plant by a diſtinct, proper, and intelligible name. *Linnæi Fundam. Botan.*

BOTT, among bone-lace weavers, a kind of round cuſhion of light matter placed on the knee, whereon they work or weave their lace with bobbins, &c. See LACE.

Botts, in zoology, a ſpecies of worms which infeſt horſes and other cattle; having large heads and little tails; generally found in the ſtraight gut, near the fundament. *Ruſt. Dict. Skin. Etym.*

The name is alſo given to a ſort of grubs which deſtroy the graſs in bowling-greens, &c.

BO'TTLING, or **Botteling**, the operation of putting up liquors in bottles corked, to keep, ripen, and improve.

Cyder requires ſpecial precautions in the Bottling, being more apt to fly, and burſt the bottle, than other liquors. The beſt way to ſecure them, is to have the liquor thoroughly fine before it be bottled. For want of this, ſome leave the bottles open a while, or open them after two or three days Bottling, to give them vent. If one bottle break through fermentation, it is beſt to give them all vent, and cork them up again. Mean cyder is apter to break the bottles than rich. Some ſoak the corks in ſcalding water, to render them more pliant and ſerviceable.

Another obſervation is, to lay the bottles ſo as that the liquor may always keep the cork wet and ſwelled. Something alſo depends on the place where the bottles are ſet, which ought to be ſuch as expoſes them as little as poſſible to the alterations and impreſſions of the air: the ground is better for this purpoſe than a frame, ſand better than the bare ground, and a running water, or a ſpring often changed, beſt of all.

To haſten the ripening of bottled liquors, they are ſometimes ſet in a warm place, or even expoſed to the ſun, when a few days will bring them to maturity. *Hought. Collect.*

BO'TTOM-*Stone*, a kind of iron-ſtone, or ore, in the Staffordſhire mines.

BO'UGIE, in ſurgery, a kind of large medicated tent, worn in the urethra, for the cure of a gonorrhœa, &c.

The properties requiſite in the Bougie, are a ſufficient degree of firmneſs, that it may be introduced with ſome force; a ſuppleneſs and tenacity, that it may conform to the motions of the body without breaking; a lenient ſuppurative diſpoſition to bring on a diſcharge without pain; and, laſtly, a ſmoothneſs of ſurface, that it may not only be introduced with more eaſe, but that it may lie eaſy in the paſſage till it begins to diſſolve.

The beſt baſis of ſuch a Bougie, in my opinion, is diachylon ſimplex, which may be rendered efficacious, by a great variety of mixtures; but though an addition of certain gums, or of the mucilage plaiſter, will alone anſwer the purpoſe in ſome diſorders of the urethra; yet, as a long uſe of mercurial applications is almoſt a ſpecific for venereal ulcers, and has alſo a powerful effect on every other ſpecies of ſtubborn ulcers, I have chiefly confined my experiments to preparations of mercury.

I have often uſed white precipitate, red precipitate, calomel, and æthiops mineralis; and, though the precipitates, at leaſt the red precipitate, are properly eſcharotic powders, yet, when they are mingled in plaiſter, they loſe their corroſive property, in the ſame manner as elixir of vitriol does by dilution; and, on this account, may be employed with the utmoſt innocence: however, it may be proper to obſerve, that the red precipitate ought to be finely levigated, for levigation abates the eſcharotic quality of it, even when in powder; and in this ſtate I have often carried the proportion of powder from one drachm to three drachms for every ounce of plaiſter, without producing any miſchief, or without diſcovering any notable difference of operation in the Bougies, ſo effectually ſheathed are the cauſtical qualities of the mercury by the plaiſter they are mixed with.

But, though theſe remedies often work a cure in ſome ſtubborn diſeaſes of the urethra, yet a very large quantity of crude quickſilver, added to the plaiſter, ſeems to be better calculated for the purpoſe; as quickſilver, mingled with axungia or plaiſter, is not only an excellent topical medicine for ulcers, but has alſo a peculiar diſcutient quality, which it exerts, even when there is no rupture of the veſſels. This operation of the quickſilver, therefore, ſeems to give it greatly the preference to the other compoſitions, becauſe it not only acts as favourably upon the ſurface of the ulcers, but alſo exerts its other virtues on the fungous or indurated parts of the urethra.

Perhaps we ſhall diſcover, hereafter, the proper proportion of quickſilver to the plaiſter: at preſent I have allotted half an ounce to every ounce of plaiſter, which renders it exceſſively more mercurial than any plaiſter now in uſe. The diachylon muſt be made with oil, and a little pix Burgundica added to it, that it may be ſufficiently tenacious: to every ounce of plaiſter I have uſually flung in two drachms of crude antimony, finely levigated, from an opinion that it greatly conduces to the ſmoothneſs and good conſiſtence of the Bougie; beſides, that it may, poſſibly, have other virtues. Upon this plan the preſcription ſtands thus:

Diach. cum pice Burgund. ʒii.
Argent. viv. ℥i.
Antim. crud. pulv. ʒſs.

The quickſilver, whether it be divided in balſams, ſulphur, or honey, muſt not be put into the plaiſter till the moment before the Bougies are made; nor muſt the plaiſter be boiling-hot at that time, leſt, by the heat, the quickſilver ſhould ſeparate from the body it is divided in, and fall down to the bottom in form of globules. When the quickſilver is mingled with the plaiſter moderately hot, the ſlips of fine rag muſt lie ready to dip in the compoſition. Theſe ſlips muſt be of different lengths, from ſix to nine or ten inches, and about three inches broad; roll them up looſly, and, taking hold of one extremity with the left-hand, let it fall in upon the ſurface of the plaiſter, and then draw it out gently; as it is drawn out, it will unrol, and take up a quantity of plaiſter upon its ſurface, equal to the thickneſs of a ſilver groat; though, to facilitate the unrolling of the rag, it will be proper to aſſiſt its motion with the end of a ſpatula, or any ſuch inſtrument: the plaiſter muſt, however, be ſo hot, as to ſoak through and diſcolour the rag, otherwiſe it will not make ſo good a Bougie. Several ſlips of rags may be dipped in the ſame compoſition, one after another, before it becomes too cold; but, to do this more handily, the ladle in which it is melted ought to be broad and flat at the bottom; and the plaiſter muſt be kept ſtirring, that it may preſerve an equal conſiſtence.

If the cloth be exactly three inches broad, it will make ſix Bougies of a moderate ſize; but their ſize may be increaſed or diminiſhed according to the occaſion. It is generally adviſeable, that the Bougie ſhould be ſmaller at the end which is introduced through the ſtrictures, than at that which is left out at the penis; for that purpoſe, many cut off a part of the oblong ſquare I have deſcribed, in ſuch a manner as to reduce it almoſt into the ſhape of a long right-angled triangle: but, as this way of cutting it weakens the Bougie exceedingly, and it is not at all neceſſary the Bougie ſhould be taper from one extremity to the other, it is much better to cut off a little ſlope of about an inch and an half long, from the end that is to be paſſed into the urethra, which will leſſen it where it is requiſite to be ſmall, and leave it ſtrong in the other parts where the diminution is not neceſſary.

The plaiſter taken up by the cloth, when dipped, will have little bubbles upon its ſurface, and not be ſo ſmooth, as if it had been ſpread; therefore an iron-ſpatula, a little warmed, may be paſſed over the plaiſter before it be cut into Bougies, which will render it more compact and even. It is a much more exact and ſpeedy method to cut the Bougies off with a knife and ruler, than with ſciſſars. When they are rolled up, it muſt be with that ſide outwards which is covered with plaiſter; and they muſt firſt be rolled up with the finger and thumb as cloſe as poſſible, before they are rolled upon a board or marble; for, upon this circumſtance, the neatneſs of the Bougie depends: I think too they may be rolled up more neatly by the hand than any kind of machine. Holding the plaiſter a little before the fire, if it be in winter, will facilitate the rolling, unleſs it has been juſt dipped, when it is not neceſſary. *Sharp's Critical Enquiry.*

BOU'NTY, in commerce, denotes a premium paid by the government to the exporters of certain commodities, on their taking oath, or, in ſome caſes, giving bond, not to re-land the ſame in England.

Queen Anne's BOUNTY, for augmenting poor livings under 80l. per annum, conſiſts of the produce of the firſt-fruits and tenths, after the charges and penſions, payable out of the ſame, are defrayed. A corporation for management of the ſame was ſettled, &c. in 1704.

BOURDONNE', in heraldry, is underſtood of a croſs, whoſe extremities are turned round like the ends of a pilgrim's ſtaff; more frequently called pommeté, globatus.

BOW, in muſic, denotes a machine that ſerves to play, or give the ſound to viols, violins, and inſtruments of that kind, by drawing it gently over the ſtrings thereof.

The Bow conſiſts of three parts; the firſt is the ſtick, or wood, to which the hair is faſtened; the ſecond is compoſed of about eighty or an hundred horſe hairs, or filaments of ſilk; the third is the nut, a ſort of half-wheel, which ſerves to keep the hairs in due degree of tenſion. *Playf. Treat. of Muſic.*

Bow, in trade and manufactures, denotes a flexible inſtrument, conſiſting of a piece of ſteel or iron; to the two ends of which is faſtened a cat-gut, uſed by ſmiths, watchmakers, and other artificers, for piercing and turning of divers ſorts of works.

Bow-*Dye*, a new kind of ſcarlet-red, ſuperior to madder, but inferior to the true ſcarlet grain for fixedneſs and duration.

BO'WER, in gardening, a ſhady place, under covert of trees, or branches interwoven.

A Bower differs from an arbour, in that the latter is always built long and arched; but a Bower is either round or ſquare at the bottom, and made with a ſort of dome or ceiling at the top.

BOX *of a watch*, the outer caſe or cover.

Box *of a wheel*, the aperture wherein the axis turns.

Box *of a plough*, a name by which the farmers call that croſs piece in the head of the plough, through which the ſpindle of the two wheels paſſes, and to which are faſtened the two crow-ſtaves, ſerving, by their holes, to regulate the height of the beam, the tow-chain below, the ſtake which ſupports the bridle-chain above, and the gallows behind, into which are fixed the wilds with the crooks of iron, for the drawing the whole plough along. This part of the plough is placed croſswiſe with the beam, and ſtands much below it, and not far from the ground. *Tull's Huſbandry.*

Box-*Tree*, *buxus*, in botany, a genus of trees, whoſe characters are: the leaves are pennated, and ever-green: it hath male flowers, which are produced at remote diſtances from the fruit on the ſame tree: the fruit is ſhaped like a pottage-pot inverted, and is divided into three cells, containing two ſeeds in each, which, when ripe, are caſt forth by the elaſticity of the veſſels.

Botaniſts enumerate ſeven ſpecies of this tree, viz. 1. The Box-tree. 2. The narrow-leaved Box-tree. 3. Striped Box. 4. The gold-edged Box-tree. 5. The dwarf Box. 6. The dwarf ſtriped Box. 7. The ſilver-edged Box.

The firſt and ſecond ſorts grow in great plenty upon Box-hill, near Darking in Surry, where were formerly large trees of theſe kinds; but of late they have been pretty much deſtroyed; yet there are great numbers of theſe trees remaining, which are of a conſiderable bigneſs. The wood of this tree is very uſeful for turners, engravers, and mathematical-inſtrument-makers; the wood being ſo hard, cloſe, and ponderous, as to ſink in water; which renders it very valuable for divers utenſils.

All the varieties of the trees, or large Box, are proper to intermix in clumps of ever-greens, &c. where they add to the variety of ſuch plantations: theſe may be propagated by planting the cuttings in autumn in a ſhady border, obſerving to keep them watered until they have taken root; when they may be tranſplanted into nurſeries, till they are fit for the purpoſes intended. The beſt ſeaſon for removing theſe trees is in October; though, indeed, if care be uſed to take them up with a good ball of earth, they may be tranſplanted almoſt at any time, except in the ſummer: theſe trees are a very great ornament to cold and barren ſoils, where few other things will grow, they may alſo be propagated by laying down the branches, or from ſeeds: the laſt being the beſt method to have them grow to be large, the ſeeds muſt be ſown, ſoon after they are ripe, in a ſhady border, which muſt be duly watered in dry weather.

The dwarf kind of Box is uſed for bordering of flower-beds, or borders; for which purpoſe it far exceeds any other plant, it being ſubject to no injuries from cold or heat, and is of a long duration; is very eaſily kept handſome, and, by the firmneſs of its rooting, keeps the mould in the borders from waſhing into the gravel-walks, more effectually than any plant whatever: this is increaſed by parting the roots, or planting the ſlips; but, as it makes ſo great an increaſe of itſelf, and ſo eaſily parts, it is hardly worth while to plant the ſlips that have no roots; but it is now become ſo common, that it may be purchaſed from the nurſeries at a cheap rate. *Miller's Gard. Dict.*

BRACE, in writing, a term uſed to ſignify a certain crooked ſtroke or figure of a pen, made at the end of two or more lines, in an account which expreſs two or more articles, charged with one and the ſame ſum at the end, which is uſually placed at the end, and in the center of the Brace; and expreſſes, that the ſum there ſpecified is the joint price of both the articles mentioned in the lines connected by the Brace.

BRACHIA'LIS, in anatomy, an oblong, thick, and broad muſcle, lying immediately on the anterior part of the lower half of the os humeri; the upper part of it is forked, or ſloped, and, at the bending of the joint of the elbow, the lower part of it contracts. It is fixed to the ſurface of the os humeri, by a great number of fleſhy fibres, from the lower inſertion of the deltoides, almoſt down to the two foſſæ, at the lower extremity of the bone, and from one edge of the fore-ſide of this lower extremity to the other. The fibres are, for the moſt part, longitudinal; thoſe neareſt the ſurface of the muſcle being longeſt, the more internal growing gradually ſhorter.

The lateral fibres are a little oblique; and this obliquity increaſes, as they deſcend lower. Theſe lateral fibres are partly fixed in the intermuſcular ligaments of the os humeri, of which ligaments, that which lies toward the internal condyle, is longer and broader than that toward the external. The loweſt of theſe fibres are very oblique, and form on each ſide a kind of ſmall ſeparate faſciculus. In paſſing over the joint, all theſe fibres contract in breadth, and afterwards end in a ſtrong flat tendon, inſerted in the muſcular impreſſion, which is directly below the coronoide apophyſis of the ulna.

The ſloped or forked extremity of this muſcle embraces the large tendon of the deltoides; the internal part of the fork meets the inferior inſertion of the coraco-brachialis; and the foreſide of the whole muſcle is covered by the two fleſhy bodies of the biceps. *Winſlow's Anatomy.*

BRA'CHMANS, (*Dict.*)—Theſe were a branch of the ancient gymnoſophiſts, or philoſophers of India, remarkable for the ſeverity of their lives and manners.

The Greeks uſually give them the name gymnoſophiſts; though Clemens, Porphyry, &c. make the Brachmans only a branch of the gymnoſophiſts, whom they divide into two ſects, bracmanes and ſamanæi.

There are ſome in the Indies who ſtill bear the name, and live in the ſame manner as the ancient Brachmans: the Portugueſe call them bramanes or bramenes; we, uſually, bramins. See BRAMINS.

Some ſay, they derive their name from the patriarch Abraham, whom, in their language, they call Brachma, or Brama. Others deduce it from the name of their god Brachma; which ſome again take to be the ſame with Abraham: whence Poſtel calls them abrachmanes. F. Thomaſſin fetches the word from the Hebrew, barach, to fly, or eſcape; becauſe the Brachmans retire into the country, and live in deſarts. The ſame author gives us another derivation, viz. from the Hebrew, barach, benedicere, orare, to bleſs, pray; in regard this is their principal occupation.

Porphyry obſerves, that the ancient Brachmans ſucceeded into the order, by right of family; whereas the Samanæans were elected into it: the former therefore were all of the ſame family, the latter of various.

The Brachmans were perfectly at liberty, paid no taxes, nor were under the command of any perſon: they lived on herbs, pulſe, and fruits; abſtaining from all animals, and thinking it an impiety to touch them. The greateſt part of the day and night they ſpent, in ſinging hymns in honour of the Deity; praying and faſting continually. The generality of them lived in ſolitude, without marrying, or poſſeſſing any eſtates.

The Brachmans maintained, that life was a ſtate of conception, and death the moment of birth; that the ſoul of a philoſopher, detained in his body, was in the ſtate of a chryſalis, and diſplays itſelf, at the inſtant of death, like a butterfly, which breaks its ſhell, and takes its flight. The events of life, according to them, were neither good nor bad; becauſe the ſame thing which pleaſes one man, is diſpleaſing to another; nay, the very ſelf-ſame thing is agreeable and diſagreeable, to the ſame perſon, at different times.

They granted the world to be finite, to have a beginning and an end. They admitted of a God for a creator, who governed the world; thought the univerſe formed of the different elements; looked on the heavens as the reſult of a quinteſſence; maintained the immortality of the ſoul, and ſuppoſed tribunals of juſtice among the ſhades below, &c. Clemens, of Alexandria, erroneouſly makes the two ſects of gymnoſophiſts but one. When they were weary of living, they themſelves built up their own funeral pile, lighted it with their own hands, and then aſcended it with a grave majeſtic pace.

Such were theſe ſages whom the Grecian philoſophers went ſo often to conſult. Pythagoras is ſaid to have received the doctrine of the metempſychoſis from them. We read in Suidas, that they were called brachmanes, from king Brachman, their founder. This ſect ſubſiſts yet in the Eaſt, under the name of bramines, or BRAMINS; which ſee.

BRACHYTELO'STYLA, in natural hiſtory, the name of a genus of cryſtals, compoſed of a ſhort hexangular column, terminated at each end by an hexangular pyramid.

BRA'CKET, in building, denotes a kind of wooden ſtay, in form of a knee or ſhoulder, ſerving for the ſupport of ſhelves, &c. *Neve, Build. Dict.*

BRACTEA'RIUM, in natural hiſtory, the name of a genus of foſſils of the talc claſs; the characters of which are: each piece is compoſed of ſmall plates, in form of ſpangles; and each of theſe, naturally thin or fiſſile, into very thin ones. See *plate* IV. *fig.* 32.

BRAINS *microſcopically examined.*—The accurate Mr. Lewenhoeck examined, on ſeveral occaſions, the Brains of different creatures by his microſcope; as that of the Indian hen, the ſheep, the ox, the ſparrow, &c. He could there always diſtinguiſh multitudes of veſſels ſo extremely ſmall, that, if a globule of blood (a million whereof exceed not a grain of ſand in bigneſs) were divided into five hundred parts, thoſe parts would be too large to paſs into ſuch veſſels. He obſerved alſo, that the veſſels in the Brain of a ſparrow were as large as in that of an ox; and argues from thence, that there is really no other difference between the Brain of a large animal and that of a ſmall one, but only that the one contains a much greater number of theſe veſſels than the other; and that the globules of the fluid, paſſing through them, are in all animals of the ſame ſize. *Baker on the Microſcope.*

BRAKE, a name given by huſbandmen to a place where female fern grows, and ſometimes to the fern itſelf.

Brake is alſo uſed for a farrier's inſtrument, otherwiſe called barnacles.

Brake, in the hempen manufactory, denotes a wooden-toothed implement, wherewith to bruiſe and break the bun of hemp, and ſeparate it from the rind.

There are two kinds of Brakes uſed in the dreſſing of hemp, viz. an open and wide-toothed, or nicked Brake, and a cloſe and ſtreight Brake; the firſt ſerving to cruſh the bun, the latter to beat it forth. When the hemp is braked, they proceed to ſwingle it. *Hought. Collect.*

Brake *of a pump*, ſignifies the handle wherewith it is wrought.

BRA'MA, in ichthyology. See BREAM.

BRA'MINS, in modern hiſtory, a ſect of Indian philoſophers, formerly called brachmans.

They are prieſts, and have three principal objects of veneration, the god Fo, his law, and the books which contain their ordinances. They believe that the world is nothing but an illuſion, a dream, a deceit; and that bodies, to exiſt really, ought to ceaſe to be in themſelves, and mix themſelves with that nothing, which, by its ſimplicity, makes the perfection of all beings. They make ſanctity conſiſt in abſolute apathy, to deſire nothing, to think of nothing, to perceive nothing, to remove every idea from the mind, even that of virtue, ſo far, as that it may not diſturb the repoſe of the ſoul; which is the perfection of holineſs, according to the Bramins. This ſtate ſo much reſembles ſleep, that a doſe of opium appears more likely to ſanctify a Bramin, than all his other attempts. This quietiſm has been attacked in the Indies, and defended with warmth. They are ignorant of their firſt origin. King Brachman is not their founder. They pretend themſelves to have iſſued from the head of the god Brama, whoſe brain was not only fertile, but that his feet, hands, arms, ſtomach, and thighs, alſo generated beings, though of an inferior claſs to the Bramins. They have ancient books, which they call ſacred, and carefully preſerve the language in which they were written. They admit the metempſychoſis; aſſert that the chain of beings deſcends from the boſom of God, and continually aſcends up to it again; like the filament which comes from the belly of the ſpider, and enters it again.

Their ſyſtem of religion is various in different parts of the country. On the coaſt of Coromandel they worſhip Wiſtnou, and believe Brama was the firſt man; that Brama received from Wiſtnou a power of creating; that he made eight worlds like ours, the government of which he left to eight lieutenants or deputies; that the worlds periſh and revive again; that our earth began in water, and ſhall end in fire; that from the aſhes of this preſent earth a new earth ſhall be formed, which ſhall neither have ſea, nor viciſſitude of ſeaſons. The Bramins make the ſoul circulate in different bodies. The ſoul of a man, ſay they, who was of a quiet gentle diſpoſition, paſſes into the body of a dove; the ſoul of a tyrant animates a vulture. In conſequence of this doctrine, they hold all animals in great reſpect; they have founded hoſpitals for them, and, under a notion of religion, purchaſe the birds which the Turks take. They are in very great eſteem among the Banians throughout all the Indies; but are reverenced in a more eſpecial manner by thoſe which inhabit the coaſt of Malabar, who carry their veneration to a very extraordinary degree; truſting their brides with them before conſummation, to diſpoſe of them according to their holy will, in order to make the bridegrooms happy and proſperous. They are at the head of religion, and explain the dreams of it to the people. The auſterity of their lives, and the oſtentation of their faſts, promotes the impoſture; they are diſperſed all over the Indies, but their college is at Banaſſi. We might proceed farther to expoſe the extravagances of the philoſophy and religion of the Bramins; but it is now unneceſſary. Philoſophy, in this enlightened age, has made a gigantic progreſs, and abſurdities meet the contempt they deſerve.

BRA'NCHERY, in anatomy of vegetables, denotes the vaſcular parts of divers fruits, as apples, pears, plums, and berries.

BRANCHI'DÆ, in antiquity, prieſts of Apollo, ſerving in his temple at Dydima, in Miletus; which was famous for its oracle.

The denomination is taken from branchus or branchides, an epithet given to Apollo as worſhipped here; though on what account the title was given, is not agreed on.

BRA'NCHUS, βράγχος, in medicine, a ſpecies of catarrh, affecting chiefly the jaws, throat, and aſpera arteria.

BRA'NDRITH, among builders, denotes the fence or rail about the mouth of a well.

BRA'NDY (*Dict.*)—The French Brandies, moſt generally eſteemed, are produced up the Loire, or near Cognac, Nantz, and Rochelle. Next to theſe are the Bourdeaux, or entre deux Meres Brandies; thoſe of Languedoc, and the iſlands of St. Martin, Oleron, &c.

According to the different ſpecies and growth of the grapes, the Brandies always differ; whence there are various kinds of French ſpirits, having particular flavours; by which the conoiſſeurs readily diſtinguiſh one ſort from another; though the vulgar call them all by the name of French Brandy indiſcriminately. But an ordinary judgment may eaſily diſtinguiſh Languedoc Brandy from that of the iſles, or Bourdeaux from Cognac: nor would there be ſo great a ſimilarity between the ſeveral ſpecies of French Brandies as there is, but that only the weakeſt and loweſt-flavoured wines are diſtilled for their ſpirit, or ſuch as prove abſolutely unfit for any other uſe: but, when, out of curioſity, or good huſbandry, they diſtil the bottoms, or refuſe parcels of the groſſer-bodied and full-taſted wines, the Brandy got from them is what we, in England, emphatically call a wine-ſpirit.

Every kind of grape, therefore, as it affords a wine, ſo does it alſo a Brandy of its own peculiar flavour; which is an obſervation that ſhould be well attended to, when any parcel of French Brandy is propoſed to be imitated; for it is ridiculous to expect Cognac Brandy ſhould be perfectly reſembled with a quinteſſence made from Bourdeaux grapes; though the ſpirit, or ſubject-matter of the operation, were previouſly rendered ever ſo pure or taſteleſs.

A large quantity of Brandies is made in France during the time of the vintage; for all thoſe poor grapes, that prove unfit for wine, are uſually firſt gathered, preſſed, and their juice fermented, and directly diſtilled. This rids their hands of their poor wines at once, and leaves their caſks empty for the reception of better. It is a rule with them to diſtil no wines that will fetch any manner of price as wine; for in this ſtate the profits upon them are vaſtly greater than when reduced to Brandies. This large ſtock of ſmall wines, wherewith they are almoſt over-run in France, ſhews the reaſon of their making ſuch vaſt quantities of Brandy, more than other countries, which lie warmer, and better for grapes.

But this is not the only fund of their Brandies; for all the wine that pricks, or turns eager upon their hands, is alſo condemned to the ſtill; and, in ſhort, all that they can neither export, nor conſume at home, which amounts to a large quantity; ſince much of the wine, laid in for their family proviſion, is ſo poor, as not to keep the ſpending.

Their general method of diſtilling Brandies in France needs no formal deſcription, as not differing from that vulgarly practiſed among ourſelves in working from waſh or wines: nor are they one jot more cleanly or exact in the operation. They only obſerve, more particularly, to throw a little of the natural lee into the ſtill, along with the wine, as finding this gives their ſpirit the flavour, for which it is generally admired abroad; though not at all by themſelves at home, who have a moſt contemptible opinion of Brandy in general, but eſpecially the high-flavoured kinds; ſo that, as the diſtillation of this commodity is uſually left to the meaneſt and moſt ſervile hands amongſt them, the ſpirit itſelf is very little uſed by any other ſort of people throughout the kingdom.

Their notion of proof ſquares with our's to a tittle, and they ſtand upon it to a punctilio, as if the whole excellence of the Brandy lay there. And in this form of ſtrong bubble-proof all their fine ſpirits are conſtantly found.

But they have one particular expedient for ſuch Brandies as prove foul, ſeedy, or retain the taſte of certain weeds apt to grow among the wines, viz. to draw them over again, with a deſign to cleanſe them of that adventitious flavour: in which operation they leave out the faints, or rather change the receiver, as ſoon as ever the ſtream comes proof; then, mixing together all that run off before, they call it by the name of trois-cinque; that is, Brandy conſiſting of five parts alcohol, and three parts phlegm.

Higher than this the brewers, or common diſtillers, in France, ſeldom bring their Brandies; that refined nation having the addreſs to perſuade the foreign merchants that the phlegm of French Brandy is a natural part, as eſſential to it as the body to the ſoul. The truth is, if people were ſo diſpoſed, they might eaſily reduce French Brandies, or the Brandies of any other nations, to half their uſual bulk, without impairing their virtues: for, if the eſſential oil of the wine be the thing required, this is much better preſerved in alcohol than in proof ſpirit. But whether the charge of bringing Brandies into alcohol would exceed that of a double freight, and double ſtowage, is the merchant's buſineſs to conſider; or whether it be not proportionably as advantageous to import low wines as Brandies, which, with reſpect to alcohol, are nothing but a ſtronger low wine.

They uſe no manner of art to colour their Brandies, nor to give them any additional flavour; the thing they principally value themſelves upon, both in wines and Brandies, being to make them perfectly natural; ſo that all the colour of their Brandies is acquired from the caſk, and the length of time they uſually lie therein; which is ſometimes twelve or eighteen months, and often two or three years; during which, it is no wonder if they acquire a yellow or browniſh caſt. Their lying thus long, as it were in a ſtate of ſlow digeſtion, wonderfully takes off from that hot, acrid, and foul taſte, peculiar to all ſpirits or Brandies newly diſtilled; and gives them a coolneſs and ſoftneſs not eaſily to be introduced by art, without great care being had in the firſt operation. But theſe fine and grateful Brandies, as they prove after having lain thus long, were at firſt hot, acrid, foul, and fiery. This fine colour, and an agreeable ſoftneſs or coolneſs in the mouth, going along with French Brandies of a good natural flavour, are the things that principally recommend them to the judicious purchaſer.

And upon theſe properties are founded ſeveral methods of trying their goodneſs, or diſcovering whether they are debaſed or adulterated by the admixture of coarſer ſpirits. But there is little danger of any ſuch practice in France, as they have no cheaper ſpirits to debaſe or adulterate their Brandies withal, eſpecially ſince the prohibition of melaſſes ſpirits in that country: and the ſame reaſon, in good meaſure, holds in favour of the Dutch, who, though generally ſuſpected as great adulterators, yet, in this caſe, ſeem but little qualified for it, as, having no treacle ſpirit, and their malt ſpirit they deſpair of rectifying, it being ſo intolerably fœtid and nauſeous, that almoſt a ſingle gallon would taſte through a whole piece of Brandy: all, therefore, that the Dutch ſeem fitted to do in this caſe, is to mix Brandies with wine ſpirits, or the ſpirit drawn from wine lees, which they have in very great plenty. But even this cannot be very gainful, conſidering how cheap the Brandies are in Holland; for, paying no duty, they come almoſt as cheap there as in France itſelf. The temptation to adulterate French Brandies is much greater in England, where the duties upon them are high; though they are alſo very much adulterated up and down the continent, and all conſiderable trading towns and ſea-ports. In England, it has been above obſerved, they uſe all kinds of ſpirits to mix with them; malt, melaſſes, cyder, ſugar-ſpirit, &c. and often do it ſo dexterouſly, or ſo ſparingly, as vulgarly to paſs undiſcovered. The ſame arts are likewiſe practiſed in many other countries: but certain brokers, factors, and under merchants, who deal largely in Brandies, are ſaid to have a particular liquor, which, being added to a glaſs of any ſuſpected Brandy, will ſhew, by the colour it makes therewith, whether, and in what proportion, the whole parcel is mixed with a corn ſpirit. But ſuch proof is erroneous, and not to be truſted. The fact is this: if a few drops of a certain vitriolic ſolution be let fall into a glaſs of old French Brandy, it will, if the vitriolic ſolution were rightly prepared, turn the Brandy of a fine purple, or deep violet colour; by the ſtrength or diluteneſs of which colour, they judge the Brandy to be either pure, or mixed with a malt ſpirit, proportionably. The foundation of the thing lies here: old French Brandy, by having long lain in an oaken caſk, thus really becomes a dilute tincture of oak, which, upon the addition of the vitriolic ſolution, neceſſarily turns of a blue colour, after the manner that ink is made of a tincture of galls and vitriol. But if the Brandy be perfectly pale, or very lately diſtilled, it will not thus change its colour, upon the addition of the ſolution, though the Brandy were totally French. And in the ſame manner a light tincture of oak, extracted with a malt ſpirit, or any other ſpirit, will, upon affuſion of the ſame ſolution, exhibit the ſame appearance. Hence this kind of proof is nothing more than a way of determining how rich a tincture of oak any common ſpirit or Brandy is. Calcined vitriol of iron, lightly infuſed

In a certain dilute, or aqueous mineral acid, gives this ſolution to great perfection; being, when well made, of a fine yellow colour, and capable of giving, for a ſeaſon, the fineſt blue to a ſpirituous tincture of oak. And here it may not be amiſs to mention, that the experiments I formerly made of this kind led me, at the firſt ſight of Dr. Eaton's ſtyptic, to conjecture the manner of its preparation; which, upon a ſecond attempt, I hit to great exactneſs. I ſhould not mention ſo ſmall a matter, if the diſcovery of that famed ſtyptic had not been ſomewhat unſucceſsfully attempted by others; ſo far, I mean, as concerns the appearance and phænomena, though not, perhaps, the virtues of it. The whole ſecret is this: to a parcel of old French Brandy add a very minute proportion of calcined green vitriol; and thus there will preſently be made a dilute ink, which very ſlowly depoſits a black or duſky cloud, that afterwards reſts at the bottom of the glaſs, and cauſes the liquor to exhibit all the phænomena, and anſwer the ends of Dr. Eaton's ſtyptic.

To proceed, it is manifeſt that the French Brandies naturally receive their colours from the caſk. The diſcovery of which particular might probably be the reaſon why high-coloured Brandies have of late years ſunk in the eſteem of many, ſo as to occaſion pale ones to be much ordered; and, for a while, nothing would go down but pale Brandies. Hence, both in France and Holland, they fell to work upon rediſtilling their old Brandies, to make them of a water whiteneſs. And to ſuch a length this humour ran, and the difference in price between pale and brown Brandies grew ſo conſiderable, that much profit was made in Holland, barely by the re-diſtillation of Brandies, to render them colourleſs. This alſo made very well for France, who had much rather diſpoſe of her new colourleſs Brandies, for an advanced price, than for a lower, after having kept them in a waſting ſtate, to colour them, many months in the caſk: which colour, where not artificially introduced, is a ſure ſign of age, that is, excellence, on the ſide of Brandy.

The vulgar method of examining Brandies by the bead-proof may be of good ſervice, in procuring ſuch as will beſt ſerve to mix with, and conceal an ordinary ſpirit; as this proof, when ſtrong, ſhews they contain a good deal of the eſſential oil of the grape, which gives an agreeable flavour. But, when intended for other curious or chemical uſes, as much labour is often employed to get out this fine-taſted eſſential oil in France, as the more curious chemiſts employ to get the fœtid oil out of malt ſpirits in England: and, indeed, there are many operations where the nidorous odour of either ſpirit would be very unſuitable, nor is it often proper to uſe a menſtruum to act upon one body, whilſt it is already ſaturated with another. But no judgment can by this kind of proof be formed of Brandies, as to their mixed or adulterated ſtate.

The ſureſt way, for this purpoſe, is, to acquire the habit of judging from uſe and practice. The taſte and ſmell, by proper methods, are ſo far improveable in this particular, as not to be eaſily impoſed upon. Care indeed muſt be had, not to taſte Brandies in too high a ſtate; for this ſcorches the mouth, and confounds the judgment. Nor ſhould many ſorts be taſted ſoon after one another: for thus a mixture of taſtes will be made, the taſte of the preceding being not yet gone off the tongue.

The beſt method is to dilute Brandies well with water, in order to their being ſmelt and taſted; or rather, to burn away all their inflammable ſpirit, and afterwards examine the phlegm.

From this hiſtory of French Brandies, compared with the doctrine of ſimple diſtillation and rectification, it will appear, that many of our Engliſh ſpirits are convertible into Brandies, that ſhall hardly be diſtinguiſhed from the foreign, in many reſpects, provided this operation be neatly performed. And, in particular, how far a cyder ſpirit, and a crab ſpirit, may, even from the firſt extraction, be made to reſemble the fine and thin Brandies of France, we would recommend to the practice of thoſe diſtillers, who have any ſkill and curioſity this way.

To the ſame curious perſons we would alſo recommend the diſcovery of that deſideratum, in the buſineſs of rectifying French Brandies, which the diſtillers in France and Holland ſcarce know how to attempt, though it would be a profitable buſineſs in either country. By this rectification is meant the method of clearing Brandies from a certain ſeedy taſte, with which they are frequently impregnated; and, upon which account, they cannot find purchaſers, but upon diſadvantageous terms. Thus ſometimes a caſk of French Brandy ſhall reſemble aniſeed, or caraway-water, rather than Brandy; ſo that the proprietor, to get it off, is reduced to the neceſſity of mixing it among other Brandies, in ſuch ſmall proportions as may render it undiſcoverable: whereas, could he but clear it of this flavour, he might readily be reimburſed, with a handſome profit.

The foundation for this kind of rectification is ſo fully laid under the article RECTIFICATION, that our Engliſh diſtillers, it is hoped, may, from thence, be enabled to effect the thing.

It is a miſtake to imagine, that all the Brandies made in France are ſo good and fine, as we uſually taſte them upon our keys at London. No; there are many hundreds of pieces made, every year, almoſt as diſagreeable and nauſeous as our malt ſpirit. But the caſe is, they ſend the beſt Brandies, as they do their beſt wines, to England, where they get the beſt prices for them. But in Holland, the mart for goods of all ſorts, you ſhall ſometimes not be able to pick a good piece of French Brandy out of fifty: the general run of them being either ſeedy, oily, muſty, or otherwiſe infeſted with ſome unnatural and diſagreeable flavour. And theſe are the ſorts which, in France, they deſpair of curing by re-diſtillation, or bringing towards the ſtate of alcohol, or to what they call three fifths.

Theſe caſes require a better method of rectification, than our common one by fixed alkalies: but if due care and ſkill were employed from the firſt gathering of the grapes, to the making up of the Brandies; not only ſuch inconveniencies might be prevented, but the Brandies of France might be rendered much finer.

Some prefer Rheniſh Brandy to that of France; and, particularly in Holland, it ſells for double the price. It is indeed a very fine ſpirit; but the Engliſh know little of it farther, than that a daſh thereof ſerves to fill up a caſk of French.

The Spaniſh Brandies are much coarſer than the French, though ſometimes made to paſs for them in Holland, and other places of great traffic. *Shaw's Eſſay on Diſtil.*

The ſtill-bottoms of French Brandy are uſeful to all the purpoſes above-mentioned of the ſtill-bottoms of wine-ſpirit.

BRASS (*Dict.*)—The calamine does not enter the copper under its earthy ſtate, but is firſt converted by the phlogiſton into the form of a metal: Kunkel, it is true, imagined that only the mercurial part of the calamine was added to the copper, without any of the ſulphur; but this opinion later chemiſts ſeem to have ſufficiently refuted. *Vid. Junk, Conſp. Chem.*

Braſs may be cleanſed, firſt, by rubbing it with a cloth dipped in equal quantities of aqua-fortis and common water; then with an oily cloth, and laſtly with a dry one dipped in lapis calaminaris.

Braſs is tinged of a gold colour, firſt, by burning, then diſſolving it in aqua-fortis, and, laſtly, reducing it to its metalline ſtate. It may be whitened by heating it red-hot, and quenching it in water diſtilled from ſal armoniac and egg-ſhells. It is ſilvered, or coloured ſuperficially white, by rubbing it with balls made of ſilver diſſolved in aqua-fortis, with powder of white tartar, ſufficient to abſorb all the moiſture thereof.

Brass, in the glaſs trade. Thrice calcined Braſs is a preparation which ſerves the glaſſmen to give many beautiful colours to their metal. The manner of preparing it is this: place thin plates of Braſs on tiles on the leer of the furnace near the occhio; let it ſtand to be calcined there for four days, and it will become a black powder, ſticking together in lumps. Powder this, and ſift it fine, and recalcine it four or five days more; it will then not ſtick together, but remain a looſe powder, of a ruſſet colour. This is to be calcined a third time, in the ſame manner: but great care muſt be taken, in the third calcination, that it be not over done, nor under done; the way to be certain of making it right, is to try it ſeveral times in glaſs while melting. If it makes it, when well purified, to ſwell, boil, and riſe, it is properly calcined; if not, it requires longer time. This makes, according to the different proportions in which it is uſed, a ſea green, an emerald green, or a turquoiſe colour. *Neri's Art of Glaſs, p. 42.*

Braſs, by a long calcination alone, and without any mixture, affords a fine blue or green colour for glaſs; but they have a method of calcining it alſo with powdered brimſtone, ſo as to make it afford a red, a yellow, or a chalcedony colour, according to the quantity and other variations in the uſing it; the method of making the calcination is this: cut thin plates of Braſs into ſmall pieces with ſheers, and lay them ſtratum ſuper ſtratum, with alternate beds of powdered ſulphur, in a crucible; calcine this twenty-four hours in a ſtrong fire, then powder and ſift the whole; and, finally, expoſe this powder upon tiles, for twelve days, to a reverberating furnace; at the end of this time, powder it fine, and keep it for uſe. *Neri's Art of Glaſs, p. 37.*

The glaſs-makers have alſo a method of procuring a red powder from Braſs, by a more ſimple calcination, which ſerves them for many colours. The method of preparing it is this: they put ſmall and thin plates of Braſs into the arches of the glaſs furnaces, and leave them there till they are ſufficiently calcined, which the heat in that place, not being enough to melt them, does in great perfection. The calcined matter, powdered, is of a duſky red, and requires no further preparation. *Neri's Art of Glaſs, p. 41.*

Braſs is uſed to make great guns: ſome reckon the beſt method is to put, into the quantity of eleven or twelve thouſand weight of metal, ten thouſand of roſe copper, nine hundred pounds of tin, and ſix hundred of Braſs.

But Mr. Chandler obſerves, that the beſt Braſs guns are not made with pure copper and calaminaris, but that coarſer metals muſt be mixed therewith, as lead and pot metal, to make it run cloſe and ſounder. See FOUNDERY.

What they call Braſs wire, or Braſs in hoops, is Braſs drawn through the wire-drawing iron.

For making the fineſt ſtatues of Braſs, the proportion is one half of copper, and one half of Braſs. The Egyptians, whom ſome think the inventers of this art, uſed to put two thirds of Braſs to one third of copper: roſe copper is not ſo proper for caſting ſtatues as that which is hammered.

In common Braſs the allay is made with tin, and even with lead, when people would be ſaving. But the latter ought not to be uſed in Braſs deſigned for ſtatues. For Braſs guns, they put ten or twelve pounds of tin to a hundred of Braſs. For bells, they put twenty or twenty-four pounds of tin to the ſame weight of copper, to which they add two pounds of antimony, to render the ſound more ſoft; and they put but three or four pounds for kitchen furniture.

Corinthian Braſs has been famous in all antiquity. L. Mummius having ſacked and burnt the city of Corinth, in the 158th Olympiad, or 146 years before Chriſt, it is pretended, that this precious metal was formed from the immenſe quantity of gold, ſilver, and copper with which that city abounded, which, being all melted and mixed together by the fierceneſs of the fire, compoſed as it were a new metal. The ſtatues and veſſels which were afterwards made of it, by excellent artiſts, were eſteemed of great value: and, though it is commonly the ſculptor's hand, which enhances the price of thoſe pieces of workmanſhip, yet, on this occaſion, the matter ſeemed to vie with, or even to excel above the ordinary perfection of art.

They who have given an accurate account of this metal, diſtinguiſh three ſorts of it; in one gold was predominant, in the next ſilver, and in the laſt gold, ſilver, and copper were in equal parts. It is very probable, that what was formerly owing to chance, might at preſent be imitated by art: but, as moſt things are valued on account of their ſcarcity, it is but too true, that the eaſe with which an artiſt might now make ſuch Braſs, would render it leſs valuable, how like ſoever it might be to that of Corinth.

Braſs is alſo a colour prepared by the braziers and colourmen to imitate Braſs. There are two ſorts of it; the red Braſs, or bronze, as the French call it, and the yellow or gilt Braſs. The latter is made only of copper filings, the ſmalleſt and brigheſt that can be found; with the former, they mix ſome red ocre finely pulverized. They are both uſed with varniſh. In order to make a fine Braſs, that will not take any ruſt or verdigriſe, it muſt be dried with a chafing-diſh of coals, as ſoon as it is applied.

The fineſt Braſs colour is made with powder-Braſs, imported from Germany, diluted into a varniſh, made and uſed after the following manner: the varniſh is compoſed of one pound and four ounces of ſpirit of wine, two ounces of gum-lac, and two ounces of ſandarac: theſe two laſt drugs are pulverized ſeparately, and afterwards put to diſſolve in ſpirits of wine, taking care to fill the bottle but half full, otherwiſe it would burſt; in all proceſſes, in which ſpirit of wine is made to act by means of fire, the veſſels muſt be exactly ſtopped with a hog's bladder, and but half full. The varniſh being made, you mix ſuch quantities as you pleaſe of it, with the pulverized Braſs, and apply it with a ſmall bruſh to what you would Braſs over. But you muſt not mix too much at once, becauſe, the varniſh being very apt to dry, you would not have time to employ it all ſoon enough; it is therefore better to make the mixture at ſeveral times. After this manner they Braſs over figures of plaiſter, which look as well as if they were of caſt Braſs.

Brass *Lumps*, in minerology, a common name given by the miners and diggers of coal, &c. to the globular pyrites. This ſtone, when kept in the air, often ſends forth its effloreſcences of ſalt, in the form of ſmall and ſlender fibres, perfectly tranſparent, and ſometimes of near an inch long. The place where theſe ſtones are expoſed to the air, will greatly alter the figures and colours of their effloreſcences; if they are laid in a cellar, the ſhoots will be ſhorter, and green, like the common copperas; and, if laid in the way of the ſun-ſhine, they will be white and duſty.

Both are the ſame ſalt, which is true green vitriol or copperas, and both will, in the ſame manner, turn a decoction of galls into ink. The white ſalt is only the green powdered and calcined by the ſun's heat. The figure of the fibres of theſe effloreſcences is not eaſy to be determined; ſometimes they ſeem round, ſometimes angular. Theſe, however, are the natural figures of the ſalts of theſe ſtones; and the other ſhoots into which they form themſelves after ſolution, and bringing them together in a body by water, are rather their accidental forms, though, under a like courſe of accidents, they generally appear the ſame. *Philoſ. Tranſ.* N°. 110.

BRAWN, in the culinary art, ſignifies the fleſh of a boar, boned, rolled up, or collared, boiled, and, laſtly, pickled for a winter's cate.

Brawn is made only of the flitches, without the legs; the oldeſt boars are choſen for this uſe, it being a rule that, the older the boar, the more horny the Brawn.

There is alſo Brawn of pig, which is made by ſcalding, drawing, and bonding the beaſt whole, except the head; then cutting it into two collars, ſoaking it in brine, ſeaſoning, rolling, putting it into a cloth, binding it up, boiling it, and, when boiled, hooping it up in a frame. *Ruſt. Dict. T.* 1. *in voc.*

BRAZEN *Age*, *ſeculum æreum*, is uſed by the poets to expreſs the third age of the world.

What Heſiod and the Greeks called the Brazen, the northern nations call the rocky or ſtony age. *Phil. Tranſ.* N°. 301.

Brazen Dish, among miners, is the ſtandard by which the other diſhes are gauged, and is kept in the king's hall. *Hought. Compl. Miner.*

BRA'ZIER, an artificer who makes and ſells pans, pots, kettles, and other kitchen utenſils and braſs ware.

The implements uſed by Braziers are, a forge, wherein they burn only charcoal to heat their metal: a twibil wherewith to hold their work to the fire; divers ſorts of anvils and hammers, wherewith to beat; alſo pans, ladles, ſheers, and punches of divers ſorts, ſoldering irons, borax box, lath for turnings, &c. See BRAZING *in the Dict.*

BRAZIL-WOOD (*Dict.*)—It is differently ſurnamed, according to the ſeveral places from which it is imported: thus there is the Brazil-wood of Fernambuco, or Pernambuco; the Brazil-wood of Japan, that of Lamon, that of Santa Martha, and laſtly the braſilet, which is eſteemed the worſt. This laſt comes from the Antilles iſlands.

The Brazil-wood of Japan is otherwiſe called ſapan: there is the large and the ſmall: the large is ſimply called ſapan, and the ſmall ſapan bimaïs.

The tree of the Brazil-wood grows commonly in dry barren places, among rocks. It becomes very thick and tall, and puſhes out long branches, whoſe twigs are furniſhed with a vaſt quantity of ſmall leaves, half round, of a fine bright green, pretty much like thoſe of box, but longer, hard, dry, and brittle. Its trunk is ſeldom ſtraight, but crooked and knotty, almoſt like the hawthorn. There come, twice a year, at the extremity of the branches, and between the leaves, ſmall bunches of flowers, which are ſomewhat long, pretty much like thoſe of the lilly of the valley, of a bright red, and an agreeable aromatic ſmell, very comfortable to the brain, which they ſtrengthen: theſe are ſucceeded by a flat red fruit, which contains two ſmall flat ſeeds, of a moſt lively red; theſe ſeeds are a kind of almonds, of the form of a pumkin ſeed.

Though the trunk of this tree be very thick, yet it is covered with ſo groſs a bark, that, when the ſavages have taken it off from the wood, a trunk, which before was as thick as a man's body, remains, as it were, a log not bigger than his leg.

The Brazil-wood is very heavy, very dry, and very hard; it crackles very much in the fire, and emits hardly any ſmoke, becauſe of its exceſs in dryneſs.

None of theſe different ſorts of Brazil-woods have any pith, except that of Japan: that of Fernambuco is reckoned the beſt. It muſt be choſen in thick pieces or logs, heavy, compact, very ſound, without any part of the inner bark upon it, and without the leaſt rottenneſs, and ſuch, as after ſplitting it, from pale becomes reddiſh; and that, being chewed, it has a ſweetiſh taſte like ſugar.

This wood is proper for turner's work, and takes a good poliſh: but its chief uſe is for dying, where it ſerves for a red colour. However, by the regulations made in France, the dyers of rich and valuable ſtuffs are forbidden to uſe it, becauſe it yields but a ſpurious colour, which fades very ſoon; yet the dyers of inferior ſtuffs are ſuffered to uſe it, though it is ſubject to very great inconveniences.

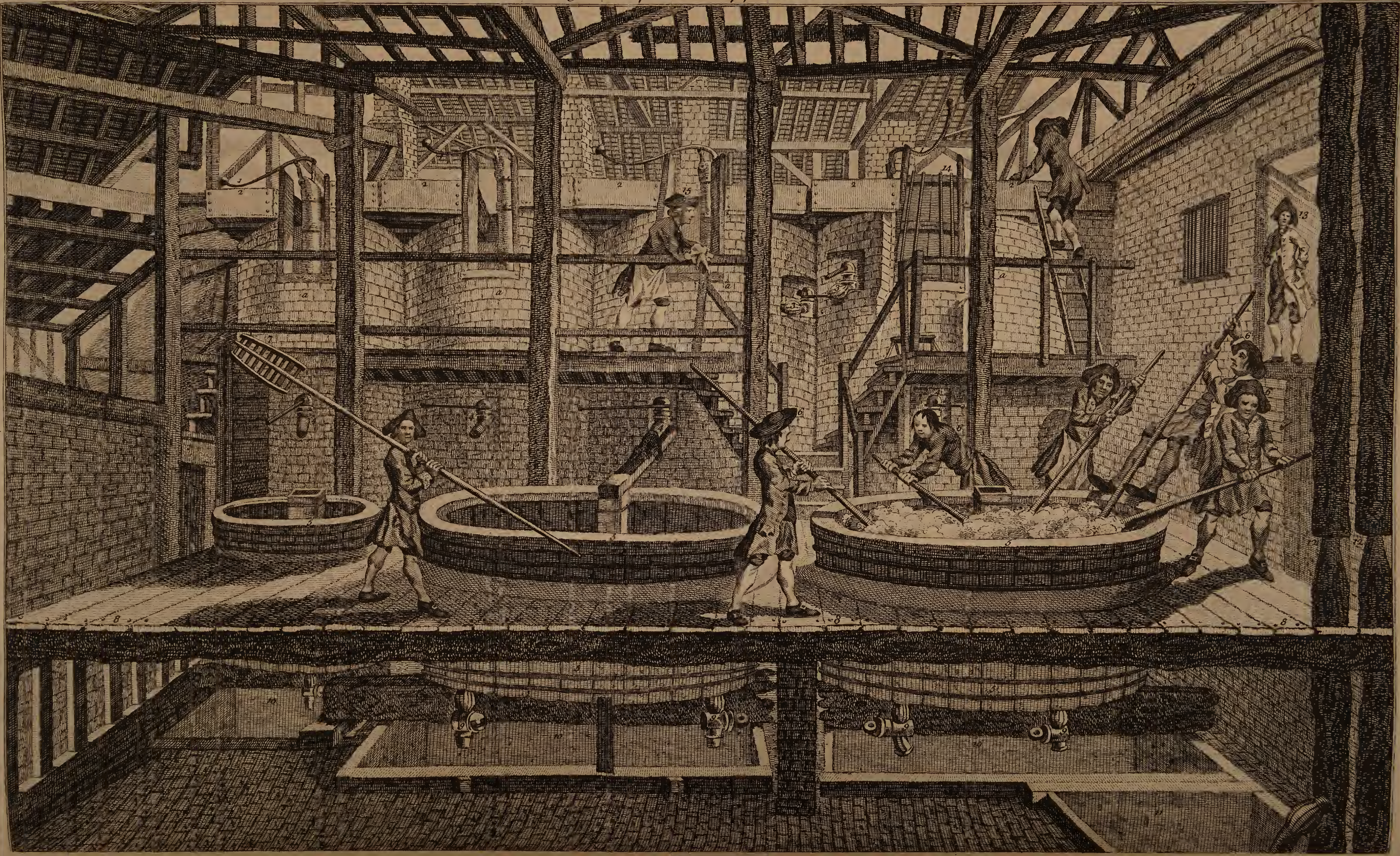
From the Brazil-wood of Fernambuco, they extract, by means of acids, a kind of carmine: they alſo make of it a liquid lacca for painting in miniature. And, with a tincture of this wood often repeated, they make that reddiſh chalk, which is called roſetta; but it is nothing but the white of Roan, to which the Brazil-wood gives the colour of an amaranthus.

BREAD.—Among us, Bread is chiefly divided into white, wheaten, and houſhold; differing only in degrees of purity. In the firſt, all the bran is ſeparated; in the ſecond, only the coarſer; in the third, none at all: ſo that fine Bread is made only of flour; wheaten Bread, of flour, with a mixture of fine bran; and houſhold, of the whole ſubſtance of the grain, without taking out either the coarſe bran, or fine flour.

We alſo meet with ſymnel Bread, manchet or roll Bread, and French Bread; which are only ſo many denominations of the fineſt or whiteſt Bread, made of the pureſt flour; except that in roll Bread there is an addition of milk, and, in French Bread, of eggs and butter alſo. To which may be added, ginger Bread, made of white Bread, with almonds, liquorice, aniſeed, roſe water, and ſugar; and maſliſi Bread, panis mixtus, made of wheat and rye, or ſometimes of wheat and barley.

For armies the Bread is either baked in the park of proviſions in the camp, or in the town neareſt the army; for the conveniency of ovens, an army ought always to have at leaſt four days Bread before-hand. In ſome caſes, the diſtance of the places, from whence Bread is to be had, or the army's march from one country to another, obliges the general to diſtribute for ſix or even for eight days; a thing never done

PLATE VII. *Engraved for the Supplement.* *Facing* Brew-houſe.



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without abſolute neceſſity, by reaſon of the abuſe which ſome ſoldiers make of it, who ſell their Bread without regard to future ſubſiſtance. For long marches through an enemy's country, they ſometimes make biſket inſtead of Bread.

Horſe Bread is made of wheat, oats, and beans; to which ſometimes are added aniſeed, gentian, liquorice, fenugrec, eggs and ale; and ſometimes rye and white wine are uſed.

For race-horſes, three ſorts of Bread are uſually given with ſucceſs, for the ſecond, third, and fourth fortnights feeding; they are all made of beans and wheat, worked with barm; the difference conſiſting chiefly in the proportion of the two former. In the firſt kind, three times the quantity of beans is uſed to one of wheat; in the ſecond, equal quantities of both; in the third, three times the quantity of wheat to one of beans.

The proceſs of making houſhold Bread, amongſt us, is thus: to a peck of meal they add a handful of ſalt, a pint of yeaſt, and three quarts of water, cold in ſummer, hot in winter, and temperate between the two; the whole, being kneaded in a bowl or trough by the fire in winter, from it in ſummer, will riſe in about an hour; they then mould it into loaves, and put it into the oven to bake. *Hought. Collect.*

For leavened Bread, part of the flour intended for it, being made into dough with warm water and a little ſalt, is laid in the reſt of the flour an hour or more, in which time it riſes to three times the bulk; then they mix and knead the whole with more water, till it be brought into a ſtiff dough; which, being formed into loaves, is baked in the oven: though the more uſual way is to take a piece of dough kneaded, and leave it in the tub till next time, when they break it ſmall, and mix it with the meal, adding ſome yeaſt. *Hought. Collect.*

For French Bread, they take half a buſhel of fine flour, ten eggs, and a pound and a half of freſh butter, into which they put as much yeaſt, with manchet; and, tempering the whole maſs with new milk, pretty hot, let it lie half an hour to riſe; which done, they make it into loaves or rolls, and waſh it over with an egg beaten with milk: care is taken the oven be not too hot. *Ruſt. Dict.*

BREAM, *brama,* in ichthyology, a river fiſh of the leather-mouthed kind, eſteemed a ſpecies of carp, and called by the generality of authors cyprinus latus.

It is a very broad and thin fiſh; the head is ſmall, the back of it broad and flat, and the back riſing from the head and tail toward the middle, like that of a hog; the ſide lines are turned into a ſort of arched figures near their origin at the gills, and run much nearer the belly than the back. When the fiſh is full grown, its ſides are of a yellowiſh hue, and its belly reddiſh; the ſcales are large, and ſtriated downwards; the mouth is very ſmall for the ſize of the fiſh, and has no teeth. It lives in ponds, and rivers of ſlow current, and ſometimes grows to more than two feet in length, and is not accounted a delicate fiſh. *Willughby, Hiſt. Piſc. Geſner de Piſc.*

This is but a coarſe fiſh for the table, but it affords great ſport to the angler. The method of taking it is this: procure about a quart of large worms, put them into ſome freſh moſs, well waſhed and dried; let this be changed every three days, and let then be put, at the bottom of the veſſel, ſome good black mould, with ſome fennel chopped ſmall amongſt it. This will clean them perfectly; and, in about three weeks, they will be fit for uſe. The lines muſt be ſilk alone, or ſilk and hair, and the floats large gooſe or ſwans quills; a plummet muſt be prepared of a piece of lead, of the ſhape of a pear, with a ring at the ſmall end; the lead muſt be faſtened to the line, and the line hook to the lead; about ten or twelve inches ſpace will be enough between the lead and the hook; and the lead muſt be heavy enough to ſink the float. The hook to be baited with a ſtrong and vigorous worm, which will draw it up and down at the bottom, and provoke the Bream to bite more greedily. It will be beſt to fit up three or four rods in this manner, and ſet them all at once. Find the exact depth of the water, if poſſible, that the float may juſt lie even with the ſurface, directly over the lead; then provide the following ground bait.

Take a peck of ſweet groſs ground malt, boil it a little, ſtrain it through a bag, and take it to the water ſide; throw in this malt by handfuls, ſqueezed hard together, that the water may not ſeparate it before it gets to the bottom; it ſhould be thrown in about a yard above the place where the hook is to be. This is to be done about nine o'clock at night, and, about three in the morning, go again to the place, approaching cautiouſly, ſo as to keep out of ſight of any fiſh that may be at the top of the water, while the reſt are feeding at the bottom; then throw in the line, with the hook nicely baited, and the others at about a yard diſtance above and below the firſt, and one another; let the rods lie on the ground, and, when one is taken, there is no occaſion to run up haſtily; but the fiſh may be left to tire himſelf a little, and then be taken up.

BREAST-PLATE, in the manage, denotes a leathern ſtrap running from one ſide of the ſaddle, croſs the horſe's breaſt, to the other; intended to keep the ſaddle from ſlipping backwards, in mounting up riſing grounds. It is otherwiſe called tee; ſometimes the poitrail.

BREAST-PLATE, among artificers, denotes a drill plate, againſt which to ſet the blunted end of the drill. *Moxon's Mechan. Exerciſes.*

BREEDING *of fiſh.* The neceſſary qualities for a pond, in order to its ſerving well for the Breeding of fiſh, are very different from thoſe which are to make it ſerve for feeding them; inſomuch that ſome particular ponds ſerve only for one of theſe uſes, and others for the other; and ſcarce ever the ſame pond is found to ſerve for both. In general, it is much more rare to find a good Breeding pond than a good feeding one. The beſt indications for a Breeding pond are theſe: that there be a good quantity of ruſhes and graſs about its ſides, with gravelly ſhoals, ſuch as horſe-ponds uſually have: when a pond has this property, and takes to the Breeding of fiſh, it is amazing what a progreſs will be made in a little time. The ſpawn of fiſh is prodigious in quantity, and, where it ſucceeds, one is able to produce many millions: thus, in one of theſe Breeding ponds, two or three melters, and as many ſpawners, will, in a very little time, ſtock the whole country. When theſe ponds are not meant intirely for Breeding, but the owner would have the fiſh grow to ſome ſize in them, the method is to thin the numbers, becauſe they otherwiſe ſtarve one another, and to put in other fiſh that will prey upon the young, and then devour them in the quickeſt manner. Eels and pearch are the moſt uſeful on this account; for they prey not only upon the ſpawn itſelf, but on the young fry, from the firſt hatching to the time that they are of a conſiderable ſize. Some fiſh are obſerved to breed indifferently in all ſorts of waters, and that in conſiderable plenty; of this nature are the roach, pike, and pearch. See the article FISH.

BRENTA, in zoology, the name of a fowl of the gooſe-kind, known among us by that of the brent-gooſe, and, by ſome, ſuppoſed to differ from the barnacle no other way than in ſex; but this is erroneous. It is ſomewhat larger than the barnacle, and is longer-bodied; the head, neck, and upper part of the breaſt, are black; the neck, however, is ornamented on each ſide with a ſort of chain of white. Its back is of a browniſh grey, but ſomewhat blackiſh towards the tail; the feathers immediately over the tail are white; it is white alſo on the belly, and of a browniſh grey on the breaſt. *Ray's Ornith.* See *Plate* IV. *fig.* 34.

BRETESSE, in heraldry, a term uſed to expreſs a line in ſome coat of arms, of the ſame nature with what is uſually called the crenelle, or embattled line; except that this laſt is only embattled on one ſide, and the Breteſſe or crenelle on both ſides. Some authors ſeem, however, to have underſtood the terms Breteſſe and crenelle as ſynonymous words, and, when they would expreſs ſuch a line, they call it, if embattled on both ſides, contre-Breteſſe. *Niſbet's Heraldry.*

BREW-HOUSE, a building adapted to the brewing, &c. of malt liquors.

In order to erect a large or public Brew-houſe to the beſt advantage, ſeveral circumſtances ſhould be carefully obſerved. 1. That three ſides in four, of the upper part, or ſecond floor, be built with wooden battons about three inches broad, and two thick, that a ſufficient quantity of air may be admitted to the backs or coolers. 2. That the coppers be erected of a proper height above the maſhing-ſtage, that the hot water may be conveyed by means of cocks into the maſh-tuns, and the worts into the coolers. 3. That the fire-places of the coppers be very near each other, that one ſtoker, or perſon who looks after the fire, may attend all. 4. That the yard for coals be as near as poſſible to the fire-places of the copper. 5. That the malt be ground near the maſh-tuns, and the mill erected high enough that the malt may be conveyed from the mill immediately into the maſh-tuns by means of a ſquare wooden ſpout or gutter. 6. That the upper backs be not erected above thirty-three feet above the reſervoir of water, that being the greateſt height water can be raiſed by means of a common ſingle pump. 7. That the pumps which raiſe the water or liquor, as the brewers call it, out of the reſervoir into the water-backs, and alſo thoſe which raiſe the worts out of the jack-back into the coppers, be placed ſo that they may be worked by the horſe-mill, which grinds the malt.

Explanation of *Plate* VII. being a ſection of that part of a large Brewhouſe, which contains the coppers, maſh-tuns, &c.

a a a a, the coppers.

1 1 1 1, copper-pumps, which throw the wort out of the coppers into the boiling-backs.

2 2 2 2, boiling-backs.

3 3, cocks to ſupply the coppers with water.

4 4 4 4, cocks which convey the water out of the coppers into the maſh-tuns. The water is carried from theſe cocks through a wooden trunk to the bottom of the maſh-tun, above which is a falſe bottom full of ſmall holes, through which the water riſes and wets the malt in the maſh-tun.

5 5 5, maſh-tuns.

6 6 6 6 6, men maſhing, or ſtirring with utenſils, called oars, the malt and water in the maſh-tun.

7, an utenſil called an oar, uſed in maſhing.

8 8 8, the maſhing-ſtage, or floor on which the maſh-tuns are placed.

9, 9 9, 9, Cocks for letting the wort, or, as brewers call it, the goods, out of the maſh-tuns, into the under backs.

10, 10, 10, Under backs, which receive the goods from the maſh-tuns.

11, The jack-back. This back is placed ſomething lower than the under backs, and has a communication with them all; and out of this back the wort is pumped into the coppers.

12, 12, Two wort-pumps, by which the wort is pumped out of the jack-back into the coppers. Theſe pumps, as well as thoſe which raiſe the water from the reſervoir into the upper backs, and which could not be ſhewn in the figure, are worked by the horſe-mill which grinds the malt.

13, The miller, or perſon who grinds the malt.

14, A boiling-curb. Its uſe is to prevent the wort from boiling over the copper.

15, The maſter-brewer.

16, A gutter for conveying the wort out of the wort-backs into the cooling-backs.

17, Pipes which carry the wort from the wort-pumps into the coppers.

BRE'WING (*Dict.*)—*Method of* Brewing *Butt-beer*, or *Porter*. When the water juſt breaks or boils, they let in a quantity of cold to keep it from ſcalding, which they let run off by a great braſs-cock down a wooden trunk, fixed to the ſide of the maſh-tun, and up through a falſe bottom into the malt: then maſh with wooden oars half an hour; by this time the water in the copper is ſcalding hot, which they likewiſe let run into the malt, and maſh half an hour longer. This they cap and cover with freſh malt, and let it ſtand two hours; then ſpend away by a cock-ſtream into the under back, where it lies a little while until a ſecond liquor is ready to boil, but not boil, with which they maſh again to have a ſufficient length of wort that they boil at once, or twice, according to the bigneſs of their utenſils. Others will make a third maſh, and boil a ſecond copper of wort. The firſt wort is allowed an hour and a half's boiling with three pounds of hops to each barrel. The ſecond wort two hours with the ſame hops, and ſo on. Some calling the firſt hop-wort; the ſecond, maſh-wort; the third, neighbour-wort, and the fourth, blue. Which laſt, being a moſt ſmall ſort, is ſometimes allowed ſix or ſeven hours boiling with the ſame uſed hops. When in a right temper, they let down the worts out of the backs into the tun from their groſſer contents, where they cooly ferment it with yeaſt, till a fine curled head riſes and juſt falls again, which ſometimes requires twenty-four, ſometimes forty-eight hours, as the weather is hot or cold to perform this operation. Then they cleanſe it off into barrels.

Uſes of ſap in Brewing.—The ſap or juice of trees not only improves malt liquor, but renders it much cheaper. The ſycamore is the beſt tree for tapping for this purpoſe; it yields a great quantity, and that without any other trouble than boring a hole properly, and placing a veſſel under it. One buſhel of malt brewed with this juice will make as good beer as four buſhels in the ordinary way. The beſt way of procuring the ſap is this: take a large augre, and with it bore two holes on the oppoſite ſides of the tree, each ſo deep as to the pith. Each hole is to be bored ſloping upwards, and the beſt place for it is immediately under a large arm of the tree near the ground; and, if the arm be pierced through with the augre in the way to the tree, it will be ſo much the better: in this manner, there needs no ſpiggot or ſtone to keep open the hole, or to direct the courſe of the liquor, for it will of itſelf run down into a veſſel placed to receive it; and one tree will thus, in a few days, yield a ſufficient quantity of liquor to brew with.

In order to preſerve the ſap in a proper condition for Brewing, what is firſt gathered muſt be inſolated by a conſtant expoſition of it to the ſun, in proper glaſſes, till the reſt be obtained; otherwiſe the firſt will contract an acidity that will ſpoil it. When a ſufficient quantity of the ſap is thus collected, as much rye-bread muſt be put into it, cut thin and well toaſted, but not burnt, as will ſerve to ferment it; when it works well, the bread is to be taken out, and, at a convenient time, it is to be bottled up, and will thus afford a pleaſant liquor, of conſiderable ſtrength, without malt or any other addition. Some people add ſage to this liquor, baking it in their cruſts of rye bread, till thoroughly dry, and then adding it with the bread to the working liquor. If a few cloves be tied up in a rag, and put into the veſſels into which the ſap is received from the tree, they will preſerve it the year round, without any fermentation: they are very apt to give a taſte to the liquor; but, if it be ſo contrived that they are taken out before they give this taſte, the liquor will keep well without any flavour of them. The adding a few drops of oil of ſulphur will have the ſame effect; and ſo will the fuming with ſulphur itſelf. A little ſpirit of wine, poured on the top of the juice in every bottle, will alſo be very inſtrumental in the preſerving it.

Many people, inſtead of adding malt, and Brewing the ſap of the ſycamore or birch into ale, uſe raiſins, and make a ſort of wine of it; and ſome add ſugar. Some have uſed the rye toaſts with very good ſucceſs, though they were not put into the liquor, but only hung over it, at ſuch a diſtance as to give warmth and motion to the ſurface. Common ale-yeaſt has been tried by ſome to ferment the juice of the birch; but it uſually ſpoils it, turning the liquor into a very bad ſmall beer. The Flemiſh wheat ferment would probably in time excel the bottled juice of the birch or ſycamore; but it would require a conſiderable time for it. Cinnamon is worthy to be tried in the ſtead of cloves, as of an infinitely more agreeable flavour. Honey has no effect on cyder at all; for it will not mix with it, though boiled in it, to make mead; but, after a time, the cyder lets fall the honey, and becomes ſimple cyder again: it is a queſtion whether it would mix with theſe juices; but, if it will, it will probably make a great improvement in them. The tops and young leaves of birch, boiled in the ſap, are ſaid by ſome to preſerve it. *Philoſ. Tranſact.* N°. 146.

Brewing *for Diſtillation*, implies the extracting a tincture from ſome vegetable ſubſtance, or making a ſolution of it by hot water, fitted for vinous fermentation.

Such a fermentable tincture or ſolution is obtainable from any vegetable whatever, under proper management and regulation; but, the more readily and perfectly the ſubject diſſolves, the better it is diſpoſed for fermentation, and the production of ſpirits. Thus ſugar, honey, treacle, manna, and other inſpiſſated vegetable juices, which totally unite with water, into a clear and uniform ſolution, are more immediate, more perfect, and better adapted ſubjects of fermentation, than roots, fruits, or herbs in ſubſtance, the grains, or even malt itſelf; all which diſſolve but very imperfectly in hot water.

Yet malt, for its cheapneſs, is generally preferred in England; and brewed for this purpoſe, much after the common manner of Brewing for beer; only the worſt malt is generally choſe for diſtillation; and the tincture, without the addition of hops, and the trouble of boiling, is directly cooled, and fermented.

To brew with malt for diſtillation in the moſt advantageous manner, it is requiſite, 1. That the ſubject be well prepared. 2. That the water be ſuitable and duly applied, and, 3. That ſome certain additions be uſed, or alterations made, according to the ſeaſon of the year, or the intention of the operator.

By an exact regulation in theſe reſpects, all the fermentable parts of the ſubject will be brought into the tincture, and thus become fit for fermentation.

The due preparation of the ſubject conſiſts in its being juſtly malted, and well ground. When the grain is not ſufficiently malted, it is apt to prove hard and flinty, ſo that the water can have but little power to diſſolve its ſubſtance; and, if it be too much malted, a part of the fermentable matter is loſt in the operation.

The harder and more flinty the malt, the finer it ought to be ground; and perhaps in all caſes, when deſigned for diſtillation, it ought to be reduced to a kind of coarſe meal. For it is found by experience, that, if it be ground thus fine, good part of the trouble, the expence, and the time uſually conſumed in Brewing, may be ſaved, and a greater yield of ſpirit procured. For thus the whole ſubſtance of the malt may all along remain mixed among the tincture, and be fermented and diſtilled along with it: which is a particular that deſerves the attention of the malt-ſtiller; as he principally conſults diſpatch, and making the moſt of his ſubject, without ſollicitouſly regarding the purity and perfection of the ſpirit.

The ſecret depends upon thoroughly mixing, or briſkly agitating and throwing the meal about, firſt in cold, and then in hot water; and repeating this briſk agitation after the fermentation is over: when the thick turbid waſh being immediately committed to the ſtill, already hot and dewy with working; there is no danger of burning, unleſs by accident, even without the farther trouble of ſtirring: which in this caſe is found needleſs, though the quantity be almoſt ever ſo large, provided the requiſite care and cleanlineſs be uſed. And thus the buſineſs of Brewing and fermenting may very commodiouſly be performed together, or reduced to one ſingle operation.

There are ſome alſo, who, the better to prepare their malt, ſprinkle it, before grinding, with an aqueous ſolution of nitre, or common ſalt: for the ſame purpoſe others uſe lime-water; which ſeems not ſo well adapted, if the deſign, beſides preventing the avolation of the finer flour in the grinding, be to promote the fermentation, increaſe the quantity of ſpirit, or add to its pungent, acid vinoſity.

The beſt or moſt profitable water for the purpoſe of Brewing, is that of rain; as being not only very thin, ſoft, and thence well fitted to extract the tincture of the malt, but alſo abounding in fermentable parts; whereby it quickens the operation, and adds ſomething to the yield of the ſpirit. Next to this is that of rivers or lakes, eſpecially ſuch as waſh any large tract of a fertile country, or receive the ſullage of populous towns; eſpecially if taken up near the place where great Brewing or diſtilling works are conſtantly carried on.

But where neither of theſe waters are commodiouſly procurable, or only a hard, aluminous, or vitriolic ſpring-water is to be had; this may be made fitter for the purpoſe, either by laying a chalk bottom, for it to run upon; or by adding ſome particular preparation to a parcel of it, after it is pumped. A prudent uſe of quick-lime and fixed alkali will in ſuch caſe be of ſervice, and precipitate the offending mineral matter. There are alſo other ſimple preparations, and ſome compoſitions made with the liquor of calcined flints, &c. that anſwer this end ſtill better; but they come too dear to be uſed in that quantity they are here required

Whatever water is made choice of, it muſt ſtand in a hot ſtate upon the prepared malt; eſpecially if a clear tincture be deſigned: but a known and very conſiderable inconvenience attends its being applied too hot, or near to a ſtate of boiling, or even ſcalding, with regard to the hand.

To ſave time in this caſe, and prevent running the malt into clods or lumps, the beſt way is to put a certain meaſured quantity of cold water to the malt firſt, and ſtir that very well in with it, ſo as to form a kind of thin uniform paſte; after which the remaining quantity of water required may be added, in a ſtate of boiling, without the leaſt danger of making what, in the language of diſtillers, is termed a pudding. And thus the proper or preciſe degree of heat, neceſſary to extract the full virtue of the malt, with all advantages, may be very expeditiouſly hit, or aſſigned, to a great exactneſs; as the heat of boiling water is a ſtandard, which may at once be let down to any deſired point of warmth, by a proper addition of cold water; due allowance being made for the ſeaſon of the year, and the temperature of the air. And this little obvious improvement, applied to the method juſt above hinted, for reducing Brewing and fermentation to a ſingle operation, will render it practicable to conſiderable advantage.

The quantity of the water employed muſt be ſuited to that of the malt: the rule is, that a clear tincture, or turbid mixture, be made ſo dilute and thin, as to ferment with eaſe and expedition, yet not needleſsly increaſe the bulk of the whole. Too little water makes a viſcous, clammy, tincture or mixture, ſcarce at all diſpoſed to ferment, before it is let down lower with water; nor can the water ſo clogged extract all the ſoluble parts of the malt: on the other hand, when the tincture is too thin and aqueous, it takes up too much room, and adds to the trouble and expence of all the parts of the operation. A due medium therefore is here to be choſe: and, in general, the goodneſs or richneſs of the malt-ſtillers waſh ſhould be much the ſame as of the weakeſt French wines, or that ordinarily deſigned by the brewers of London for ten ſhilling beer. But, if a more exact ſtandard is required, recourſe muſt be had to the eſſay-inſtrument, water-poiſe, hydroſtatical balance, or other methods of trying the ſtrength of ſolutions, and finding their ſpecific gravity or tenacity: which afford a ſurer rule than that obtained by weighing the malt and meaſuring the water, becauſe of the different goodneſs of different parcels of malt, and the accidents of the operation. But, if a fine ſpirit be the thing in view, it is much better to make the waſh too weak, than in the leaſt too rich.

Under the right application of the water, muſt alſo be conſidered the proper manner of agitating the maſs; ſo that all the parts of the aqueous fluid may come fully and frequently in contact with all the ſoluble particles of the ſubject: and when once the water is thus well ſaturated, by ſtanding the proper time, it is to be drawn off, and freſh poured on: and the agitation repeated, till at length the whole virtue, or ſaccharine ſweetneſs of the malt, is extracted and nothing but a fixed huſky matter remains behind, uncapable of being farther diſſolved by the action of hot or boiling water; or of being advantageouſly waſhed, or rinſed by the bare affuſion of cold. This artificial and external agitation is requiſite, as well in the ordinary way of Brewing, as the ſhorter abovementioned; and may to advantage be repeated more than once in both caſes, towards the beginning of the operation, and at each affuſion of freſh water; but eſpecially in the ſhort method which has a great dependence thereon.

The difference of ſeaſons is found to require ſome alteration in the direction and management of the buſineſs of Brewing: thus it is particularly found neceſſary to uſe the water colder in the ſummer, than in winter; to cool the tincture ſuddenly in cloſe ſultry weather, leſt it ſhould turn eager; and to check the too forward diſpoſition which malt has to ferment, when the air is hot, by a ſuitable addition of unmalted meal; which, being much leſs diſpoſed to fermentation than malt, thus helps to reſtrain and moderate its impetuoſity, ſo as to render the operation ſuitable and effectual to the production of ſpirit, that might otherwiſe, in great meaſure, be diſſipated and thrown off by an over-haſty and violent fermentation; eſpecially when the warm air is ſuffered freely to come at the fermenting liquor. Others, for the ſame purpoſe, uſe rye-meal; but this gives the ſpirit a moſt diſagreeable and nauſeous flavour, not eaſily to be got off or altered to advantage, by any known method of rectification.

It has likewiſe been thought of ſervice, in general, or at ſome particular ſeaſons eſpecially, to acidulate the water employed in Brewing, with a ſmall proportion of ſome vegetable, or light mineral acid; which is ſuppoſed to curb and regulate the fermentation of the tincture, improve the acid vinoſity of the ſpirit, and occaſion ſome ſmall increaſe of its quantity; and, with the ſame view, common ſalt, nitre, and tartar have likewiſe been employed in the manner hinted above.

The particular intention of the operator may render various other additions neceſſary: thus ſome, to improve the tincture, and diſpoſe it to yield more ſpirit, or to give it a particular flavour, add ſtrong and pungent aromatics in the Brewing; chuſing the cheapeſt for this purpoſe, ſuch as gran. paradiſ. cort. winteran. ginger, &c. But, in the common way, it is to be feared theſe additions do not effectually anſwer the intention; becauſe a particular encheireſis is requiſite to make the practice advantageous. Upon this foundation ſtands a very inſtructive method, uſed abroad for preparing geneva ab origine, by mixing the bruiſed berries of the Juniper among the malt, and Brewing them together; whence they procure a compound tincture, which, by fermentation and diſtillation, affords a ſpirit much more intimately and homogeneouſly impregnated with the fine eſſence of the berry, than that prepared in the common way of diſtillers.

The inconveniences that attend the Brewing directly with malt, are very conſiderable; the malt being of a very large bulk in proportion to the ſoluble, ſaccharine, or truly fermentable parts it affords; whence numerous large veſſels, much labour, and conſequently great expences are required to conduct and manage ſuch a buſineſs in the large way. The remedy here, as in all other caſes, may be much eaſier ſtarted than effectually applied. However, the foundation for it ſeems to reſt in practically reducing the perplexed buſineſs of the malt-ſtiller to the ſimple buſineſs of the fine-ſtiller; or, in other words, in reducing malt to a treacle. The thing in itſelf may be done to perfection; but how, in the large way, it will anſwer as to expence, muſt be left to thoſe who think it worth their care to conſider. The experiment is no more than this; when a parcel of wort, brewed in the common manner, is become fine by ſtanding, let it be decanted clear, and directly boiled in a common copper, till it begins to inſpiſſate or change a little towards a brown or duſky colour: at which time it muſt be directly emptied, into a balneum mariæ, where it may be exhaled to the full conſiſtence of treacle; which is a proper form to preſerve it in, till occaſion calls for it.

If the operation were finiſhed in the copper, the matter would be in great danger of burning, or unavoidably contracting an empyreuma, that could ſcarce ever be got off again; whence the whole might come to be abſolutely unfit for the purpoſe: or, if it eſcaped this accident, it would ſtill, through the unſuitableneſs and violence of the heat, or fire, now acting immediately upon the containing veſſel, be greatly indiſpoſed to ferment; ſo as, if it fermented at all, not to yield one fourth of the ſpirit the wort itſelf would otherwiſe have afforded.

But if the operation be dextrouſly and carefully performed, which perhaps is not quite ſo eaſy a thing as it may at firſt ſeem, the ſaccharine matter, though of as full a body, will be abundantly paler than treacle, a little more glutinous, very ſweet, pleaſant, and finely bitter, though no hops were uſed in the preparation. In this ſtate it will keep long, without any alteration; and remain capable at all times of being brought back by water to a wort again, that will ferment fully, and yield a ſpirit after the manner of treacle.

If upon full experience this method ſhall be found advantageouſly practicable in large, plentiful years, convenient ſituations, proper helps, &c. may be pitched upon for ſetting up a new trade of treacle-making, for the diſtillers at leaſt; if it ſhall not be found farther practicable to turn this new treacle into potable liquors or ſugars: which might poſſibly, under due regulation, lay the foundations of a work not unlike the ſugar-works of our plantations, though manageable with abundantly leſs trouble and expence.

When once the fermentable parts of vegetables are thus concentrated, and brought together into a ſmall compaſs, the buſineſs of Brewing becomes very facile; as being now no more than mixing, diſſolving, or ſufficiently diluting the inſpiſſated juice with lukewarm water: whence the ſolution, either alone, or with additions, is now perfectly fitted for fermentation. See FERMENTATION in the Dictionary and Supplement.

BRICKS *(Dict.)*— Bricks, among us, are various, acquiring various forms, dimenſions, uſes, method of making, place where, &c. Thoſe from their form, are compaſs Bricks, of a circular form, uſed in ſteyning of walls. 2. Concave or hollow Bricks, on one ſide flat, like a common Brick, on the other, hollowed. They are uſed for the conveyance of water. 3. Feather-edged Bricks, which are like the common ſtatute Bricks, only thinner on one edge, than the other, and are uſed for penning up the Brick-pannels in timber-building. 4. Triangular Bricks.

Thoſe from their dimenſions are, the great and ſmall, or ſtatute, and didoron, tetradoron, and pentadoron.

Great Bricks, are twelve inches long, ſix broad, and three thick; the weight of one is about fifteen pounds, ſo that a hundred will weigh fifteen hundred pounds, and a thouſand of them fifteen thouſand pounds.

Thoſe from cuſtom, are, ſtatute and cogging Bricks.

Statute Bricks, are thoſe whoſe dimenſions are conformable to the ſtatute, viz. nine inches in length, four and a half in breadth, and two and a quarter in thickneſs.

Cogging Bricks are uſed for making the indented work under the coping of walls built with great Bricks. .

Thoſe from the method of making, are place and ſtock Bricks. Place Bricks, are ſuch as are made in a place prepared on purpoſe for them, near the building they are to be uſed in. Theſe are uſually ſmall common Bricks, and ought to be nine inches long, four and a half broad, and two and a half thick. Stock Bricks are thoſe made in a mould, and burnt in a kiln. Theſe are alſo Dutch, or Flemiſh Bricks, which are uſed in paving yards, or ſtables, and for ſoap-boilers fats and ciſterns.

Thore from their uſe, are buttreſs or pilaſter, coping and paving Bricks. Buttreſs or pilaſter Bricks, are of the ſame dimenſions with the great Bricks, only they have a notch at one end of half the breadth of the Brick. Their uſe is to bind the work at the pilaſters of fence-walls which are built of great Bricks. Coping Bricks are formed on purpoſe for coping-walls; paving Bricks, or tiles, are of ſeveral ſizes in ſeveral counties and places.

Thoſe from accident, are clinkers, ſamel, or ſandal. Clinkers are ſuch Bricks as are glazed by the heat of the fire, in making. Samel or ſandal Bricks, are ſuch as lie outmoſt in a kiln or clamp, and conſequently are ſoft and uſeleſs, as not being thoroughly burnt.

Manner of making Stock Bricks.— They chuſe a piece of earth, called haſle-mold, or ſtiff loam, with a mixture conſiſting of a little ſand and a great deal of earth, without any clay.

Some little time before Chriſtmas they begin to dig as deep as the earth allows, laying it as level as poſſible, and end before Candlemas, that it may lie to mellow; that is, that the hard lumps may fall to pieces, which they will do either by the help of rain or froſt; when it is thus dug, they let it lie till Lady-day or Eaſter, when they have commonly fair weather.

Then they water the earth well, and temper it with a narrow ſpade about five inches broad, with which they dig it down, and then temper it with their feet till it is in good caſe to make a Brick, that is, like a piece of dough, ſuch as will juſt ſtick in the mold or frame when lifted up, and not fall off of itſelf: they then bring to the earth a table ſtanding upon four legs, about three feet high, five feet and a half long, and three feet and a half over, and load it with as much as it will well bear at the right-hand end about half way; at the other end are boards nailed about nine inches high to lay ſand in, and in the middle they faſten with nails a piece of board, which they call a ſtock; this ſtock is about half an inch thick, and juſt big enough for the mold to ſlip down upon: the mold or frame is made of beech, becauſe the earth will ſlip eaſieſt from it. This mold, frame, or voider is made of the bigneſs of the Brick, only half an inch deeper, to give way for the ſtock aforeſaid; and it muſt be ſhod with a thin iron of half a quarter of an inch thick, both at the top and bottom, and this keeps it from breaking and wearing out: they alſo have upon the table, before the mold or frame, a little trough, that will hold about three or four quarts of water, and in it a ſtrike to run over the mold to make the Bricks ſmooth. This ſtrike is uſually made of fir, nine inches long, an inch and a half broad, and half an inch thick: they have alſo, on a little form juſt by the ſand-bin, about thirty little pieces of board twelve inches long, ſix inches over, and half an inch thick, called pallat-boards. When they are thus prepared with utenſils, one man ſtrews ſand on the table and moulds the earth upon it; then rubbing the ſtock and inſide of the mold with ſand, with the earth he forms a Brick, ſtrikes it, and lays it upon the pallat; then comes a little boy, and takes away three of theſe Bricks and pallats, and lays them upon a hackſtead, a raiſed place like a balk in a field, or a border in a garden; which is a piece of ground five or ſix rods long, two feet over, with a gutter on each ſide about a foot deep, and as wide a top; which is made by digging half a foot deep, and the earth that comes thence raiſes the hackſtead: this hackſtead muſt be well beaten, that it may be ſmooth, level, and hard, and upon it the boy lays his Bricks edgeways, the thickneſs of the pallats one from another, on each ſide of the hackſtead a row, and ſo that the heads of each row may be two or three inches aſunder, when they are pretty hard, which in dry weather will be in a day; then the boy lays another courſe croſsways, till they come to be ten courſes high, when they are covered with ſtraw till they are hard and dry, which uſually is in three weeks or a month, and then they burn them. One perſon, without a man to temper, or boy to carry them away, but to temper and lay them himſelf, will make a thouſand in a ſummer's day, viz. about fourteen or fifteen hours; but with a man to temper, and a boy to carry them, and lay them as above, he will make two thouſand, and an extraordinary man three thouſand in a day; and the uſual price for this tempering, making, and laying, is four ſhillings per thouſand, of which the maker has one half, and the temperer and the boy the other.

The Bricks being thus prepared, they are next burnt; for the method of which, ſee BRICKS, in the Dictionary. *Hought. Collect.*

Manner of making Place Bricks.— Theſe are generally made in the eaſtern parts of Suſſex, and are ſo called, becauſe there is a place hard by, where they ſtrike or mold their Bricks, which is a level ſmooth piece of ground, prepared for the bearer-off (i. e. him who carries the Bricks from the ſtriker) to lay them down ſingly in rows (which are by them called ricks) as ſoon as they are molded; where they are let lie until they are a little dried, viz. until they are ſtiff enough to be turned on their edges, and dreſſed (i. e. until their inequalities are cut off) and, when they are dried, they carry them to the hacks (or places where they are rowed up like a wall of two Bricks thick, with ſome ſmall intervals between them, to let in the wind and air to dry them.) When the hack is filled, they cover them with ſtraw on the top, till they are dry enough to be carried to the kiln to be burnt.

Worlidge, and others after him, have laboured to excite Brick-makers to try their ſkill in making a new ſort of Brick, or a compoſition of clay and ſand, whereof to form window-frames, chimney-pieces, door-caſes, and the like. It is to be made in pieces faſhioned in moulds, which, when burnt, may be ſet together with a fine red cement, and ſeem as one intire piece, by which may be imitated all manner of ſtone work.

The thing ſhould ſeem feaſible by the earthen pipes made fine, thin, and durable, to carry water under ground at Portſmouth, and by the earthen backs and grates for chimneys, formerly made by Sir John Winter, of a great bigneſs and thickneſs.

In reality, much might be done towards making chimney-pieces, ſtone-mouldings, architraves, faſcias for fronts of buildings, and the like, if men of this profeſſion had a little tincture of chemiſtry, which would enable them to contrive ſome good compoſition of earth, and a proper way to manage it in the moulding, burning, &c. Might not even a compoſition, ſomething like common crockers earth, in ſome meaſure, anſwer the deſign? It is apparent, into whatever form the crockers put their earth, it retains it after drying and burning, although the crocks be very thin. If chimney-pieces, thus made in moulds, and dried and burnt, were not found ſmooth enough, they might be poliſhed with ſand and water: or, were care taken, when they were half dry, in the air, to have them poliſhed with an inſtrument of copper or iron, and then leave them till they were dry enough to burn, it is likely they would not want much poliſhing afterwards. The work might even be glazed, as potters do their fine earthen ware, either white, or of any other colour; or it might be veined in imitation of marble, or be painted with figures of various colours, which would be much cheaper, and perhaps equally durable, and as beautiful as marble itſelf. *Neve, Builder's Dictionary.*

Bricks, or Briques, in heraldry, are figures or bearings in arms, reſembling a building of Bricks; being of a ſquare form, like billets and tablets, from which they only differ in this, that they ſhew their thickneſs, which the others do not. *Coat. Dict. Herald.*

BRICKLAYER, an artificer whoſe buſineſs is to build with bricks, or make brick-work. See the articles BRICKS and BRICKLAYING.

Bricklayers work or buſineſs, in London, includes tiling, walling, chimney-work, and paving with bricks and tiles. In the country, it alſo includes the maſons and plaiſterers buſineſs. *Neve, Build. Dict.*

There is ſome diſpute, as to the point of priority, between the white maſon, or hewer of ſtone, and the red maſon, or hewer of bricks: ſcripture, it ſeems, favours the latter, making mention of making bricks, before any account of hewing or digging of ſtones. *Moxon's Mechan. Exerc.* See the article MASON.

The materials uſed by Bricklayers, are bricks, tiles, mortar, laths, nails, and tile-pins.

Their tools are, a brick trowel, wherewith to take up mortar; a brick ax, to cut bricks to the determined ſhape; a ſaw, for ſawing bricks; a rub-ſtone, on which to rub them; alſo a ſquare, wherewith to lay the bed or bottom, and face or ſurface of the brick, to ſee whether they be at right-angles; a bevel, by which to cut the under ſides of bricks to the angles required; a ſmall trammel of iron, wherewith to mark the bricks; a float-ſtone, with which to rub a moulding of brick to the pattern deſcribed; a banker, to cut the bricks on; line-pins, to lay the rows or courſes by; plumb-rule, whereby to carry their work upright; level, to conduct its horizontal; ſquare, to ſet it off at right-angles; ten feet rod, wherewith to take dimenſions; jointer, wherewith to run the long joints; rammer, wherewith to beat the foundation; crow and pick-ax, wherewith to dig through walls. *Moxon, lib. cit. p.* 245 *& ſeq.*

The London Bricklayers make a regular company, which was incorporated in 1568, and conſiſts of a maſter, two wardens, twenty aſſiſtants, and ſeventy-eight on the livery. *New View of London.*

Tilers and Bricklayers were incorporated, 10 Elizabeth, under the name of maſter and wardens, of the ſociety of freemen of the myſtery and art of tilers and Bricklayers.

PLATE VIII. *Engraved for the Supplement.* *Facing* Bridge

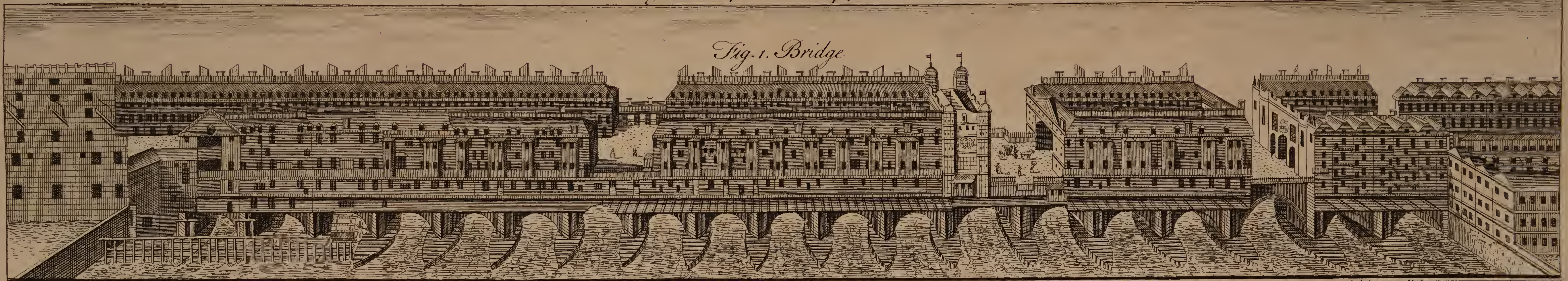

Fig. 1. Bridge

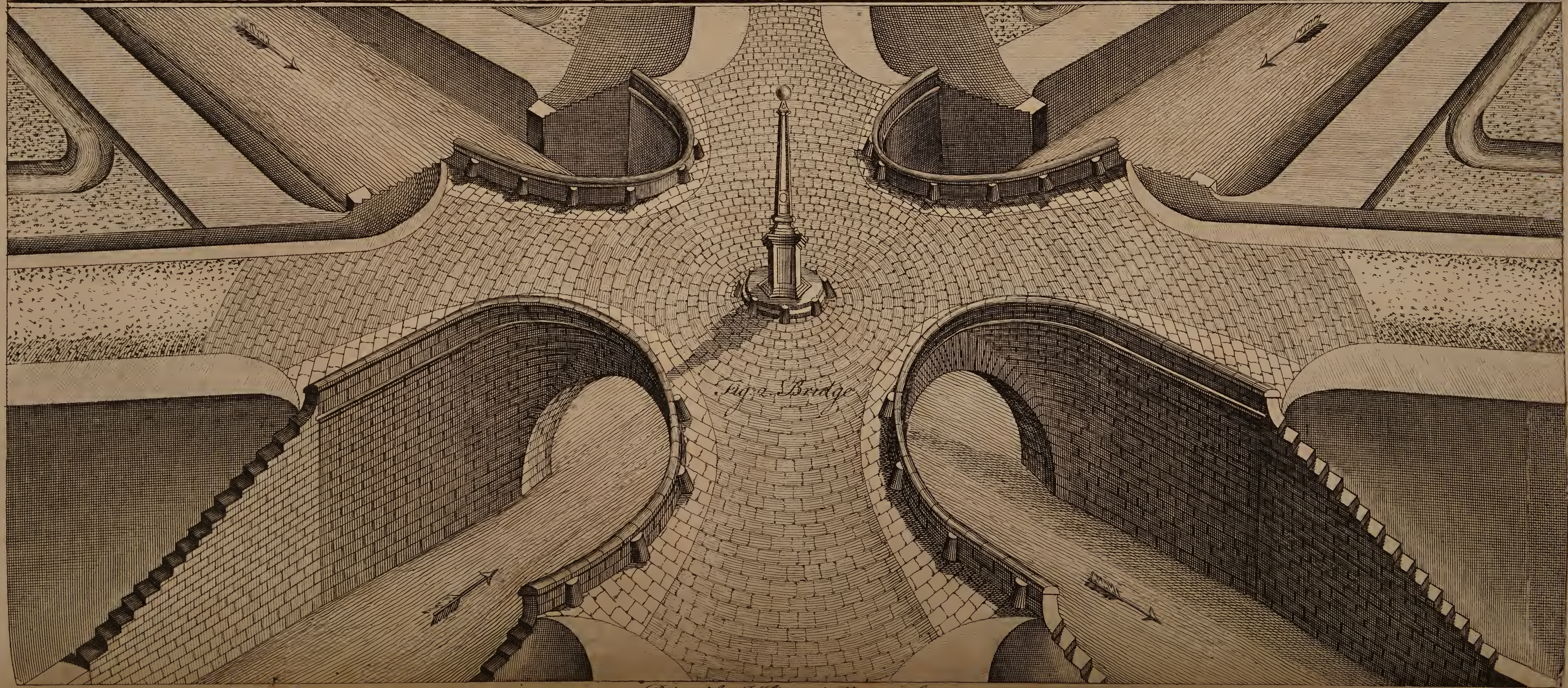

Fig. 2. Bridge

Printed for J. Hinton in Newgate Street.—

The univerſal call for this trade is ſo well known to every one, that little need be ſaid of it.

This, however, is to be obſerved, that it is moſtly an out-door buſineſs, much expoſed to the weather, by which they are often hindered from working.

As to the work itſelf, it is not very difficult to be learned, nor laborious (for they have labourers to do their heavy work) but handy and ingenious in contriving. With reſpect to the maſters, moſt of them live handſomely: and ſome, who employ many hands, and undertake large works, commonly called maſter-builders, obtain good eſtates; but then they are ſuch, who not only have money at command, but take great pains to qualify themſelves for projecting, drawing plans, ſurveying and eſtimating buildings.

BRICKLAYING, the art of building edifices with bricks.

The following directions, with regard to the beſt method of laying bricks, have been recommended by experienced workmen.

1. Take care to procure good ſtrong mortar. See the article MORTAR, *Dict. and Sup.*

2. If your bricks are laid in winter, let them be kept and laid as dry as poſſible. If they are laid in ſummer-time, it will quit coſt, to employ boys to wet them; becauſe, being wetted, they will unite much better with the mortar, than if they were laid dry, and will render the work much ſtronger.

But if it ſhall be objected, that, if the building be large, it will be a great deal of trouble to wet all the bricks, by dipping them in water; and alſo that it will make the workmen's fingers ſore in laying them.

To prevent theſe inconveniences, water may be thrown on each courſe of bricks after they have been laid; as is ſaid to have been done by the order of the ingenious Mr. Robert Hook, the ſurveyor at the building of the Phyſicians-college in Warwick-lane.

3. If bricks are laid in the ſummer-time, do not fail to cover them, to prevent their drying too faſt; for, if the mortar dry too haſtily, it doth not cement ſo firmly to the bricks as when it dries leiſurely.

4. If the bricks are laid in the winter-time, take care to cover them well, to defend them from rain, ſnow, and froſt; the laſt of which is a mortal enemy to all mortar, eſpecially to all ſuch as has taken wet juſt before the froſt ſeizes it.

5. Take care that bricks be not laid joint in joint on the middle of walls, but as ſeldom as may be; but let there be good bond made there, as well as on the outſides: for ſome workmen, in working a brick and half wall, lay the header on one ſide of the wall, perpendicular on the other ſide of the wall; and ſo all along through; which, indeed, neceſſarily follows, from the unadviſed ſetting up of the quoin at a toothing; for it is common to tooth in the ſtretching-courſe two inches with the ſtretcher only; and the header on the other ſide to be perpendicular over the header on this ſide; which cauſes the headers to lie joint in joint in the middle of the work.

Whereas, if the header on one ſide of the wall were toothed as much as the ſtretcher on the other ſide, it would be a ſtronger toothing, and the joints of the headers on one ſide would be in the middle of the headers of the courſe they lie upon on the other ſide.

All that can be pretended in excuſe of this ill practice in working thus, is this: that the header will not hang two inches over the bricks underneath it.

This, indeed, is an objection: but yet the inconveniency may be avoided without much difficulty, viz. as follows: by having a piece of wood of the thickneſs of a courſe of bricks, and two inches broad, and laying it on the laſt toothing-courſe, to bear it; or a brick-bat, put upon the laſt toothing, will bear it till the next quoin is ſet upon it, and then the bat may be taken away.

6. The ſame inconvenience at an upright quoin in a brick and half wall; where it is uſual to lay a cloſer next the header, on both ſides of the walls; and, in ſo doing, it is joint in joint all the length of the wall, except, by chance, a three-quarter bat happen to be laid.

In order to avoid this inconveniency, and by that means to make the wall much firmer, lay a cloſer on one ſide; but lay a three-quarter bat on the ſtretching-courſe, and join a header next to the header at the quoin, in the heading-courſe.

7. Alſo, in two brick-walls, it will be the beſt way in ſtretching-courſes, in which ſtretching is laid on both ſides the walls next the line, to lay alſo ſtretching in the middle of the wall, and the cloſers next to each ſtretching-courſe which lies next the line.

BRIDGE (*Dict.*)—The ancients built many ſtupendous ſtructures of this kind: and the remains of ſeveral of them over the Tyber are ſtill to be ſeen at Rome.

The emperor Adrian cauſed the firſt to be built, which is the Pons Ælius, at preſent called Pont St. Angelo, or Angel's Bridge, the fineſt of all thoſe that are at this day at Rome. It was called the Bridge Angelo, on account of an angel pretended to have been ſeen at the entrance of it. It was garniſhed on the upper part with a covering of braſs, ſupported by forty pillars of the ſame.

The ſecond was the Triumphal Bridge, of which the ruins are ſtill to be ſeen in the river Tyber. Over this Bridge the emperors and conſuls uſed to paſs, when they had a triumph decreed them; which was at that time adorned with all imaginable art.

The third was the Pons Janiculenſis, at preſent called Sixtus's-Bridge; becauſe pope Sixtus IV. cauſed it to be rebuilt in the year 1475. This Bridge was antiently built of marble.

The fourth was that called Pons Cæſtius; at preſent, St. Bartholomew's-Bridge; which was re-edified in the time of the emperor Veſpaſian.

The fifth was that named Fabricius, or Tarpeius; at preſent called Ponte Caſpi, or Quatro Capi.

The ſixth was the Senatorian, or Palatine Bridge, now called Sancta Maria.

The ſeventh was the Pons Horatius, or Sublicius; one of the fineſt Bridges of Rome, and of which the ruins are ſtill to be ſeen in the Tyber, and which has not yet been re-edified.

An Italian author in his works concerning the antiquities of the city of Rome, has given a full account of the elevation, &c. of this celebrated ſtructure.

The figure of it ſeems extraordinary and fantaſtical: to ſee a ſecond Bridge raiſed over a firſt, and, in a like work, columns and other ornaments of architecture over that; ſo that it appeared more like a triumphal arch, or portico, than a Bridge. This Bridge was demoliſhed in the reign of the emperor Otho, but rebuilt by Antoninus Pius.

The eighth and laſt was that without the city of Rome, and about two miles diſtant; which was called Milvius, in the Flaminian Way.

Beſides theſe Roman Bridges, we have modern ones, which are not without their merit.

Among thoſe of France, may be reckoned thoſe of Avignon, of Saint Eſprit, and of Lyons upon the Rhone. The firſt of theſe is demoliſhed; there remaining only ſome arches on the ſide of Avignon.

The ſecond is ſtill ſubſiſting, and may be ſaid to be one of the fineſt Bridges in the univerſe. One thing particular in theſe three Bridges, is, that their plan is not in a ſtraight line, eſpecially thoſe of Avignon and Saint Eſprit.

The angle is little ſenſible in that of Lyons, but nevertheleſs perceivable; and is on the upper ſide of the ſtream.

But, as for the two preceding, it is certain, that they have an angle, or a ſort of bending, the convexity of which oppoſes the waters of the Rhone, as though being by this diſpoſition centered, and are bouted, the better to reſiſt the weight and current of the waters.

The Bridge of Avignon was compoſed of eighteen arches, in length one thouſand three hundred and forty paces, making about five hundred fathoms. It was begun in the year 1176, and finiſhed in 1188.

The ſchiſm between Benedict and Boniface was fatal to it in the year 1385; but a greater calamity happened to it in the year 1602, by the negligence of repairing one arch fallen down, which cauſed the fall of three others. In fine, in the year 1670, the cold was ſo violent, that the Rhone was frozen ſo as to bear waggons with the heavieſt loads for ſeveral weeks; and, upon the thaw happening, ſuch mountains of ice daſhed againſt the piers, as ſhook them, and cauſed ſeveral arches to fall down.

But, nevertheleſs, the third pile on Avignon ſide, with the chapel of St. Nicholas built upon it, has always borne up againſt all accidents.

Pont Saint Eſprit is finer and more bold than that of Lyons, or Avignon: it conſiſts of nineteen great arches, beſides ſeven ſmaller ones. It has arches from fifteen to twenty fathoms, opening, rather more than leſs, which make the length of the Bridge upwards of four hundred fathoms.

The Bridge of Lyons, upon the Rhone, has twenty arches. It is obſerved farther of theſe Bridges, that they are defended by towers to ſecure the paſſages.

Among the fine Bridges of France, are reckoned the Pont Royal of the Thuilleries, that of Libourne upon the Garonne, and one arch of Pont-Neuf at Paris.

But the moſt famous Bridge in France is that of four arches built on the ſection of two navigable canals, and may be looked upon as a very great improvement in architecture.

This famous Bridge is ſituated on the ſection of the canals of Calais and Ardres, on the new road between Calais and St. Omer. By its ingenious contrivance it has centered to a ſingle point the navigation of four different canals, the paſſage of a great road, and the communication of the four principal parts of the country, which, before the building of it, were ſeparated, and could not be joined without making ſeveral Bridges, whereas this alone anſwers the end. The eight banks of theſe canals, beſides the uſe in drawing of the boats, ſerve likewiſe for the conveniency of carriages to and from the adjacent parts, and one may perceive twelve different ways leading to the center of the Bridge which facilitates the commerce and the carriage of proviſions to the neighbouring towns, as well as for carrying manure, &c. to the lands; whereas, before, the farmers were obliged to tranſport their grain, and to be at annual expences and great loſſes, by loading and unloading their commodities at different places.

The invention of this Bridge is owing to M. Barbier, engineer of Bridges and cauſeys, who contrived it in 1747, when he was impowered by the generality of Picardy for carrying on works of this kind.

The court having approved of his plan, the execution of it was committed in 1750 to M. Beſſara, engineer in the ſame generality, who brought it to its preſent perfection. See a perſpective view of this celebrated Bridge, *Plate* VIII. *fig.* 2.

This Bridge is formed of four circular arches, over which riſes a vault, and over the center a ſemi-ſpheroid vault, one and twenty feet high, which is penetrated with the four arches for the paſſage of boats, &c.

England can boaſt of ſeveral fine Bridges, particularly that over the Thames at Weſtminſter; a full account of which we have given under the article BRIDGE, in the Dictionary.

London-Bridge was begun in the reign of Henry II, in the year 1176, and finiſhed in the reign of king John, in the year 1209. Since that time, it has been divers times burnt, and ruined by ice, and as often repaired, or re-built. The king and the city contributed to the charge. This Bridge is made of hewn ſtone: it has nineteen arches of a hundred and twenty-five fathoms, Paris meaſure, or eight hundred feet long, and thirty or twenty-eight feet and one eighth broad. Some ſay ſixty or fifty-ſeven feet one quarter; for the London foot is fourteen ſixteenths of that of Paris. In height, on the two ſides of the Bridge, are built two rows of ſtately houſes; and a conſiderable fund is ſettled for the maintaining it. This Bridge is continually aſſaulted by the flux and reflux of the tide. Large veſſels, which come up to the Thames, do not go above the Bridge; but ſmall ones paſs through it. Its piers are perfectly well guarded by ſtarlings. See a perſpective view of this ſtructure, *Plate* VIII. *fig.* 1.

When any one projects a Bridge, he ought to begin,

1. With making an exact local plan; which plan ſhall preciſely lay down the extent of the water, the ſands, if it has any, the banks, or brinks of the river, and the ways or ſtreets that abut upon this Bridge.

2. He muſt project upon this plan the Bridge deſigned, whether of maſonry, or carpentry; with the number of arches, and quantity of piles, bays, or joiſts. He muſt always lay down the Bridge over the river upon the ſquare, and never ſlanting.

3. He muſt, upon this plan, trace a line which ſhall cut the Bridge in the middle, and there ſound the depth of the water from fathom to fathom, or from two to two, or from three to three, according as there ſhall be occaſion.

This ſounding is to be made either by a pole, divided into feet, at the end of which is a leaden weight, according as the current of the water ſhall require.

If this ſhall not be ſufficient, he muſt make uſe of a cannon-ball, put into a little bag, tied to the end of a cord, which has been before divided into feet and fathoms.

He muſt make uſe of theſe, or other methods, which ſhall be found to be moſt proper, according to the rapidity of the water that is to be ſurmounted.

All this is to be done by means of a boat, which may be conducted in different manners; either by a cable, which is carried a-croſs the river, or by other cords made faſt to trees, or ſtakes on the bank, or to ſtakes drove down for that purpoſe; round which the cable that is to hold it is to be many times turned, and ſlackened, according as occaſion requires, to guide the boat more to one ſide than the other.

4. The ſoundings of the water being made, and ſet down on the plan, they ſerve for making a profile of the river, which marks or ſets out the depth of the water that has been found; and the line under the water, whether it be ſandy or rocky, to which attention muſt be given, marking the difference on the profile.

Upon this profile is marked by a line the depth of the water, at the loweſt it is at any time of the year, which the Bridge-maſters of great and navigable rivers will acquaint you with; and the peaſants or inhabitants of the neighbouring places to ſmall rivers will inform as to the height of thoſe inundations, which have happened in their memory.

Theſe may alſo be drawn in the profile, which ſhall ſhew the a mean of the height of the waters.

All theſe lines being drawn by a perfect level, parallel the one to the other, may be waſhed with a water colour.

5. The profile being thus raiſed, a ſounding-iron may be made, of a convenient length, for ſounding below the depth of the water, the ballaſt, or ſand; and no certainty can be attained till this is done, and the depth of the water be known: and, in order to this, there are two methods uſed, either by a ſounding inſtrument of iron, made on purpoſe, having a large ring at its head for a crowning, croſs which there goes the arm of a borer, larger or ſmaller, in order to turn it with; and having at the top a head to be driven down, to make it enter till it comes to a firm bottom below the ſands.

This ſounding-iron is made pointed and barbed at the end with four angles; ſo that being bored or forced through the ſand or part of the rock, or ſolid ground, that it meets with below the ſand, by being turned ſeveral times, in order to bring up in the hollows of the barbs ſome ſmall quantities of the ſolid ground it meets with, and thus being drawn up, the quality of it is to be entered down in the memorial that is provided for this purpoſe, in order to know what kind of ground the bottom is.

There are inſtruments for ſounding of another ſort, which have a little pocket in the form of a ſnail-ſhell at the end in the ſhape of a borer, which receives nothing but ſand in turning one way, and the earth under the ſand by turning it the other.

Theſe ſounding inſtruments muſt be all of one piece, that they may be as ſtrong as poſſible; ſometimes they are adjuſted according to the hardneſs or eaſineſs of the ground to be penetrated; ſometimes they are of no uſe, eſpecially when the ſand is too groſs, and meets with flints that the ſounder cannot remove.

In this caſe, they make uſe of a ſtake of oak made round, of the ſtraighteſt piece of a tree of three, four, five, or ſix inches diameter; which having determined to what depth of the earth they would ſound, they arm with a lardoir, or pointed iron at the end, for removing the flints; with a ferrel at the head, to be able to reſiſt the ſtrokes of a beetle with two or three helves, with which the ſounder is driven down.

All this requires a great deal of pains, care, and expence too; but the ſatisfaction of doing the work well, and making a faithful relation of it on the profile, of the depth of the ſand or gravel that is to be piled, or which ought to be removed for the foundation of the piles, in order to ſettle the dams neceſſary, will make amends for them; and, ſo long as a perſon is ignorant of the depth, he can neither project a Bridge, nor know how to compute the expence, ſince he cannot tell what timber it will take up, nor what precautions ought to be taken for ſecuring the work.

6. When a knowledge of the conſiſtence of the ground has been obtained, as whether ſand, earth, rock, &c. then a perſon may proceed with ſafety upon the profile he has made, to lay down the projection of the Bridge, whether of maſonry or carpentry; then the length and thickneſs of the piers and piles may be known, according as the foundation muſt be more or leſs in depth.

7. This being done, and the height of the higheſt inundations being known by the information of the oldeſt neighbouring inhabitants, marks are to be made at this height; and ſuppoſing three feet upwards to be the intradoſſe, or inward face of the arches of the Bridge that one would lay down a projection of, and alſo the bays, joiſts, beams, &c. of a wooden Bridge, which is the ſame: the work may be ſo regulated, that it may be known to what height the greateſt inundation will riſe, and to what depth the foundation of the piles, &c. muſt be carried.

8. The next thing to be done, is to provide the materials which are to be employed in the work.

For a ſtone Bridge. It ought to be conſidered from whence the free-ſtone may be had, its diſtance, the eaſineſs or difficulty of cutting it, its carriage, its nature, as to its being ſtrong or weak, in regard to the effort it is to ſuſtain, being preſſed by the reins of the arches, if it will be able to ſuſtain the weight; for there are ſome ſtones ſo tender, eſpecially having been but lately taken out of the quarry, as one may ſay bleeding, that they will crack, ſplit, or ſhiver to pieces.

As to the lime, it is to be conſidered from whence that is to be had, its nature, and when it takes hold, whether as ſoon as it is uſed, or a long time after; the wages of workmen, the cheapneſs and conveniency of having proviſions, the conveniency of the place, and number of the workmen required to finiſh the work in a certain time, before the rains of autumn, which make rivers overflow; and many precautions are neceſſary to be taken, that cannot well be enumerated.

For a Bridge of carpentry. The builder muſt inform himſelf from whence the timber muſt be had: if it be ſound and good; the time for procuring it; the charge of it, as to what it will coſt, laid down at the place; what quantity muſt be faſhioned for piles, and what for centers, ſcaffolding, &c. that all the materials may be ready in time, to begin the work without hindrance, and to be able to finiſh it before the contrary ſeaſons for the compleating of the Bridge commence. See PLANS *of Bridges*.

BRIGA'DE-*Major*, in the military art, an officer choſen from among the moſt ingenious and expert captains. Brigade-majors are to wait, at proper times, to receive the word and orders which they carry firſt to their brigadier, and afterwards to the adjutants of regiments at the head of the Brigade, where they regulate together the guards, parties, detachments, and convoys, and appoint them the hour and place of rendezvous at the head of the Brigade, where the Brigade-major takes and marches them to the place of the general rendezvous. A major of Brigade ought to keep a roll of the colonels, lieutenant-colonels, majors, and adjutants, belonging to the Brigade. When a detachment is to be made, the major-general of the day regulates with the Brigade-majors, how many men and officers each Brigade ſhall furniſh; and they again with the adjutants of the regiments, how many each battalion is to ſend, which the adjutants divide among the companies. The complements each regiment is to furniſh, are taken by the adjutant at the head of each regiment, at the hour appointed, who delivers them to the Brigade-major at the head of the Brigade, who again delivers them to the major-general of the day, and he remits them to the officer who is to command the detachment. *Vide Bland's Milit. Diſcipl.*

BRI'MSTONE-*Marble*, a preparation of brimſtone in imitation of marble.

To do this, you muſt provide yourſelf with a flat and ſmooth piece of marble; on this make a border or wall, to encompaſs either a ſquare or oval table, which may be done either with wax or clay. Then having provided ſeveral ſorts of colours, as white-lead, vermilion, lac, orpiment, maſticot, ſmalt, Pruſſian blue, &c. melt on a ſlow fire ſome Brimſtone, in ſeveral glazed pipkins; put one particular ſort of colour into each, and ſtir it well together; then, having before oiled the marble all over within the wall, with one colour quickly drop ſpots on it, of a larger and leſs ſize; after this, take another colour and do as before, and ſo on, till the ſtone is covered with ſpots of all the colours you deſign to uſe. When this is done, you are next to conſider what colour the maſs or ground of your table is to be; if of a grey colour, then take fine ſifted aſhes, and mix it up with melted Brimſtone; or, if red, with Engliſh red oker; if white, with white-lead; if black, with lamp or ivory-black. Your Brimſtone for the ground muſt be pretty hot, that the coloured drops of the ſtone may unite and incorporate with it. When the ground is poured even all over, you are next, if judged neceſſary, to put a thin wainſcot board upon it: this muſt be done while the Brimſtone is hot, making alſo the board hot, which ought to be thoroughly dry, in order to cauſe the Brimſtone to ſtick the better to it. When the whole is cold, take it up, and poliſh it with a cloth and oil, and it will look very beautiful. *Smith's Laboratory.*

BRIMSTONE *Medals, Figures,* &c. are caſt in the following manner: melt half a pound of Brimſtone over a gentle fire; with this mix half a pound of fine vermilion, and, when you have cleared the top, take it off the fire, ſtir it well together, and it will diſſolve like oil; then caſt it into the mould, which muſt firſt be anointed with oil. When cool, the figure may be taken out; and, in caſe it ſhould change to a yellowiſh colour, you need only wipe it over with aqua-fortis, and it will look like the fineſt coral.

BRINE-*Pans*, the pits wherein the ſalt water is retained, and ſuffered to ſtand, to bear the action of the ſun, whereby it is converted into ſalt.

There are divers ſorts of ſalt-pans, as the water-pan, ſecond-pan, ſun-pan; the water being transferred orderly from one to another. *Coll. Diſc. of Salt and Fiſh.*

BRINE-*Pit*, in ſalt-making, the ſalt ſpring from whence the water to be boiled into ſalt is taken. There are of theſe ſprings in many places; that at Namptwich in Cheſhire is alone ſufficient, according to the account of the people of the place, to yield ſalt for the whole kingdom; but it is under the government of certain lords and regulators, who, that the market may not be overſtocked, will not ſuffer more than a certain quantity of the ſalt to be made yearly. *Ray's Engl. Words.* See the article PIT.

Leach-BRINE, a name given to what drops from the corned ſalt in draining and drying, which they preſerve and boil again; being ſtronger than any Brine in the pit. *Hought Collect.*

BRI'STLE, the ſtrongeſt hair ſtanding on the back of a hog, or a wild boar.

Hog Briſtles are put to ſeveral uſes, particularly in making ſeveral ſorts of bruſhes: they are commonly ſent in barrels or hogſheads, in parcels of ſeveral ſizes, which are ſold by weight. Wild boar's briſtles are much ſtronger than hog's, and are much more valued, but then they are alſo much dearer. Shoemakers, harneſs-makers, ſadlers, and others, uſe them, putting one of them as a needle or awl at the end of their thread, to ſew their work.

There is a great deal of this commodity imported from Muſcovy and Livonia, by the way of Hamburgh and Holland; whence it is ſent away in ſmall parcels tied in the middle, and put in little deal boxes about a foot long, and two or three inches broad: it is commonly ſold by weight.

Briſtle, both of hogs and wild boars, is part of the ironmongers trade in France, who buy it by wholeſale, and ſell it by retail, to ſuch workmen as make it into bruſhes, &c. or have occaſion for it in their own way of buſineſs.

BRITA'NNICA, in the materia medica of the ancients, the name of a plant deſcribed as having leaves of a dark colour, very large, and in ſhape reſembling thoſe of the common wild dock, but ſomewhat hairy, and of an aſtringent taſte; the root ſmall and ſlender, and the ſtalk not large. This is the deſcription of Dioſcorides, who attributes to its inſpiſſated juice great virtues, as an aſtringent, and a remedy for ulcers of the mouth and tonſils; and Pliny acquaints us of its prodigious efficacy in a diſtemper attending the army of Germanicus, who, when they had croſſed the Rhine, encamped in a place where there was only one ſpring of water, the drinking of which affected them in a terrible manner in their mouths, and made their teeth drop out; and that the phyſicians, who called the diſeaſe ſtomacace and ſcelotyrbe, were at length directed to a remedy by the Friſians who were in their camp, which was the herb Britannica.

The virtues attributed to this plant are obſerved by the later phyſicians to agree very well with thoſe of the hydrolapathum majus, or great water dock, a plant produced very abundantly with us, but at preſent neglected in the practice of phyſic; and Muntingius, who has written profeſſedly of the Britannica of the ancients, is perſuaded that this is the true and genuine plant. He by no means countenances the opinion of its having its name from the iſland of Britain, but deduces it from a very expreſſive phraſe in the Friſian language, in which brit ſignifies to conſolidate, tan a tooth, and ica looſe; ſo that it plainly had its name from its virtues of faſtening the teeth, when looſened in the mouth by diſtemperature. Every part of the herb is powerfully aſtringent, and the root, which is its moſt efficacious part, is very ſerviceable in hæmorrhages of all kinds, and in whatever diſorders the cold aſtringents are required in. It is ſaid alſo to be very uſeful in nervous complaints; and is very powerful in the cure of quinſies, inflammations of the tonſils, and almoſt all the diſorders of the mouth and throat, and is by ſome eſteemed a ſpecific in the ſcurvy.

Its leaves are ſtyptic, and bitter to the taſte, and ſtrike a ſtrong red upon blue paper; the root has the ſame effect, but in a more remiſs degree. The bark of it is of a fleſh colour, and ſtreaked, and the heart of a pale yellow. Experience confirms its efficacy in ſome diſorders of the mouth; the chewing it in a morning having been found an effectual remedy for the bleeding of the gums. *Muntingius de vera Herba Britan.*

BRIZE-*Vents*, or BRISE-*Vents*, a kind of ſhelters uſed by gardeners, who have not walls on the north ſide, to keep the cold winds from damaging their melon beds.

BROAD-SIDE, in the ſea language, a diſcharge of all the guns on one ſide of a ſhip at the ſame time.

BROCATE'LLE, a ſlight ſtuff made with cotton, or coarſe ſilk, in imitation of brocades. There are ſome all of ſilk, and others alſo of wool. That which was manufactured at Venice was always the moſt valued.

They alſo give the name of Brocatelle to another ſort of ſlight ſtuff, which is otherwiſe called ligature, or mezeline.

There is alſo a kind of marble, called Brocatelle.

BRO'CCOLI, among gardeners, the ſhoot of a ſort of cabbage. There are ſeveral ſorts of it, the Roman, the Neapolitan, and the black; but the Roman is far the beſt, and is therefore the only ſort now in uſe.

The ſeeds of this ſhould be ſown about the middle of May, in a looſe moiſt ſoil, when the young plants have eight leaves: they are to be tranſplanted, and ſet three inches diſtant; and, when they have grown there till the middle of July, they will be fit to plant out for ſtanding. They muſt be now ſet in ſome well-ſheltered ground, but not under the drip of trees, and at a foot and an half diſtance from one another. The ſoil ſhould be light, and, about the beginning of December, they will begin to ſhew their heads, which look ſomewhat like a cauliflower; from this time they will continue eatable to the end of March. When the heads divide, and begin to run up, they are to be cut, with about four inches of the ſtem to them; and, when theſe are cut off, about a month's time furniſhes a freſh crop from the ſame ſtock. They are to be ſtripped of their outward ſkin, and boiled; and, when perfectly fine, they are very little inferior to aſparagus. The beſt way to have them fine, is to get freſh ſeed every year from Italy; for they are very apt to degenerate. *Miller's Gard. Dict.*

BRO'KER (*Dict.*)—The Broker's profeſſion is very neceſſary in commerce, and renders it more eaſy, eſpecially in towns of great trade, there to have perſons of a good underſtanding, well known and eſteemed amongſt the merchants, workmen, and tradeſmen, to give them notice where they may meet with the merchandizes they may have occaſion for, or with the materials proper for their ſeveral works, or for their manufactures, and to find for thoſe who have manufactured any wares, or who would ſell them, perſons ready or willing to buy or barter them.

We may diſtinguiſh, as it were, two ſorts of Brokers; the one who may be called ſimply Brokers of merchandizes, and the other Brokers of manufactures, workmen, and tradeſmen. Their functions are alike; that is to ſay, they all contrive to make people buy, ſell, or barter, for the ſake of their commiſſion, or brokerage; but the object of their functions is, in ſome manner, different, the former facilitating between merchants the ſale of the merchandizes which they have bought by wholeſale, or which the foreign merchants bring to market; and the latter applying themſelves only to procure to the manufacturers, workmen, and artificers, the materials proper for their ſeveral manufactories, or works; or to afford them opportunities and means for ſelling the ſtuffs, and other merchandizes, they have worked.

Stock BROKERS are thoſe who are employed to buy and ſell ſhares in the joint ſtock of a company, or corporation.

As the practice of ſtock-jobbing has been carried to ſuch an exceſs, as became not only ruinous to a great number of private families, but even affected, or at leaſt might ſoon affect, even the public credit of the nation, the legiſlature thought fit to put a ſtop to it, or, at leaſt, to bring it within certain bounds, and under ſome regulation; and, therefore, the following act was paſſed:

By ſtatute 7 George II. cap. 8. ſect. 1. All contracts, upon which any premium ſhall be given for liberty to put upon, deliver, accept, or refuſe, any public ſtock, or ſecurities, and all wagers, puts, and refuſals, relating to the preſent or future price of ſtocks, or ſecurities, ſhall be void; and all premiums upon ſuch contracts, or wagers, ſhall be reſtored to the perſon who ſhall pay the ſame, who ſhall be at liberty, within ſix months from the making ſuch contracts, or laying ſuch wager, to ſue for the ſame, with double coſt; and it ſhall be ſufficient therein for the plaintiff to alledge, that the defendant is indebted to the plaintiff, or has received to the plaintiff's uſe the money, or premium, ſo paid, whereby the plaintiff's action accrued, according to the form of this ſtatute, without ſetting forth the ſpecial matter.

Sect. 2. Perſons who, by this act, ſhall be liable to be ſued, ſhall alſo be obliged to anſwer, upon oath, ſuch bill as ſhall be preferred in equity, for diſcovering any ſuch contract, or wager, and the premium given.

Sect. 3. Provided that the plaintiffs, relators, or informers, in ſuch bill, give ſecurity to anſwer coſt.

Sect. 4. Every perſon who ſhall make any ſuch contracts, upon which any premium ſhall be given, for liberty to put upon, deliver, accept, or refuſe, any public ſtock, or ſecurities, or any contracts in the nature of puts and refuſals, or ſhall lay any ſuch wager (except ſuch who ſhall, bona fide, ſue, and, with effect, proſecute, for the recovery of the premium paid by them; and except ſuch who ſhall voluntarily, before ſuit commenced, repay, or tender ſuch premium, as they ſhall have received; and alſo except ſuch who ſhall diſcover ſuch tranſactions in any court of equity) ſhall forfeit 500 l. and all perſons negotiating, or writing, ſuch contracts, ſhall likewiſe forfeit 500 l. which penalties may be recovered by action of debt, or information, in any of his majeſty's courts of record at Weſtminſter, one moiety to his majeſty, and the other moiety to them who ſhall ſue for the ſame.

Sect. 5. No money, or other conſideration, ſhall be voluntarily given, or received, for compounding any difference for the not delivering, or receiving, any public ſtock, or ſecurities; but all ſuch contracts ſhall be ſpecifically executed; and all perſons, who ſhall voluntarily compound ſuch difference, ſhall forfeit 100 l. one moiety to his majeſty, and the other moiety to them who ſhall ſue for the ſame.

Sect. 6. No perſon, who ſhall ſell ſtock, to be delivered and paid for, on a certain day, and which ſhall be refuſed, or neglected to be paid for, ſhall be obliged to transfer the ſame; but it ſhall be lawful to ſuch perſons to ſell ſuch ſtock to any other, and to receive, or recover from the perſon, who firſt contracted for the ſame, the damage which ſhall be ſuſtained.

Sect. 7. It ſhall be lawful for any perſon, who ſhall buy ſtock, to be accepted and paid for on a future day, and which ſhall be refuſed, or neglected to be transferred, to buy the like quantity of ſuch ſtock of any other perſon, at the current market-price, and to recover and receive, from the perſon who firſt contracted to deliver the ſame, the damage ſuſtained.

Sect. 8. All contracts which ſhall be made for the buying, or transferring, of ſtock, whereof the perſon, on whoſe behalf the contract ſhall be made to transfer the ſame, ſhall not, at the time of making ſuch contract, be actually poſſeſſed in his own name, or in the name of truſtees, ſhall be void; and every perſon on whoſe behalf, and with whoſe conſent, any contract ſhall be made to ſell ſtock, whereof ſuch perſon ſhall not be actually poſſeſſed in his own name, or in the name of truſtees, ſhall forfeit 500 l. and every broker, or agent, who ſhall negociate ſuch contract, and ſhall know that the perſon on whoſe behalf ſuch contract ſhall be made, is not poſſeſſed of ſuch ſtock, ſhall forfeit 100 l.

Sect. 9. Every perſon, receiving brokerage in the buying or diſpoſing of ſtocks, ſhall keep a Broker's book, in which he ſhall enter all contracts that he ſhall make, on the day of making ſuch contract, with the names of the principal parties; and ſuch Broker, who ſhall not keep ſuch book, or ſhall wilfully omit to enter any ſuch contract, ſhall forfeit 50 l.

This act was made perpetual, 10 George II. cap. 8.

Piece-BROKERS, a ſort of petty dealers in drapery, who ſell fragments or remnants of cloths, ſtuffs, ſilks, and the like, at under-price.

BRO'KERAGE, or brokage, the fee or commiſſion paid to a broker for his trouble in negociating buſineſs between perſon and perſon.

BROKERAGE. Thus they call at Bourdeaux a duty which is raiſed on all ſorts of merchandizes, of what nature ſoever they be, which are either imported, or exported, by ſea, in that city; except, however, thoſe merchandizes, on which new duties are laid; on theſe Brokerage is raiſed, when it is ſaid in the decrees, edicts, or declarations, that thoſe merchandizes ſhall pay no other duties, but thoſe laid upon them in the ſaid decrees, edicts, or declarations.

BRO'NTIÆ, among naturaliſts, a kind of figure ſtones, commonly hemiſpherical, and divided by five pointed zones.

The word is formed from the Greek βροντὴ, thunder, alluding to the popular tradition, that thoſe ſtones fall in thunder-ſhowers; whence they are alſo denominated thunder-ſtones, ſometimes polar ſtones, fairy-ſtones, and alſo ombriæ, by naturaliſts.

BRO'NZE, a factitious metal, chiefly uſed for the caſting of ſtatues and figures.

The word is French, where it is uſed more extenſively, ſo as to include all the compoſitions of braſs or copper, as for guns, bells, pots, or the like.

It is formed from the Italian Bronze, which ſignifies the ſame.

Copper medals are frequently called medals of Bronze.

The compoſition of Bronze is different; for the fineſt ſtatues, the mixture is half copper and half braſs, or latten. The Egyptians, whom ſome make the inventors of the art, uſed two-thirds braſs, and one-third copper.

BRONZE alſo denotes a colour prepared by the colour-men of Paris, wherewith to imitate Bronze.

There are two ſorts, the red Bronze, and the yellow or golden. The latter is made ſolely of copper-duſt, the fineſt and brighteſt that can be had; in the former is added a little quantity of red oker, well pulverized. They are both applied with varniſh. To prevent their turning greeniſh, the work muſt be dried over a chafing-diſh, as ſoon as bronzed.

BROO'DING, the act of an hen, or other bird, ſitting on a number of eggs, to keep them warm, till they hatch or produce young ones.

BROOM, a medicinal plant, growing plenteouſly on heathy grounds, and producing a yellow flower; reputed to be nephritic, hepatic, and ſplenetic; and, as ſuch, uſed to bring away gravel, and againſt cachexies and dropſies.

It roots deep, and, ſhedding no leaves, is continually ſucking the moiſture from the earth. The beſt method of deſtroying it, is the burning the land, then plowing it deep, and manuring it very well with dung and aſhes; the ſpreading on the land chalk or marle, or the manuring it with urine. If the ground be deſigned for paſture-land, it is beſt to cut it cloſe to the ground in May, when the ſap is ſtrong in it. By this artifice, the roots are deſtroyed; whereas, in the common way of pulling up the young plants, ſome ſtrings will be left, and the leaſt of theſe will grow. Foddering of cattle upon broomy land is one very good way of deſtroying the Broom, their urine killing the roots, and their treading the land making it leſs proper for the roots of this plant; for the Broom is never obſerved to grow in trodden places. This troubleſome and pernicious plant is not, however, without its uſe to the farmer; for, when well laid, it will make an excellent and laſting kind of thatch for barns.

BROOM-*Gall*, in natural hiſtory, a name given by authors to a remarkable ſpecies of galls found on the geniſta vulgaris, or common Broom.

BROWN, a duſky kind of a colour, inclining ſomewhat towards redneſs.

Dyers diſtinguiſh divers ſhades and gradations of Brown, a ſad Brown, London Brown, clove Brown, purple Brown, walnut-tree Brown, &c.

Spaniſh Brown is a dull red colour, uſed by houſe-painters, chiefly for priming, as being cheap and eaſy to work.

BRUSH, an aſſemblage of hairs or hog's briſtles, faſtened in the holes of a wooden handle or board, pierced for that purpoſe, ſerving to cleanſe divers bodies by rubbing therewith.

Sherman's BRUSH is made of wild boar's briſtles, and ſerves to lay the wool or nap of cloths, after ſheering it for the laſt time.

The manner of making Bruſhes, is by folding the hair or briſtle in two, and bringing it, by means of a packthread, which is engaged in the fold, through the holes wherewith the wood is pierced all over, being afterwards faſtened thereon with glue. When the holes are thus filled, they cut the ends of the hair, to make the ſurface even.

BRUSH, among painters, a large and coarſe kind of pencil, made of hog's briſtles, wherewith to lay the colours on their large pieces.

BRUSHES for painters are of divers ſhapes and ſizes, ſome round, others flat; the latter chiefly uſed for drawing lines, and in imitating olive and walnut work.

Plaiſterers have three kinds of implements wherewith they apply their plaiſter and white-waſh on walls, viz. ſtock-bruſhes, round Bruſhes, and pencils. *Moxon, Mechan. Exerc.* See the article PLAISTERING.

Wire BRUSHES are uſed by ſilver-ſmiths and gilders, for ſcrubbing ſilver, copper, or braſs pieces, in order to the gilding them.

BRUSH *Iron-ore* ſignifies a kind of ore full of ſtriæ, reſembling the hair of a bruſh.

BRUTE, an animal deſtitute of the faculty and uſe of reaſon.

The common opinion of the untaught and unprejudiced part of mankind ſeems to be, that the brutes have ſenſe, imagination,

nation, memory, and paſſion, but that they are void of underſtanding and reaſon; that is, in the language of philoſophers, they have the inferior faculties of the ſoul, but not the ſuperior. Nor will the diſtinction appear groundleſs to thoſe who attend to the difference between the objects of the mind, and its acts about thoſe objects; as alſo to the difference between the confuſed and diſtinct comprehenſion of any thing. How great a difference therefore is there between the faculties of Brutes, and thoſe of even a child, who can ſpeak, reckon, and perform the operations of arithmetic? Some philoſophers gravely tell us, that Brutes want ſpeech to expreſs themſelves; and aſſign this as a cauſe of their ſeeming want of underſtanding. But will not a parrot, brought up in a nurſery with children, learn to pronounce words ſooner than they; but will he, therefore, alſo learn to expreſs his thoughts, reckon, &c? Ought we, therefore, to ſay, that Brutes cannot ſpeak? It is true, Brutes do many things, from ſome principle incomprehenſible to us, although there are inſtances of a like principle in man; but it does not follow, that this principle is underſtanding and reaſon. A bee does not make honey, nor does an infant ſuck from reaſon. The like may be ſaid of many other actions of Brutes, as building their neſts, &c. What the true principle of ſuch actions is, may, perhaps, be beyond the power of human faculties to comprehend. But, whatever it be, it is far from putting Brutes on a level with man. The difference is immenſe; and thoſe who, in other reſpects, admit of inſenſible gradations from one order of beings to another, muſt own there is a vaſt chaſm between man and the moſt perfect Brutes. Mr. *Buffon's Hiſt. Natur.*

BU'BALUS, *the buffalo*, a ſort of wild bull, very common in many parts of Europe, and in the pope's territories, kept tame, for the ſake of the milk of the female, of which the famous cheeſes, called caſe de cavallo, are made. They are alſo commonly employed in the affairs of huſbandry, and have, for this purpoſe, a braſs or iron ring put through their noſes, and, by means of a rope, or thong of leather, put through this, they are managed at pleaſure; though, if ever ſo well tamed, they uſually keep ſomething of their native fierceneſs.

The buffalo is about the bigneſs of an Engliſh calf ſix months old, and pretty much like our Engliſh bull, excepting that it hath very ſhort horns, and a bunch or riſing on its back between the ſhoulders. See *plate* XIII. *fig.* 3. *Edwards's Hiſt. Birds.*

BU'BBLES (*Dict.*)—The black ſpots at the top of the water-bubble, and, in the middle of the object glaſſes, compreſſed together, are always ſurrounded by a multitude of concentric rings of all ſorts of colours; and, as the colour in every ring is the ſame quite round its circumference, and different in different rings, ſo it is manifeſt (from the ſpherical figure both of the object-glaſſes and of the Bubbles of water, and from the uniform gravity of the particles of the water ſubſiding gradually on all ſides from the top to the bottom) that the thickneſſes, both of the plate of air between the glaſſes and of the water-bubble, are alſo the ſame in every part of the ſame ring, and different in different rings; which ſhews that the particular colour of any ring depends upon a particular thickneſs of the plate of air, or ſhell of water, where the incident light of the open air is reflected to the eye. Rings of colours do alſo appear by light tranſmitted through the water-bubble, and through the object-glaſſes, held between the eye and the light; but their colours are different from thoſe that appear in the ſame places, by reflected light.

Theſe are the general appearances of the rings in the open air; but, when homogeneal light is caſt by a priſm upon the object-glaſſes in a dark room, the colour of all the rings, ſeen by light reflected from the glaſſes, is the ſame as of the light thrown upon them; and in the intervals between the coloured rings other dark rings appear like the ſpot in the middle; through all which the incident light is tranſmitted, and forms other intermediate rings of the ſame colour upon a white paper held behind the glaſſes, as repreſented in *plate* XI. *fig.* 1. It is alſo to be obſerved, that the diameters, breadth, and intervals of rings of homogeneal lights, of different colours, are all different; thoſe made by homogeneal red being the largeſt, and by homogeneal violet the leaſt; and thoſe of intermediate priſmatic colours are of intermediate ſizes. And from hence the origin of the different-coloured rings in the open air is manifeſt; namely, that the air between the glaſſes, according to its various thickneſs, is diſpoſed in ſome places to reflect and in others to tranſmit the light of any one colour; and in the ſame place to reflect that of one colour where it tranſmits that of another. The appearances are the ſame when water is between the object-glaſſes, only the rings are ſmaller.

Bubbles, a cant term, given to a kind of projects for raiſing money on imaginary grounds, much practiſed in France and England about the years 1719, 1720, and 1721.

The pretence of theſe ſchemes was the raiſing a capital for retrieving, ſetting on foot, or carrying on, ſome promiſing and uſeful branch of trade, manufacture, and machinery, or the like. To this end, propoſals were made out, ſhewing the advantages to be derived from the undertaking, and inviting perſons to be engaged in it. The ſum neceſſary to manage the affair, together with the profits expected from it, were divided into ſhares, or ſubſcriptions, to be purchaſed by any diſpoſed to adventure therein.

BU'BO, in zoology, a name uſed by ſome for the owl in general, but, by the more accurate naturaliſts, appropriated to the great horn-owl, called alſo, in ſome places, the eagle-owl. Some authors have deſcribed three ſpecies of this bird; but they ſeem to be only varieties of the ſame ſpecies, according to the difference of age, ſex, and other accidents.

BUCARDI'TES, *or bucardia*, in natural hiſtory, a name given by many authors to a ſtone, in ſome degree reſembling the figure of an ox's heart.

It is uſually of the ſubſtance of the coarſer ſtones, and is no other than a quantity of the matter of ſuch ſtones received, while moiſt, into the cavity of a large cockle; the cardo or hinge of this ſhell making a long and large dent in the formed maſs, which gives it a heart-like ſhape.

BUCA'RDIUM, in natural hiſtory, a name given by authors to a kind of heart-ſhell, reſembling an ox's heart in ſhape; it is of the genus of the cordiformes, or heart-ſhells, and differs from the other kind, in being of a more globular figure.

BU'CCINUM, *the trumpet-ſhell*, in natural hiſtory, the name of a large genus of ſhells, the characters of which are theſe; they are univalve ſhells of the form of a trumpet, according to old pictures, with a wide belly and a large broad and elongated mouth. They have a diſtinct and regular tail, uſually long, though ſometimes ſhort; they have a crooked beak, and the clavicle is often elevated, though ſometimes depreſſed and contabulated. See *Plate* V. *fig.* 11, 12, 13.

The family of the Buccina, when examined ever ſo ſtrictly, is very large; but according to the general cuſtom of authors, of confounding together ſeveral genera under the name, it is uſually made to appear much larger then it really is. Liſter has made it comprehend a vaſt number of ſhells, by confounding with it the families of the murex and purpura.

It is not indeed peculiar to this author to have confounded theſe genera; thoſe who went before him have done the ſame: and Pliny has compriſed the Buccinum, murex, and purpura under the general name ceryx.

To avoid the general confuſion, which ariſes from not diſtinguiſhing the families of the Buccinum, murex, purpura, and vis, or ſcrew-ſhell, it will be proper to obſerve that there are regular characters, which diſtinguiſh them all one from another; the characters are theſe:

The Buccinum differs from the purpura, in that it has a very long mouth of an oval figure, and has an elevated head; whereas the purpura has a round mouth, and a head ſomewhat flatted. The tail of the purpura is alſo uſually furrowed, and is ſhorter than that of the Buccinum.

The Buccinum differs alſo from the murex in having a longer tail, by the ſmoothneſs and variety of colours of its coat, and by having a larger mouth leſs furniſhed with teeth; the murex having a ſmaller and longer ſhaped mouth, its ſurface covered with points or ſpires, and ſeveral teeth.

It is eaſier to diſtinguiſh the Buccinum from the ſcrew-ſhell, as this is always more long and ſlender than the Buccinum; it has alſo a flat mouth and has rarely any tail. Theſe are all very large families in nature, and it is highly neceſſary for the naturaliſts to be well acquainted with them. The moſt ſingular ſpecies of the Buccinum claſs is one that hath its mouth turned the contrary way to all other ſhells: this has been thence called by authors the unique and the ſans pareil. Aldrovand is of opinion that the Buccina may be ranked among the bivalve ſhells; becauſe they have an operculum, or ſhelly ſubſtance, fixed to the end of their body, which occaſionally ſtops up the aperture of the mouth; but, if this were a ſufficient reaſon, we ſhould have many more genera to add to the bivalves, particularly the ſnails of ſeveral kinds.

The Buccina generate in warm months, and ſome ſpecies of them have been frequently remaining in pairs together, upon the rocks deſerted by the tide on that occaſion. Theſe have been thence ſuppoſed to be of a different genus, and have been called buccina litoralia; they are uſually found in copulation early in the morning.

BUCK, a male horned beaſt of venery or chace, whoſe female is denominated a doe.

A Buck the firſt year is called a fawn, the ſecond a prickat, the third a ſorel, the fourth a ſore, the fifth a Buck of the firſt head, and the ſixth a great Buck. *Coſ. Gent. Recr.*

Buck, is alſo applied to the male of the hare and rabbit kind. Hares commonly go to Buck in January, February, and March, and ſometimes all the warm months; ſometimes they ſeek the Buck ſeven or eight miles from the place where they ſit. *Cox. Libat.*

BUCKING, an operation performed on linen cloth and yarn, to render them ſomewhat white, by working them with lye made with aſhes.

Bucking *of cloth* is the firſt ſtep or degree of whitening it.

To drive a buck of yarn, they firſt cover the bottom of the Bucking-tub with fine aſhes of the aſh-tree, then ſpread the yarn thereon, then cover it again with aſhes, and thus ſtratum ſuper ſtratum, till the yarn is all in, when they cover the whole with a Bucking-cloth, and lay on it more aſhes and pour in warm water, till the tub be full, and let it ſtand all night. Next morning they let the lye run into another veſſel, and, as it waſtes, fill up the tub with warm water from a kettle, and, as this waſtes, fill it up with the lye that runs from the Bucking-tub; ſtill obſerving to make the lye hotter and hotter, till it boils. Thus are both the tub and kettle to be ſupplied for at leaſt four hours, which is called driving a buck of yarn. *Hought. Collect.*

BU'CKLE, in matters of trade, a little metalline machine, whereby to retain and keep faſt certain parts of the habit, as well as of the harneſs of horſes, &c.

Buckles are of divers ſorts, as ſhoe and garter Buckles; ſome round, others ſquare, or oval, or cut, each of which have their reſpective artificers by whom they are made.

The like may be ſaid of the great variety of Buckles belonging to the pack and hackney ſaddles, ſuch as ſets, black or oiled Buckles, ſanguine Buckles, crupper Buckles, breaſt-plate Buckles, and ſurcingle Buckles: and to theſe may be added divers other Buckles, made promiſcuouſly with the former, as the heſter Buckle, plain and knobbed, for the white bridles, and the open and plain crown Buckles for the black; and ſo the Poland Buckle, the peaſe Buckle, chaſed Buckles, Dutch and Iriſh Buckles, which are braſs, and made by the copper-ſmith. *Plot. Nat. Hiſt. Staffordſhire.*

BU'CKRAM, a ſort of coarſe cloth, made of hemp gummed, calendered, and dyed ſeveral colours.

Buckrams are ſold wholeſale by the dozen of ſmall pieces, or remnants, each about four ells long, and broad according to the pieces from which they were cut. Sometimes they uſe new pieces of linen cloth to make Buckrams of; but moſt commonly old ſheets, and old pieces of ſails. They make a great many at Paris, and they get, alſo, vaſt quantities from Normandy, particularly from Caen, Roan, and Alencon.

BUC'KTHORN, *rhamnus*, a hedge tree or buſh, whoſe branches are full of long ſtiff thorns, and yellowiſh green leaves about as big as the ſloe-tree, more neatly ſerrated about the edges. The flowers grow ſeveral together, being ſmall, four-leaved, and yellow, which are ſucceeded by little round black berries yielding, when ripe, a purpliſh bitter juice, and having three or four angular ſeeds. It grows in woods and hedges, and flowers in June, the berries being ripe about the latter end of September. See *Plate* IX. *fig.* 2. where *u* is the plant, *f* the flower, *g* the berry, *h* the ſeed.

The juice of the berries purges ſerous watery humours pretty briſkly, and is good againſt the dropſy, gout, jaundice, and ſcurvy, and very ſerviceable againſt the itch, and all manner of eruptions on the ſkin.

The berries of which are ordered by the College of Phyſicians for medicinal uſe; but particularly for making a ſyrup, which was formerly in great uſe; but of late the perſons who ſupply the markets, have gathered ſeveral other ſorts of berries, which they have either mixed with thoſe of the Buckthorn, or have wholly ſubſtituted them in their place. Theſe are the berries of the frangula, cornus fœmina, &c. which mixture hath ſpoiled the ſyrup, and rendered it leſs eſteemed. But whoever purchaſes the Buckthorn berries, may diſtinguiſh whether they are right or not, by opening them, and obſerving the number of ſeeds in each; for theſe have commonly four, whereas the frangula has but two, and the cornus fœmina but one; as alſo by bruiſing of the berries on white paper, the juice giving a green tincture.

By the chymical analyſis, the berries yield a great deal of acid phlegm and oil, and a little fixed ſalt and earth. They are purgative, and very good to remove ſerous humours in chronical diſeaſes; by which it relieves thoſe that have the gout, palſy, cachexy, ſciatica, and rheumatiſm. Take a drachm, or a drachm and a half of its berries, powdered and mixed with a little conſerve of orange flowers. They boil fifteen or twenty berries in common broth, adding half a drachm of cream of tartar; ſtrain it through a cloth, and give it the patient to drink; ſome mix with it two drachms of tincture of ſteel, or boil half an ounce of iron ruſt in a rag tied up in a knot, for the green ſickneſs. The moſt common uſe of theſe berries is to make a ſyrup of them. The doſe is from one ounce to two, and even to three, when neceſſary; but it is proper to eat ſome pottage after taking it. *Martyn's Tournefort.*

Syrup of BUCKTHORN-*berries. Syrupus de Spina Cervina.*

The College Diſpenſatory orders it to be thus made:

Take of the juice of freſh ripe Buckthorn berries one gallon, cinnamon, ginger, and nutmegs, each one ounce, the fineſt ſugar ſeven pounds; let the juice ſtand for ſeveral days to ſettle; then ſtrain it, and infuſe the ſpices in part of it; boil the reſt, and, towards the end of the time, add that part of it in which the ſpices were infuſed, being firſt ſtrained; let the whole be reduced by boiling to four pints, to which add the ſugar, and make a ſyrup of them.

The Edinburgh Diſpenſatory directs it in the following manner:

Take of the clarified juice of ripe Buckthorn berries, three quarts; brown ſugar four pounds; and with a gentle fire boil them to a ſyrup; and, while it is yet warm, mix therewith a drachm of the diſtilled oil of cloves, received upon a little ſugar.

To add the corrector here, in the form of a chymical oil, ſaves the trouble of ſteeping the ſpices ordered for that purpoſe in the London Diſpenſatory, and anſwers the end more certainly.

Sydenham obſerves, that ſyrup of Buckthorn alone evacuates water plentifully and little elſe, without diſturbing the blood, or rendering the urine high-coloured, as other purgatives generally do, and has only one bad quality, as occaſioning great thirſt during the operation. But if it be given, even in the greateſt doſe, to ſuch as are difficult to purge, it will neither give any motions, nor carry off enough of water.

Of Buckthorn berries are made three ſeveral ſorts of colours; being gathered green, and kept dry, they are called ſap-berries; which, being ſteeped in allum-water, give a fair yellow colour, uſed by painters, bookbinders, and leather-dreſſers; who alſo make a green colour, called ſap-green, taken from the berries when they are black. Theſe being bruiſed, and put into a braſs kettle, and there ſuffered to remain three or four days, with ſome beaten alum put to them, they are afterwards preſſed, and the liquor uſually put into bladders, and hung up till it be dry; this is afterwards diſſolved in water or wine, but canary is the beſt, to preſerve the colour from ſtarving. The third is of a purpliſh colour, made of the berries, ſuffered to grow upon the buſhes till the middle or end of November, when they are ready to fall of themſelves.

BUCK-WHEAT, *fagopyrum*, in botany, a genus of plants, whoſe characters are:—the flowers are ſpecious, growing in a ſpike, or branched from the wings of the leaves: the cup of the flower is divided into five parts, which reſemble the petals of a flower: the ſeeds are black, and three-cornered.

Buck-wheat is cultivated in many parts of England, and is a great improvement to dry barren lands. The beſt ſeaſon for ſowing the ſeed is in May: one buſhel will ſow an acre. The ground ſhould be plowed and dreſſed in the ſame manner as for barley; and, if the ſoil is not very lean, it will yield a very great increaſe, as fifty or ſixty buſhels upon an acre, and is excellent food for hogs, poultry, &c. The flour of it is very white, and makes a very good ſort of pancake, if mixed with a little wheat flour. The ſtraw is good fodder for cattle; and the grain, given to horſes amongſt their oats, will make them thrive; but it muſt be broken in a mill, otherwiſe it is apt to paſs through the cattle whole.

It is commonly late in the ſeaſon before it is ripe; but there is no great danger of the ſeeds failing, nor of ſuffering by wet after it is mown: it muſt lie ſeveral days to dry, that the ſtalks (which are hard) may wither before it is houſed.

Buck-wheat is ſometimes ſown very thick, and ſuffered to grow until it is near flowering, and is then plowed in, which makes a very good lay for wheat or rye: but ſome people eſteem it the better way to feed cattle with it, eſpecially milch-cows, which, they ſay, will cauſe them to give a great deal of milk, and make both the butter and cheeſe very good. This will alſo afford food for cattle in the drieſt time, when all other graſs is burnt up. *Miller's Gard. Dict.*

BU'DDLE, in minerology, a name given by the Engliſh dreſſers of the ores of metals to a ſort of frame made to receive the ore after its firſt ſeparation from its groſſeſt foulneſs.

The ore is firſt beaten to powder in wooden troughs, through which there runs a continual ſtream of water, which carries ſuch of it as is fine enough to paſs a grating, which is placed at one end of the trough; this falls into a long ſquare receiver of wood, called the launder; the heavieſt and pureſt of the ore, falling at the head of the launder, is taken out ſeparately, and requires little more care or trouble; but the other parts, which ſpread over the middle and lower end of the launder, is thrown into the Buddle, which is a long ſquare frame of boards, about four feet deep, ſix long, and three wide; in this there ſtands a man bare-footed, with a trambling ſhovel in his hand, to caſt up the ore about an inch thick, upon a ſquare board placed before him as high as his middle; this is termed the Buddle-head; and the man dexterouſly, with one edge of his ſhovel, cuts and divides it longways, in reſpect of himſelf, about half an inch aſunder, in theſe little cuts; the water, coming gently from an edge of an upper plain board, carries away the filth and lighter parts of the prepared ore firſt, and then the metalline part immediately after, all falling down into the Buddle, where, with his bare feet, he ſtrokes it and ſmooths it, that the water and other heterogeneous matter may the ſooner paſs off from it.

When the Buddle by this means grows full, the ore is taken out; that at the head part, being the fineſt and pureſt, is taken out ſeparate from the reſt, as from the launder. The reſt is again trampled in the ſame Buddle; but the head, or, as it is called, the forehead of this Buddle, and of the launder, are mixed together, and carried to another Buddle, and trampled as at firſt. The forehead of this laſt Buddle, that is, that part of the ore which has fallen at the head, is carried to what they call a drawing Buddle, whoſe difference from the reſt is only this, that it has no tye, but only a plain ſloping board, on which it is once more waſhed with the trambling ſhovel. Tin ore, when it is taken from this, is called black-tin, and this is found to be compleatly ready for the blowing-houſe. *Philoſ. Tranſ.* N°. 69.

BU'DDLING *of calamine*, denotes the operation of cleanſing it

PLATE IX. *Engraved for the Supplement* *Facing* Buckthorn.

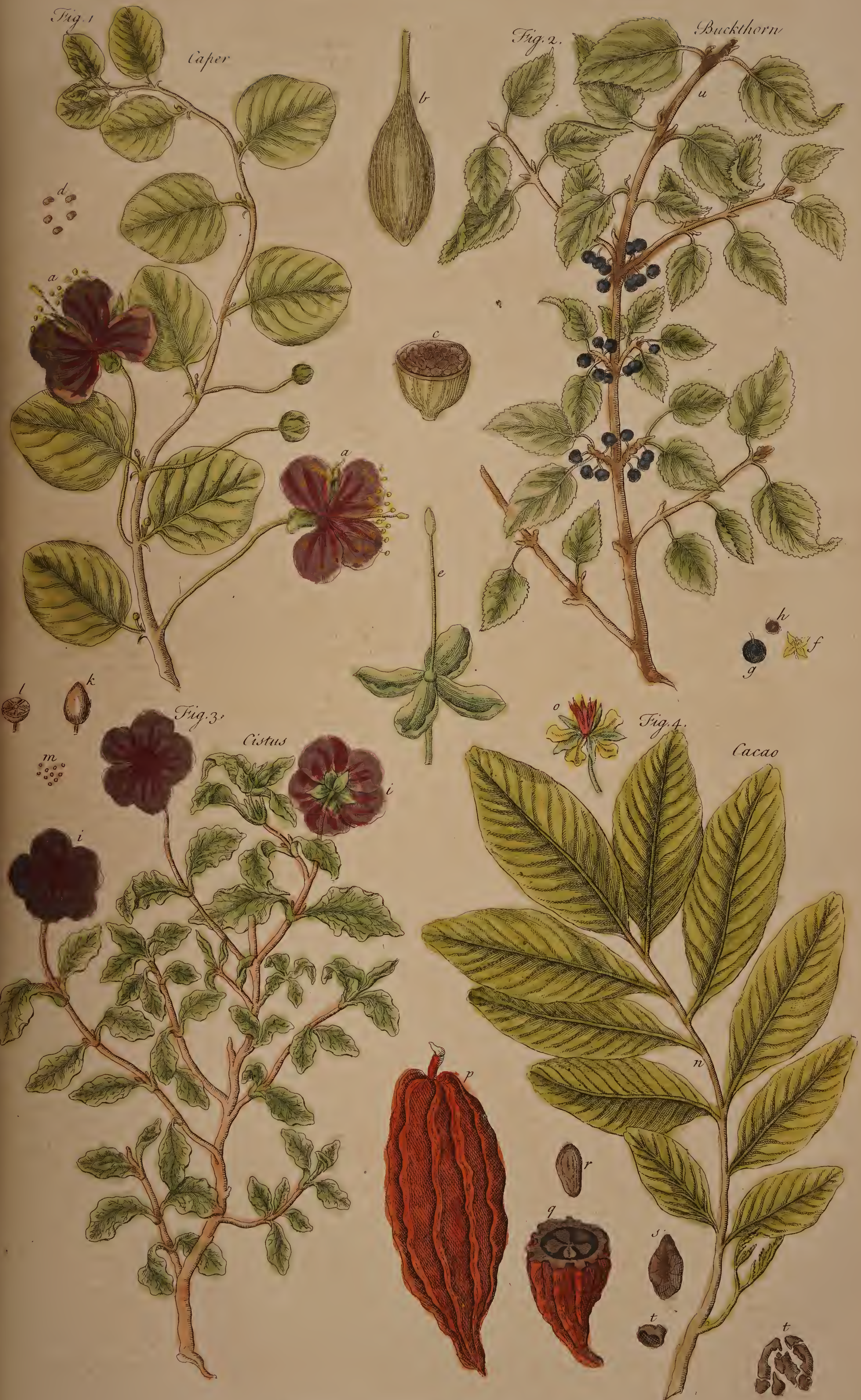

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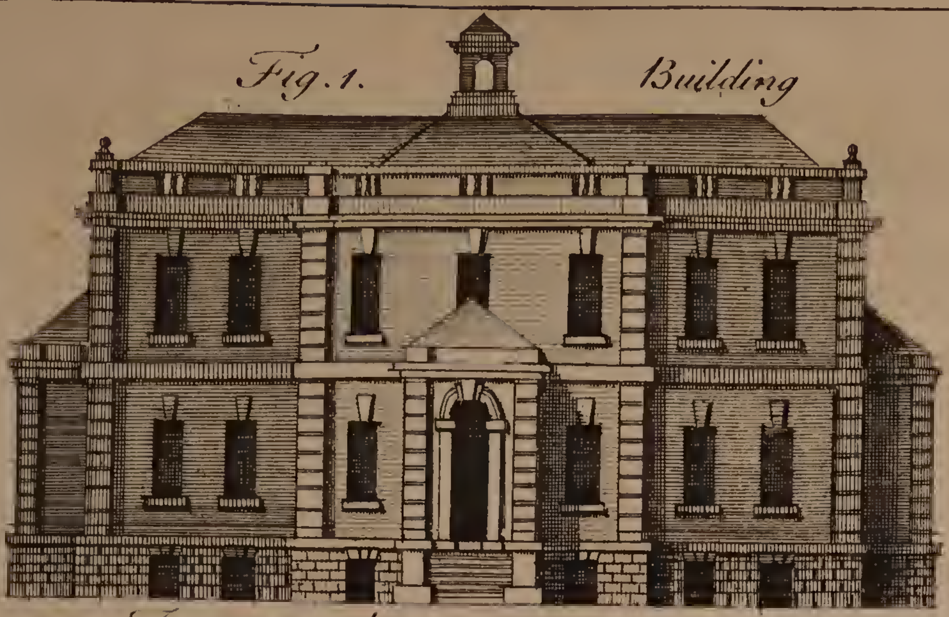
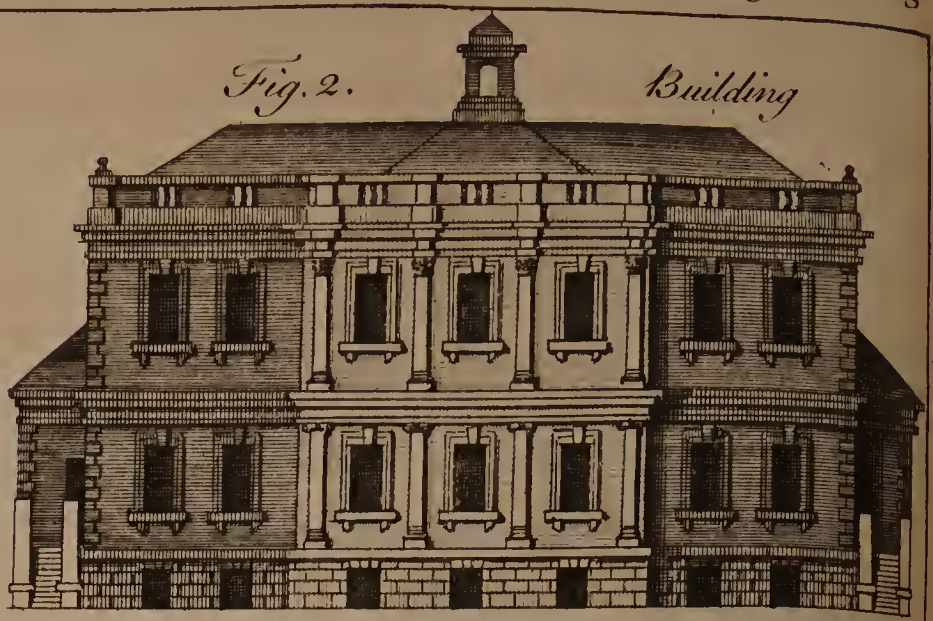
Fig. 1. *Building*



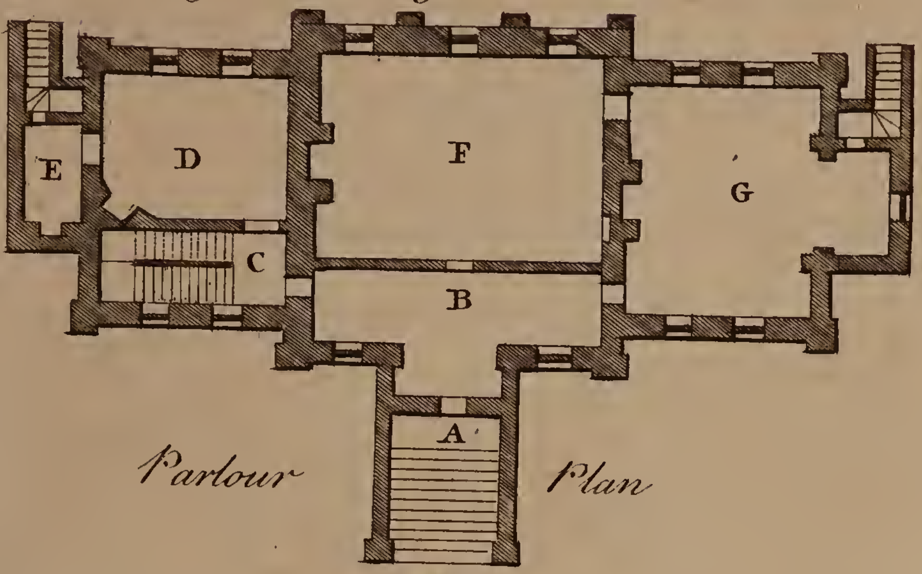
Front extends 79 – 9

Fig. 2. *Building*



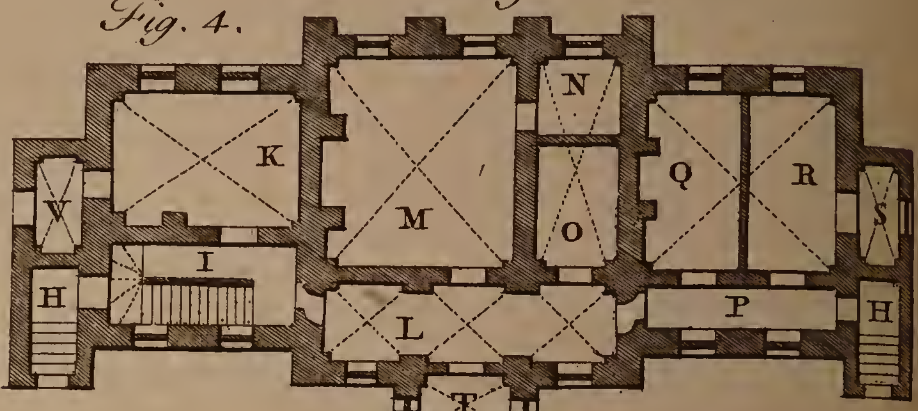
Garden Front extends 79 – 9

Fig. 3. Building.



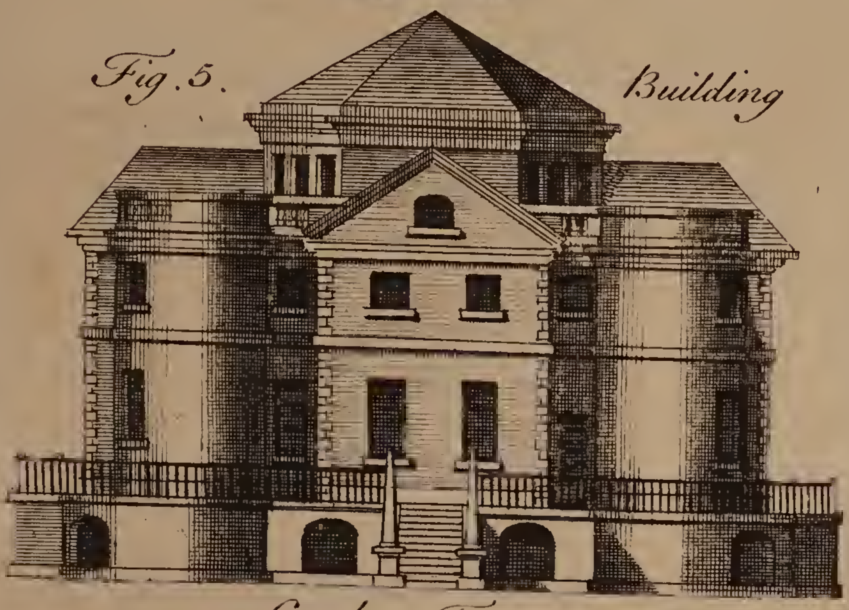
Parlour Plan

Fig. 4. *Building.*



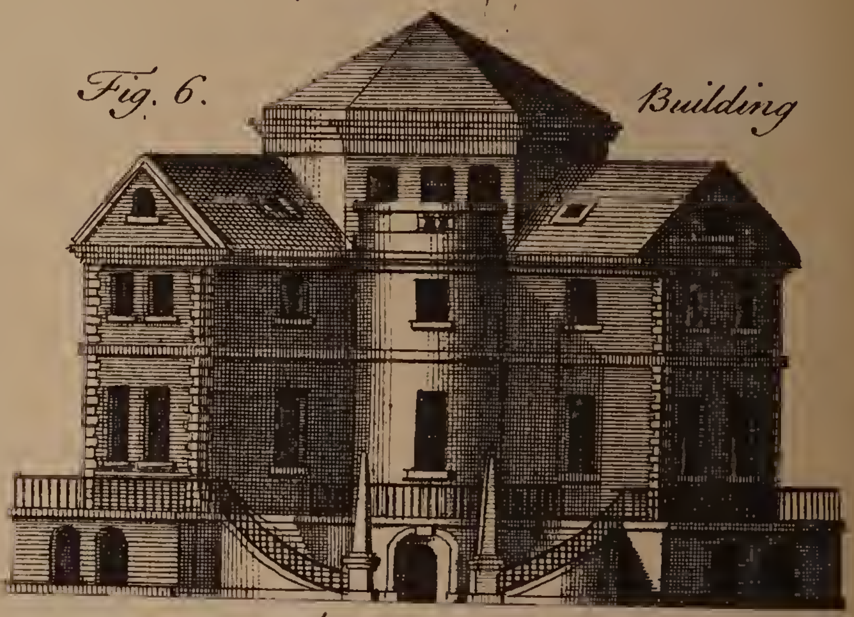
Cellar Plan

Fig. 5. *Building*



Garden Front

Fig. 6. *Building*



Front to Court

Scale of Feet

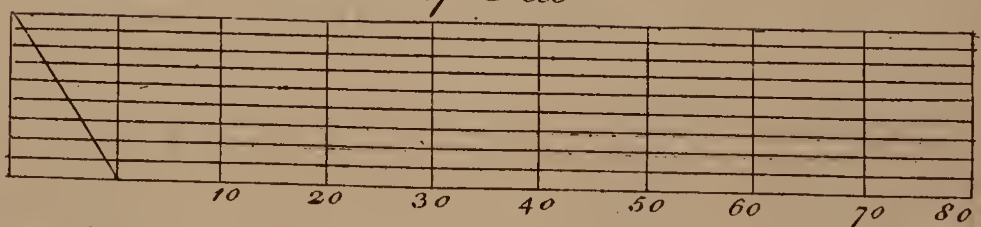


Fig. 7. *Building.*

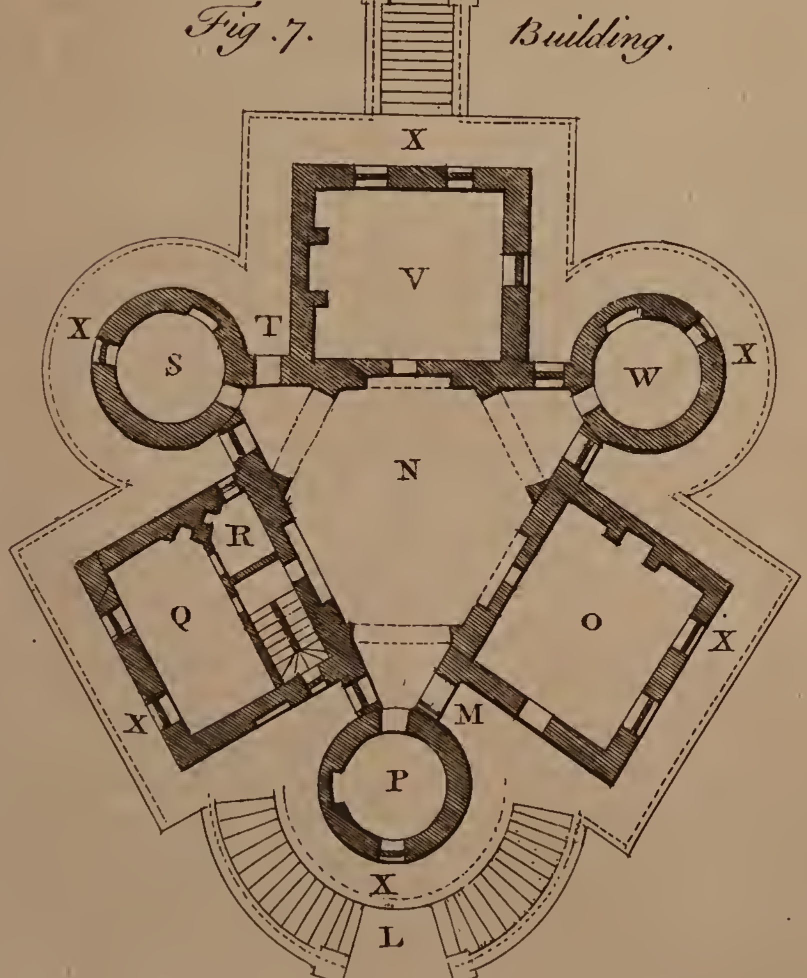
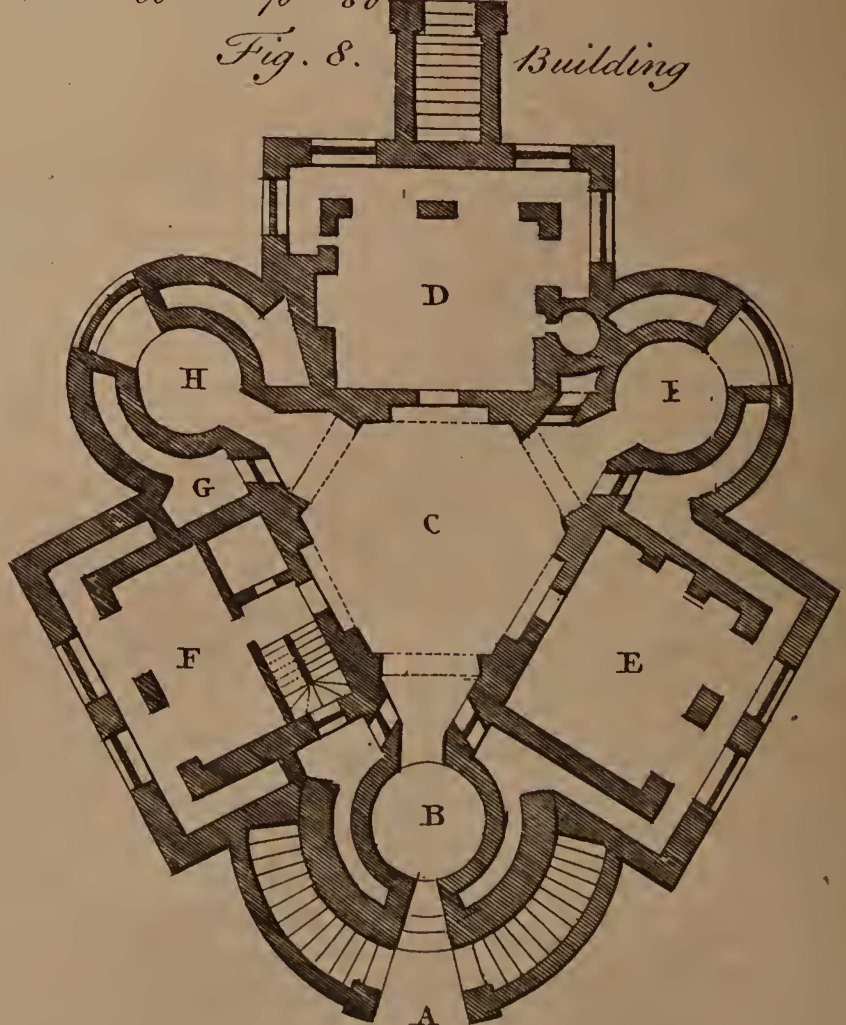


Fig. 8. *Building*



Printed for J. Hinton in Newgate Street

from filth, by waſhing and picking it, preparatory to the baking it in the oven. *Phil. Tranſ.* N°. 198.

Buddling-*diſh*, a ſmall ſhallow veſſel, like the baſons of a pair of ſcales, for the waſhing of ores of metals by the hand. *Shaw's Lect.*

BUG'LOSSUM, bugloſs, in botany, a phyſical plant, which, from a long, thick, brown root, ſends forth large, rough, hairy leaves, leſs prickly than borrage, half a foot long, narrow, and ſharp-pointed. The ſtalks ariſe to the height of two or three feet; full of ſhort ſtiff hairs, on which grow long narrow leaves, ſet on without foot-ſtalks. The flowers grow ſeveral together, at the top of the branches, in long rough calyces, of a ſingle leaf, cut into five round partitions, of a purple colour at their firſt appearing, and turning to a bright blue as they ſtand, and are ſucceeded by four-cornered rough ſeeds.

Bugloſs is uſually planted in gardens, and flowers in June and July. The leaves, flowers, and ſometimes the root, are uſed.

Bugloſs is much of the nature of borrage, being accounted cordial, and good to exhilarate the ſpirits, and drive away melancholy; and is uſeful againſt hypochondriac and hyſteric diſorders.

The flowers are amongſt the number of the four cordial flowers. *Miller's Bot. Off.*

The roots are very glutinous, and gives a deep tincture of red to blue paper; the flowers give it but very little, and the leaves hardly any at all: ſo that probably the ſal ammoniac in this plant is involved in a glutinous juice, in which the earth and ſulphur are predominant. The Bugloſs moiſtens, cools, and gives great relief to melancholy perſons; it is good to diſſipate the defluxions of the breaſt, and an obſtinate cough. The juice is drank from three ounces to ſix. The ptiſan is taken by glaſs-fulls. The roots and leaves are uſed in cooling broths, and this plant cools no otherwiſe than by reſtoring the motion of the blood, which ſtagnates and heats the parts wherein its circulation is retarded. Bugloſs flowers are uſed after the manner of tea. A conſerve is made of the flowers. The ſyrup made with the juice of the leaves of Bugloſs gives great relief to melancholy perſons: this juice is employed in the ſimple Byzantine ſyrup, and the compound one of Meſue. It enters alſo as an ingredient in Fernelius's ſyrup of ſpleen-wort. *Martyn's Tournefort.*

Buglossum *Silveſtre*, wild bugloſs.—This is a much leſs plant than the garden kind, growing not above a foot high, with a ſmall whitiſh root, which dies yearly: the leaves are long and narrow, but broader, and roundiſh-pointed at the end, rough and prickly, like borrage. The ſtalks are thick, ſucculent, and prickly, cloathed with narrow and ſharp-pointed leaves, ſet on without foot-ſtalks. The flowers grow on the tops of the ſtalks, in ſhape like the flowers of garden bugloſs, but leſs, and of a light blue colour; the ſeeds are alſo like the ſeeds of that. It grows by hedges and way-ſides, and among the corn; and flowers in May.

This wild Bugloſs is but ſeldom uſed, though it is ſaid to have the ſame virtue with the garden, but in a lower degree, and, for want of that, may ſerve to ſupply its place. *Miller's Bott. Off.*

BU'GULA, bugle, in botany, a plant having a ſmall ſtringy root, ſending forth ſeveral ſtalks of different forms; ſome roundiſh, and lying along, and creeping on the ground, ſending out fibrous roots from the joints; the others, which grow erect, and bear the flowers, are ſquare, beſet with but few leaves, ſtanding in pairs oppoſite to one another; the lower on long foot-ſtalks, the upper on very ſhort ones; they are oblong, ſomewhat crenated about the edges, an inch and half long, and an inch broad, of a dull green colour, and oftentimes with a daſh of purple: The ſtalks are eight or nine inches high, having the flowers growing at the top, in looſe ſpikes, whorle faſhion, with two ſmall browniſh leaves under each whorle. They are of a blue colour, and labiated, but have the galea ſo ſmall, that it is hardly diſcernible. When the flowers are paſt, they are ſucceeded by ſmall longiſh ſeeds, in fine pointed calyces. It grows in woods and hedges, and flowers in May.

Bugle is a noted vulnerary plant, and uſed inwardly and outwardly for all kinds of bruiſes, wounds, and contuſions, as likewiſe for ſores and ulcers, for ſpitting of blood, and hæmorrhages from any part. It is alſo aperitive and diuretic, and good to open obſtructions of the kidneys, and provoke urine. *Miller's Bot. Off.*

This plant is bitter, deterſive, and gives a faint red colour to blue paper. It is employed in vulnerary potions, ptiſans, and apozems; the dyſentery, fluor albus, and diſeaſes of the throat, ulcers and thruſhes in the mouth. The clarified juice of Bugle has the ſame virtues; it is uſed in plaiſters; Camerarius and Dodonæus preſcribed it for obſtructions of the liver. It contains ſome ſal ammoniac involved in ſulphur. *Martyn's Tournefort.*

BU'ILDING *(Dict.)*—In the diſtribution of lodging-rooms, in a building, it is a popular and ancient fault, eſpecially among the Italians, to caſt the partitions ſo, as, when the doors are all open, a man may ſee through the whole houſe; grounded on the ambition of ſhewing a ſtranger all the furniture at once: an intolerable hardſhip on all the chambers, except the inmoſt, where none can arrive but through all the reſt, unleſs the walls be extreme thick for ſecret paſſages: nor will this ſerve the turn, without at leaſt three doors to each chamber; a thing inexcuſable, except in hot countries: beſides its being a weakening to the Building, and the neceſſity it occaſions of making as many common great rooms as there are ſtories, which devours a great deal of room, better employed in places of retreat; and muſt likewiſe be dark, as running through the middle of the houſe.

In the compartition, the architect will have occaſion for frequent ſhifts; through which his own ſagacity, more than any rules, muſt conduct him. Thus he will be frequently put to ſtruggle with ſcarcity of ground; ſometimes to damn one room for the benefit of the reſt, as to hide a buttery under a ſtair-caſe, &c. at other times, to make thoſe the moſt beautiful which are moſt in ſight: and to leave the reſt, like a painter, in the ſhadow, &c.

For the covering of the Building; this is the laſt in the execution, but the firſt in the intention: for who would build, but to ſhelter? In the covering, or roof, there are two extremes to be avoided, the making it too heavy or too light: the firſt will preſs too much on the underwork; the latter has a more ſecret inconvenience; for the cover is not only a bare defence, but a band or ligature to the whole Building, and therefore requires a reaſonable weight. Indeed, of the two extremes, a houſe top-heavy is the worſt. Care is likewiſe to be taken, the preſſure be equal on each ſide; and Palladio wiſhes, that the whole burden might not be laid on the outward walls, but that the inner likewiſe bear their ſhare.—The Italians are very curious in the proportion and gracefulneſs of the pent or ſlopineſs of the roof; dividing the whole breadth into nine parts, whereof two ſerve for the height of the higheſt top or ridge from the loweſt: but, in this point, regard muſt be had to the quality of the region; for, as Palladio inſinuates, thoſe climates which fear the falling of much ſnow, ought to have more inclining pentices than others.

The ſtrength of a Building is ſometimes much impaired by the erecting it, by reaſon of the maſter not having prepared either ſufficient materials, or money, before he ſet about Building. For, when Buildings are erected by fits and pauſes, by doing firſt one piece, and then another, the work dries, and ſinks unequally; by which means the wall becomes full of chinks and crevices: and therefore this way of Building by fits is condemned by all authors.

As for beauty: let not the front look a-ſlant upon a ſtranger, but accoſt him right at his entrance. Uniformity and proportion are very pleaſing to the eye. And it is obſervable, that free-ſtone, like a fair complexion, grows old, whilſt bricks keep their beauty longeſt.

Let the offices keep their due diſtance from the manſion-houſe; thoſe are too familiar which preſume to be of the ſame pile with it.

The ſame may be ſaid of ſtables and barns; without which, a houſe is like a city without works: it can never hold out long. It is not only very inconvenient, but rather a blemiſh than a beauty to a Building, to ſee the barns and ſtables too near the houſe; becauſe cattle, poultry, and ſuch-like, muſt be kept near them; which will be an annoyance to an houſe.

Gardens ought alſo to be diſpoſed in their proper place. When God planted a garden eaſtward, he made to grow out of the ground every tree pleaſant to the ſight, and good for food. Sure (ſays Dr. Fuller) he knew better what was proper to a garden, than thoſe who now-a-days only feed their eyes, and ſtarve their taſte and ſmell.

Mr. Worlidge adviſes, that the garden join to one, if not more ſides of the houſe. For what can be more pleaſant and beautiful, for the moſt part of the year, than to look out of the parlour and chamber-windows into gardens?

For beauty, ſays he, let there be alſo courts or yards, kept from cattle, poultry, &c. and planted with trees, to ſhade, defend, and refreſh your houſe: and the walls alſo planted with vines, and other wall-fruit: all which will add pleaſure and beauty to your habitation.

Thus much for the principal or eſſential part of a Building.—For the acceſſories, or ornaments, they are fetched from painting and ſculpture. The chief things to be regarded in the firſt, are, that no room have too much, which will occaſion a ſurfeit; except in galleries, or the like: that the beſt pieces be placed where there are the feweſt lights: rooms with ſeveral windows are enemies to painters, nor can any pictures be ſeen in perfection, unleſs illumined, like nature, with a ſingle light: that in the diſpoſition regard be had to the poſture of the painter in working, which is the moſt natural for the poſture of the ſpectator; and that they be accommodated to the intentions of the room they are uſed in.

For ſculpture it muſt be obſerved, that it be not too abundant; eſpecially at the firſt approach of a Building, or at the entrance, where a Doric ornament is much preferable to a Corinthian one: that the niches, if they contain figures of white ſtone, be not coloured in their concavity too black, but rather duſky; the ſight being diſpleaſed with too ſudden departures from one extreme to another. That fine ſculptures have the advantage of nearneſs, and coarſer of diſtance; and that, in placing of figures aloft, they be reclined a little forwards: becauſe, the viſual ray, extended to the head of the figure, is longer than that reaching to its feet, which will of neceſſity make that part appear further off: ſo that, to reduce it to an erect poſture, it muſt be made to ſtoop a little forward. M. le Clerc, however, will not allow of this reſupination, but will have every part in its juſt perpendicular.

As to the ſtone and ſtucco, uſed in Buildings, which are freſh and white at firſt, and are commonly ſuppoſed to be diſcoloured with the air, moiſture, ſmoak, &c. the true cauſe thereof is, that they become covered with a minute ſpecies of plants, which alter their colour. A ſort of lichens yellowiſh, browniſh, or greeniſh, which commonly grow on the barks of trees, do grow alſo on ſtones, mortar, plaiſter, and even on the ſlates of houſes, being propagated by little light ſeeds, diſperſed by the wind, rain, &c. The beſt preſervative, known, is a coat of lime. *Build. Dict.*

Explanation of *Plate* X.

Fig. 1, 2, 3, 4, The cellar and parlour plans with the two elevations of a houſe, ſeventy-nine feet nine inches front, and are divided as follows.

Fig. 3. A, Front ſteps.

B, Hall or paſſage fourteen feet wide in the middle, and eight feet at each end.

C, Stairs eighteen feet by ſeven feet ſix inches.

D, Parlour eighteen feet by fourteen feet.

E, Cloſet nine feet by ſix feet.

F, Great drawing-room twenty-eight feet three inches by twenty feet.

G, Dining-room twenty-two feet by eighteen feet, with a receſs for a ſide-board ten feet by eight feet.

This ſtory is fourteen feet high in the clear, and that over it thirteen feet, which may be divided into three bed-chambers; the room over D muſt be equal to that below, next to which take eight feet four inches from the room over F, and divide it into two cloſets, which will be each nine feet nine inches by eight feet; that to the front (by making a door through the wall) will be a dreſſing cloſet for the room over D, and the other will be dark, which may open to the paſſage; then the room over F will be nineteen feet eleven inches by twenty feet, its chimney being cut off by the dreſſing cloſet; fix one at the back of that in the room over G, then take, from the garden front of the room over G, ſeven feet four inches, and divide it into two dreſſing cloſets, which will be each eight feet ten inches by ſeven feet: and the room over G will be eighteen feet by fourteen feet eight inches; the chimney may be fixed in the angle at the ſide of that which may be made in the dreſſing cloſet; the chimney for the room over G may be fixed in the angle of the Building.

N. B. The plan of the great room F is a diagonal proportion, its length being equal to the diagonal or hypothenuſe of a ſquare, whoſe ſide is equal to the width of the room.

The cellar plan, *fig.* 4.

Let the height of the lower offices be nine feet in the clear; the parlour floor is five feet ſix inches above the ſurface of the earth, from which, take one foot four inches for the thickneſs of the vaulted arch with joiſt and board, and four feet two inches remains, which is the height of its ſofeta, above the ſurface, and ſhews that the floor of the offices muſt be ſunk four feet ten inches below to make the clear of the ſtory nine feet; the plan is divided as follows:

H H, Steps leading down to the offices.

I, Paſſage and ſtairs ſeventeen feet ſix inches by ſeven feet three inches.

K, Houſe-keeper's room ſeventeen feet ſix inches by thirteen feet ſix inches.

L, Paſſage ſeven feet three inches wide.

M, Kitchen nineteen feet three inches by eighteen feet.

N, Larder eight feet ſix inches by eight feet.

O, Cellar ten feet eleven inches by eight feet.

P, Paſſage four feet wide.

Q, Butler's pantry ſeventeen feet two inches by eight feet ſeven inches.

R, Cellar ditto.

S, Ditto nine feet ſix inches by five feet ſix inches.

T, Ditto nine feet by five feet.

V, Houſe-keepers ditto nine feet ſix inches by five feet.

CAUTION.

Obſerve, in the laying out groined vaults, to place the buttments as near as poſſible to puſh againſt each other, more eſpecially when the ſpand is large, otherwiſe they will be in great danger of falling, let the workman do his part ever ſo well; for example, ſee the buttment between L and M, if that was a large ſpand, it muſt unavoidably puſh out the wall. I laid it down thus, as an example in executing the work: omit the pier L, and groin ſingle from the buttments of the two angles in the kitchen M, &c. becauſe where ſtrength or conveniency is abſolutely neceſſary (eſpecially in the baſer parts of a Building) nice regularity muſt give way.

Eſtimate to this Building.

This Building contains twenty-five ſquare one-half, meaſuring but one of the ſheds, and computing them both to be equal to ſo much of the other plan; for the ſame reaſon all the outſide ſteps are throwed into the plans of the porch; the whole may be built in a moderate well finiſhed manner, ſixty-four pounds per ſquare, which amounts to one-thouſand ſix-hundred thirty-two pounds.

Fig. 5, 6, 7, 8, The ground and parlour plans of deſign for a Building formed by an equilateral triangle, whoſe ſides B H I B, or P S W P, are forty-four feet, which are the extreme points of the angle, and are the centers of the circular cloſets, &c. the dimenſions of the ſeveral rooms are as follows:

Fig. 8. A, Foot of ſteps, which leads up to the terras.

B, Porch or entrance into the lower offices, nine feet ſix inches diameter, and its floor two feet below the ſurface of the earth.

C, Servants hexagon hall, twenty-one feet ſix inches diameter, lighted by four windows from the terras.

D, Kitchen ſeventeen feet ſix inches by fifteen feet ſix inches in the clear of the walls, which bears the upper ſtories.

E, Houſe-keeper's room ditto.

F, Cellar ſeventeen feet ſix inches by eight feet nine inches in the clear, between the ſtairs and wall which bears the upper ſtories.

G, Little cellar ſix feet ſix inches by ſix feet ſix inches.

H, Butler's pantry nine feet ſix inches diameter.

I, Larder ditto.

K, Steps to the garden.

N. B. The walls of this ſtory are two feet ſix inches thick, and the void ſpace between them two feet three inches.

Parlour plan. *Fig.* 7.

L, Foot of the ſteps.

M, Door of entrance from the terras.

N, Hexagon hall twenty-two feet diameter, two ſtories high.

O, Parlour eighteen feet by ſixteen feet.

P, Cloſet ten feet diameter.

Q, Study eighteen feet by nine feet.

R, Cloſet ſeven feet by ſix feet.

S, Cloſet ten feet diameter.

T, Door to the terras.

V, Dining-room eighteen feet by ſixteen feet.

W, Cloſet ten feet diameter.

XXXXXX, Terras five feet wide, incloſed by iron rails.

Y, Garden ſteps.

The terras is eight feet above the ſurface of the earth, from whence the floor of the hall riſes ſix inches, and the floor of the offices is two feet below the ſurface; ſo the whole height from the office floors to the floor of the hall is ten feet ſix inches, from which deduct one foot for the thickneſs of the floor, and nine feet ſix inches remains for the height in the clear of the office ſtory. The parlour ſtory is fourteen feet high in the clear, and the ſtory over it eight feet, and truſſed galleries in the hall for a communication between the upper rooms; there are garrets in the roof, and a billiard room over the hall with a coved ceiling.

Eſtimate to this Building.

The whole plan, including ſteps and terras, contains forty-one ſquare and one-half, and may be built one with the other in a good manner for thirty-five pounds per ſquare, which amounts to one thouſand four hundred and fifty-two pounds ten ſhillings. *Halfpenny's Architecture.*

BUL, in the Hebrew calendar, the eighth month of the eccleſiaſtical, and ſecond of the civil year, ſince called Marſhevan; it anſwers to our October, and is compoſed of nine and twenty days.

BULBOCASTA'NUM, *earth-nut*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is umbelliferous, and of a roſaceous kind, being compoſed of ſeveral leaves, arranged in a circular form. The cup finally becomes a fruit, compoſed of two ſmall ſeeds, which are ſometimes ſmooth, ſometimes ſtriated on their gibboſe ſides, and ſmooth on their flat ones. To which it is to be added, that the roots are tuberous and fleſhy.

Mr. Miller has enumerated ſix ſpecies of this plant, and Tournefort four.

They are all very hardy plants in reſpect to cold; ſo may eaſily be propagated by ſowing of their ſeeds on a moiſt ſhady border, ſoon after they are ripe, (for, if they are kept out of the ground till ſpring, they ſeldom ſucceed ſo well as when they are ſown in autumn.) When the plants appear in the ſpring, they muſt be carefully cleared from weeds; and, where they are too near, they ſhould be thinned, ſo as to leave them three or four inches aſunder; after this they will require no other culture, but to keep them clear from weeds, for they do not bear tranſplanting; ſo muſt be ſown where they are to remain. The autumn following the roots will be fit for uſe, and will continue good all the winter, till they ſhoot up their ſtems in the ſpring for ſeed; after which time they are tough, and not fit for eating.

BU'LLET (*Dict.*)—Bullets ſhot into the water undergo a refraction; ſeveral experiments concerning which are given by Mr. Carre.

BULLETS are uſually piled up in the form of a pyramid. See a a repreſentation of a pile of Bullets, *plate* XXXV. *fig.* 18. in the Dictionary.

BULLET-*moulds* conſiſt of two concave hemiſpheres, with an handle whereby to hold them; and between the hemiſpheres is a hole, called a gate, at which to pour in the melted metal. The chaps, or hemiſpheres of Bullet-moulds, are firſt punched, being blood-red-hot, with a round-ended punch, of the ſhape, and nearly of the ſize, of the intended Bullets. To cleanſe the inſides, they make uſe of a Bullet-bore.

Bullet-*bore* is a ſteel ſhank, having a globe at one end, wherewith to bore the inſide of the mould clean, of the ſize intended. *Moxon, Mechan. Exerc.*

BU'LLION (*Dict.*)—When gold and ſilver are in their purity, they are ſo ſoft and flexible, that they cannot well be brought into any faſhion for uſe, without being firſt reduced and hardened with an allay of ſome other baſer metal.

To prevent the abuſes which ſome might be tempted to commit, in the making of ſuch allays, the legiſlators of civilized countries have ordained, that there ſhall be no more than a certain proportion of a baſer metal to a particular quantity of pure gold or ſilver, in order to make them of the fineneſs of what is called the ſtandard gold or ſilver of ſuch peculiar ſtate or nation.

According to the laws of England, all ſorts of wrought plate, in general, ought to be made to the legal ſtandard; and the price of our ſtandard gold and ſilver is the common rule whereby to ſet value on their Bullion, whether the ſame be in ingots, bars, duſt, or in foreign ſpecie: whence it is eaſy to conceive, that the value of Bullion cannot be exactly known, without being aſſayed, that the exact quantity of pure metal therein contained may be determined; and, conſequently, whether it be above or below the ſtandard.

BU'NIAS, *navew gentle*, in botany.—The leaves of this plant, which lie on the ground, are long and large, deeply cut in, and in ſhape like a turnep-leaf, but leſs, and very little hairy. The ſtalks grow to be two or three feet high, beſet with ſmaller leaves, ſmooth as well as the ſtalk, and little or nothing jagged, eſpecially thoſe which grow higher upon the branches, which are round and broad at bottom, and encompaſs the ſtalk, ending in a narrow point of a bluiſh-green colour. The flowers grow many together, on the tops of the ſtalks, made of four bright yellow leaves, and are ſucceeded by long cylindrical pods, containing ſmall, round, black ſeed; the root is white, longer and ſlenderer than a turnep, but much like it in taſte. It is ſown in gardens, and flowers in April; the root is uſed in food, and the ſeed in phyſic.

The ſeed is commended by the antients as good againſt all kinds of poiſons, and the bites of venomous creatures, to provoke urine, and the menſes. Matthiolus extols it againſt all kinds of infectious diſtempers, to expel malignity, and chear the heart, as alſo to drive out the ſmall pox and meaſles. *Miller's Bot. Off.*

BUPHTHA'LMUM, *ox-eye*, in botany, by ſome called cachlan, ſends forth tender and ſomewhat ſlender ſtalks, with leaves like thoſe of fennel, and yellow flowers, larger than thoſe of the anthemis, and reſembling an eye; whence it took its name. It grows in fields, and about cities and towns. The bruiſed flowers, with cerate, diſcuſs œdematous tumors and hardneſſes. They ſay, that Buphthalmum, drank after coming out of the bath, reſtores, after ſome time uſing it, a good complexion, to thoſe who are diſcoloured with the yellow jaundice. *Dioſcorides, lib.* 3. *cap.* 156.

Ox-eye is a plant that has a great many ſhrubby branches, whereon grow fine winged leaves, like yarrow, but ſhorter, ſtiffer, and ſomewhat white and hoary: each ſtalk is terminated by one pretty large corymbiferous flower, of a deep yellow colour, like a marigold, but that the middle thrum is larger in proportion, and the petala are much ſhorter and firmer. The root is ſmall and fibrous. It grows wild in ſome parts of the north of England, and flowers in June or July. It is ſeldom or never uſed: but that which is called the ox-eye in the ſhops is the bellis major. *Miller's Bot. Off.*

BURLE'SQUE (*Dict.*)—Some who are fond of diſcovering traces of every thing in antiquity, aſcribe the invention of Burleſque to Homer, whoſe Batrachomyomachia, ſay they, is only ſome parts of the Iliad and Odyſſey traveſtied and turned into ridicule, by an application of the combats of kings and heroes to the battle of the frogs and mice: but it is not certain Homer was the author of this poem. Suidas gives the honour of it to Pigres, or Tigres, brother to the famous Artemiſia; and, in an ancient MS. of this in the French king's library, the name of this Carian is wrote at the beginning of it. Stephen Nunneſius, and other learned moderns, are of opinion Homer was not the author of it. But antiquity decides in favour of Homer. Martial expreſly aſcribes it to him in this Epigram:

> Perlege Mæonio cantatas carmine ranas,
> Et frontem nugis ſolvere diſce meis.

Statius is of the ſame opinion; and a baſſo relievo, repreſenting Homer with two rats, done by Archelaus, which was dug up near Rome, in the gardens of the emperor Claudius, ſeems to confirm the opinion of the ancients on this head.

BU'RNING *of Land* (*Dict.*)—This is a very great means of improvement of lands, and is not only at this time uſed in many parts of this and other kingdoms, but it has been practiſed from the earlieſt times of huſbandry that we have any account of. Virgil very expreſsly mentions, and greatly recommends it, and all the old writers of huſbandry ſay much in its praiſe.

It does not take effect, however, in all ſorts of ground. It is not proper for rich ſoils, nor for ſtony or chalky ones; nor is it a practice often to be repeated on any land, eſpecially where the ſurface is ſhallow; nor muſt corn be ſown too long upon the land afterwards; for Burning exhauſts the good juices of the land, in ſome degree, as well as the bad ones. It is moſt profitably uſed to ſuch lands as have lain a long time uncultivated, and over-run with rank weeds, ſuch as ſowre graſs, fern, heath, furze, and the like. Some lands, when corn is ſown upon them, run it up into ſtraw, and make the ears but poor and light; theſe are, beyond all others, improved by Burning. The uſual method of plowing up for this is with a breaſt-plough, which a man puſhes before him, and cuts the turf off the ſurface, turning it over when he has cut it to about eighteen or twenty inches long. The common way is only to pare it about half an inch thick; but, if it be very full of weeds, with ſtubborn roots, it is better to go deeper.

If the ſeaſon proves dry, the turf needs no more turning, but dries, as it lies. If it be wet, it is neceſſary to ſet it on edge, and keep it hollow till ſuch time as the wind and air have ſufficiently dried it. It is then to be piled up in little heaps, about the quantity of two wheel-barrows full in each heap; and, if there be much roots and a good head upon it, there needs no farther care but ſetting it on fire, and the whole heap will be reduced to aſhes; but if it be earthy and too dead to burn out by itſelf, there muſt be a heap of furze or heath laid under every parcel.

When the heaps are reduced to aſhes, they are left upon the place till ſome rain comes to wet them; otherwiſe, in the ſpreading, they would all blow away. When they are wetted, the farmer takes the opportunity of a calm day, and ſpreads them as equally as poſſible over the whole land, cutting away the earth a little under the heaps, to abate its over great fertility there. After this, the land is to be plowed but very ſhallow, and the corn is to be ſown upon it only in half the quantity that it is upon other land, and the later this is ſown the better. If it be wheat, the beſt time is the latter end of October; for, if ſown ſooner, it is apt to grow too rank. The beginning of May is the proper time for cutting the turf off from theſe lands, becauſe there is then time ſufficient to get the land in order for ſowing at the proper ſeaſon. The whole charge of cutting, carrying, and Burning the turf, is generally about twenty-four ſhillings an acre.

The turf is not to be burnt to white aſhes, for this waſtes a great part of its ſalt; it is only to be burnt ſo as to crumble all to pieces, and be in a condition to ſpread well upon the land; and it is better that the heaps of it ſhould burn ſlowly and gradually than furiouſly.

Some farmers ſtub up furze, heath, and the like, and, covering heaps of them with the parings of the earth, ſet fire to them; others burn the ſtubble of the corn fields, and others the ſtalks of all ſorts of weeds, and add half a peck of unſlaked lime to every buſhel of aſhes. They cover the lime with the aſhes, and leave the heaps in this manner till there comes ſome rain to ſlake the lime; and, after this, they ſpread the mixture carefully over the field. There is one great advantage attending this ſort of manure, which is, that it does not breed weeds like the common way with dung, but only fills the ears of the corn, not running them up into ſtalk; but it is proper to add ſome dung to theſe lands at the time of plowing them up for a ſecond or third of crop corn. *Mortimer's Huſbandry.*

BU'RNISHER, which ſome alſo call poliſher. An inſtrument to burniſh with. It is made of the fineſt ſteel, and is of ſeveral figures, according to the matter that is to be burniſhed: it ought to be well ſmoothed with the file, and afterwards poliſhed on the wheel, till it be as bright as a looking-glaſs. They temper it afterwards as ſtrongly as they can; the harder and better poliſhed it is, the better it ſerves for its ſeveral uſes. To burniſh gold, ſilver, and other metals, and gilded works, the Burniſher muſt be of pure ſteel, made round, ſometimes with one, and ſometimes with two handles; when it has but one, the other end is faſtened with a moving ring to the working boards, on which the workman works. The Burniſher for gilt works is made of a wolf's or dog's tooth, or with a piece of blood-ſtone faſtened to a wooden handle.

Burnisher, is alſo a tool uſed by the engravers of copper-plates: it is an inſtrument of ſteel, about ſix inches long, on one ſide of the figure of a heart, the point of which is ſomething long, made round, not very thick, and not ſharp. At the other end it has a kind of a darts head of iron, with three angles, ſharp on the three ſides. They call it a grater. See ENGRAVING.

The lock-ſmiths have three ſorts of Burniſhers: ſome that are crooked, to poliſh the rings of the keys; ſome ſtraight, to poliſh the iron; and ſome half-round, to tin over. Other artificers who work and poliſh iron, as the gun-ſmiths, ſword-cutlers, &c. have alſo ſeveral Burniſhers or poliſhers, ſome like thoſe of the lock-ſmiths, others like thoſe of the engravers, and ſome that are peculiar to themſelves, but little differing from the others.

BU'RSA *Paſtoris, ſhepherds-purſe*, in botany, a plant whoſe lower leaves lie flat on the ground, in a round compaſs, three or four inches long, narrow, and cut into ſeveral gaſhes, a little hairy. The ſtalk is ſlender, about a foot high, branched towards the top, beſet with a few whole leaves, which are ſharp-pointed, and ſet cloſe on, without foot-ſtalks. The flowers are ſmall, white, and four-leaved, and are ſucceeded by three ſquare ſeed-veſſels, in the ſhape of a purſe, containing a very ſmall reddiſh ſeed. The root is whitiſh, woody, and full of fibres, of but little taſte. It grows every-where among rubbiſh, banks, and walls, and flowers all the ſummer. *Miller's Bot. Off.*

It is of an herby taſte, a little ſaltiſh, and deterſive; the juice of its leaves gives a faint red colour to blue paper, which gives us reaſon to imagine, that, in this plant, the ſal ammoniac, which is natural in the ſalt of the earth, predominates over the other principles; this ſal ammoniac is diſſolved in a conſiderable quantity of phlegm, and is tempered by a good deal of earth, and a little ſulphur.

This plant does not yield much acid, by a chemical analyſis; almoſt all that is extracted from it is ſalt, beſides a ſmall quantity of earth.

There are but few plants which yield more concrete volatile ſalt, fixed lixivial ſalt, and earth. Theſe principles, mixed together, render the ſhepherds-purſe proper to diſſolve the blood, when it is thickened by foreign acids, which hinder it from paſſing, with its ordinary velocity, from the arteries into the veins; to which we may refer the greateſt part of defluxions. Beſides, the earth, which is in this plant, eaſily imbibes the ſeroſities, which occaſion a relaxation of the fibres; thus, by the conſent of all authors, it is vulnerary and aſtringent; it is alſo believed to be febrifugous and lenitive. The juice of its leaves drank, from four ounces to ſix, is an excellent remedy in all loſſes of blood, and in defluxions attended with an inflammation. They boil a handful of it in lean broth, and employ it in ptiſans, clyſters, and cataplaſms Its diſtilled water has little or no virtue; it is nothing but the phlegm ſeparated from the other principles.

It is found almoſt all the year; for it propagates itſelf by ſeed towards the end of ſummer. *Martyn's Tournefort.*

BUSS, a ſmall ſea veſſel uſed by us and the Dutch in the herring-fiſhery. They call it in Dutch haering-buys; theſe veſſels are commonly from forty-eight to ſixty tons burthen, and ſometimes more. They have two ſmall ſheds or cabbins, one at the head, and the other at the ſtern: that at the head ſerves for a kitchen.

Each Buſs has a maſter, an aſſiſtant, a mate, and ſeamen in proportion to the veſſel's bigneſs. The maſter commands in chief, and, without his expreſs order, the nets cannot be caſt or taken up. The aſſiſtant has the command after him, and the mate next, whoſe duty it is to ſee the ſeamen manage the rigging in a proper manner; to mind thoſe who draw in the nets, and thoſe who kill, gut, and cure the herrings, as they are taken out of the ſea. The ſeamen generally engage for a whole voyage in the lump.

The proviſions which they take on board the Buſſes, conſiſt commonly of biſket, oatmeal, and dried, or ſalt fiſh; the crew being content for the reſt with what freſh fiſh they catch.

BU'TCHER, one who kills, cuts up, and ſells meat, either in the ſhambles, where it ſhould only be ſold, or at particular ſhops in the market.

The practical part of this trade, or killing, may claim its riſe with almoſt the beginning of time itſelf; and that of ſelling was alſo very early.

When Rome flouriſhed, they were three collected companies under ſtrict regulations, which bore even the modern diſtinction of beef-Butchers, hog-Butchers, and ſlaughter-men, with ſome little difference.

Ours now are divided into carcaſe-Butchers, who buy live goods at market, have them killed, and ſell the carcaſes whole, ready for cutting up; ſome indeed halve and quarter them.

The next are the great retailers, who themſelves buy their goods alive, kill them, and diſpoſe them in joints, or pieces, for ſale. Some of theſe chiefly ſell beef, others only veal, others mutton and lamb, others pork, and many of them all ſorts.

There are, alſo, ſmall retailers, who buy their meat of the carcaſe-Butchers, and ſell it by piece-meal.

Hog-Butchers, are ſuch as deal in ſwine only; and ſome of theſe are alſo called bacon-men, who cure hog-meat for bacon, which is a very conſiderable buſineſs in and about London; but, in the country, moſt people cure it themſelves.

How neceſſary and populous the trade of a Butcher is, we ſee daily. The buying in live ſtock requires experience, which gives judgment; the killing part is very ſlaviſh, dirty, wet work; the ſhop-keeping part ought to be accompanied with a good deal of cleanlineſs, beſides the art of ſetting off their meat.

They commonly have with an apprentice five or ten pounds, and give a journeyman ten or twelve pounds a year, and his board; but the ſlaughtermen are paid by the head; ſome of whom will earn four or five ſhillings in a day, or night, for they have no ſet hours of working.

They were a company in the city of London, before the year 1180; but not incorporated till 1605, in the reign of king James I. Livery fine forty ſhillings.

Their hall is in Pudding-lane, near the Monument; and their court-day on the firſt Wedneſday of the month.

Arms. Azure, two axes ſaltier-ways, or, headed proper; between two bulls-heads couped argent, armed or, on a chief of the fourth a boar's-head eraſed gules, between two garbs of the fifth.

Motto. *Omnia ſubjeciſti ſub pedibus: oves et boves.* Thou haſt brought all things under foot: ſheep and oxen.

BU'TEO, in zoology; ſee BUZZARD.

BU'TTER (*Dict.*) — *A new way to make the beſt of* BUTTER *from St. Foyne.*

—The following eſſay is extracted from a letter, which has been ſent us by a gentleman, who has contributed his aſſiſtance from the country, where he cultivates a large eſtate of his own, and communicates to others ſuch improvements as he makes, with a generous openneſs of ſpirit and freedom, rarely to be met with among us. This ſeed of St. Foyne, being much larger than clover, muſt be ſowed in a much greater quantity. Four buſhels to an acre will be better than three, which is the leaſt you can venture to ſow; obſerve the directions given for clover, as to manuring while the turf is tender, and the earth is frozen; but, as to the time of letting it grow, that may, if you pleaſe, be five years, for ſo long it will continue in its prime perfection; and, running into a large knotty root, does ſo enrich the ground it grows on, that, after it has borne St. Foyne five years, it will afford three excellent crops of what corn you pleaſe, and ſo improve itſelf, by alternate burdens of graſs and corn, till it arrives at the utmoſt perfection which land is capable of reaching. Nothing is ſo ſweet, nothing ſo innocent, as this St. Foyne; but, above all, it is obſerved to increaſe milk, in quantity and quality, beyond any graſs yet known in the whole world; and it is for this reaſon that I adviſe you to keep cows upon it, and make you a five-years dairy. But, when I ſay a dairy, imagine not that I mean ſuch a dairy as is commonly kept in England. Would you know what kind of dairy? I will haſten to inform you, and conclude my letter with this particular. The worſt acre of an hundred, which quantity of land is moſt ſuitable to this purpoſe, improved by this graſs, will very well maintain four cows from the firſt of April to the end of November, and afford beſides a ſufficient ſtore of hay, to make good part of their ſubſiſtence the four winter months following: you muſt buy then about four hundred milch-cows, but take care you chuſe them with judgment. I have bought your largeſt ſort of runts from Wales, for leſs than fifty ſhillings a cow, with a good calf by her ſide, which I always diſpoſed of as ſoon as I could. You will obſerve, that I make too good an uſe of the milk to afford the calf his ſhare of it: I generally keep theſe cows above twelve months, and then, ſelling them, ſometimes for four pounds a-piece, I ſtock myſelf with ſuch that are new milched. I obſerve this rule every year, and the trouble is ſufficiently rewarded by the advantage it brings me; for, beſides the profit I make by ſelling dearer than I buy, I avoid the inconvenience of having any thing to do with bulls, and the conſequences; ſo that I always preſerve my cows in their full milk, and find it no uncommon thing for one of theſe milch-cows to be milked twice a day, and afford a gallon and an half at a meal. Four hundred of theſe cows will coſt a thouſand pounds; and you will find, that, coming from a poor paſture to a rich, they will proſper and increaſe both in milk and ſize. In eight convenient places about your hundred acres let there be built eight thatched ſheds, a little riſing in the middle to carry off the water; the height may be ten feet, and the breadth thirty; each of theſe ſheds ſhould be a hundred and twenty-five feet long, and, under the higheſt part, directly in the middle, you muſt raiſe a ſlight partition, lathed and plaiſtered, which ſerves to ſupport the ridge of the roof, while the two ſides are ſuſtained by ſquare wooden poſts, about eight feet high, and placed at proper diſtances. On either ſide of the partition wall let there be fixed a kind of rack, like thoſe in ſtables, which is to run the whole length of the ſhed, and muſt be placed as high as a cow can reach her fodder from. The ſhed muſt next be divided into ſtalls, like thoſe for ſtone-horſes, and each ſtall will be about five feet broad; the length of theſe ſtalls muſt be exactly fitted to that of a cow, that a croſs bar, being placed at the outward end, may keep the beaſt from running backwards: thus every ſhed will hold fifty cows, five and twenty on each ſide of the partition: to every one of theſe ſheds you muſt appoint a man, whoſe buſineſs it will be to clear the place, and carry off the dung; as alſo to mow the St. Foyne every day, and give it to the cows in the rack before-mentioned: this man beginning at one end of his proportion of ground, and going gradually on to the other, the firſt place will always be fit to mow again by that time he has gone through his whole diviſion. Your cows are thus fed at diſcretion, with neither too much nor too little; they are not peſtered with the ſcorching heats, nor troubled with the ſtinging fly, which, in open paſtures, often makes them whiſk about, and trample down more graſs than they eat. At each end of every ſhed you muſt build a ſlight room of brick, thirty feet ſquare, and ten feet high, which is to be divided, the croſs-way of the ſhed, into two partitions, each fifteen feet broad, and thirty feet long; that, which joins the cow-houſe, muſt be paved with tiles, and is to ſerve for a dairy; the the other muſt be floored and windowed, and is to be a lodging-room for the dairy-maids. Every ſhed will require five maids, that is, to every ten cows one dairy-maid; fewer might ſerve, but it is better to exceed, than fall ſhort, in this particular. Thus each dairy will have two or three maids belonging to it, whoſe lodging will be the room adjoining, and whoſe care is to extend to the ſhed on both ſides the partition, to the five and twenty cows which are the neareſt to their ſtation. All along both ſides of the partition, at about a foot above the ground, let there be fixed, cloſe to the wall, a ſtrong pipe of lead, a little leſs than an inch diameter; both which pipes, being ſomewhat raiſed exactly in the middle of the ſhed, muſt have a gentle and almoſt an inviſible deſcent from that riſing to the dairies, through the wall of which their nether ends are to be brought, and there wrought into one another, that whatever deſcends through them, into either of the dairies, may have iſſue but at one mouth. This mouth of the pipes muſt be made very ſmall, and neatly fitted into the hollow end of a ſtrong wooden axle-tree; which, whilſt it is turning ſwiftly round the mouth of the pipe, may by no means ſtrain it by the motion, but receive, into its own hollow, the milk which deſcends through the leaden pipes, without ſpilling any, and paſſes ſo far through a wheel, or veſſel like a barrel, only much larger in its circumference. The axle-tree, which this veſſel is to turn upon, is bored very full of round holes, through which it delivers the milk into the veſſel, as faſt as it receives it from the pipe.

The veſſel muſt be capable of containing, at leaſt, three times the quantity of milk, which it is deſigned to receive; and there muſt be ſix wings, or thin pieces of wood, glued on edge-ways to the wooden axle-tree, whoſe length and breadth muſt be ſo contrived, as to leave a free ſpace of ſix inches at at either end of the axle-tree, and a foot between their edges length-ways, and the ſmooth inſide of the veſſel; in the moſt convenient part of which muſt be contrived a door, to open and ſhut down upon occaſion, as cloſely as if there was none. This door will perform its work very neatly, if you line the inſide and edges with ſome kind of cloth, which is commonly uſed in the preſſing of cheeſe. The other ſolid end of the axle-tree muſt extend itſelf about five feet longer; and the whole length may be ſupported by ſquare wooden poſts, and turn in their tops, which are to be made hollow, and kept greaſed for that purpoſe. This end of the axle-tree is to be faſtened into a wheel, exactly like thoſe which are uſed in many places for roaſting of meat. The diameter of this laſt wheel muſt be within ſix inches of the height of the dairy, and two or three large dogs, being put into it at a time, will turn it with extraordinary ſwiftneſs: the dogs are eaſily taught, and will at laſt take delight in the exerciſe. I have brought up a large buck to the practice of this labour, and it is wonderful to ſee the force with which he runs round an hour or two together, and turns a wheel of ten feet diameter; but you muſt make your wheel as light, as it can poſſibly hold together. I have but one thing more to ſay, and I finiſh this direction: pretty near that ſide of every ſtall in your ſhed, to which the maid muſt come to milk the cow that belongs to it, let a hole, as ſmall as will ſerve the occaſion, be contrived by your plumber, in the uppermoſt part of the leaden pipe, to ſhut and open with a little ſcrew, which ſcrew, for fear of loſing it, may be faſtened by a little iron chain to the body of the pipe. I have endeavoured, in the deſcription of all this, to make my meaning as plain as poſſible; if you do not comprehend it at firſt, you will after two or three times reading and conſidering it.

May BUTTER, *butyrum majale*, is a medicine in ſome repute among good women for ſtrains, aches, and wounds. It is made of butter churned at that time, and expoſed to the ſun during the whole month, till, by repeated fuſions, it be brought to a whiteneſs. Helmont calls it magiſtery of graſs. Quincey affirms it is no better than plain lard.

Butter of ſtone, a kind of mineral drug found on the higheſt mountains and hardeſt rocks of Siberia, being drawn by the ſun's heat, in the way of tranſudation from the dry ſubſtance of the ſtones themſelves, and adhering to the ſurface thereof like a ſort of calx, which, having received its full coction, is ſcraped off by the inhabitants under the name of camine maſla. The Ruſſians aſcribe many virtues to it. It is much uſed for the dyſentery and venereal diſeaſes; but its operation is ſo violent, however corrected by other ingredients, that none but the Ruſſians dare uſe it.

Butter-bur, petaſitis, an officinal plant, both in figure and virtues reſembling maſter-wort; it is reputed an alexipharmic and detergent, and uſed in many compoſitions, eſpecially of the firſt of thoſe intentions.

BUTTERFLY, *papilio*, in zoology, a large claſs of inſects, which derive their origin from caterpillars.

Metamorphoſis of BUTTERFLIES.—There is ſomething very ſurpriſing in the metamorphoſes of theſe and ſeveral other inſects. Towards the end of the ſummer, and ſometimes ſooner, the caterpillars, when ſatiated with verdure, and, having changed their ſkins ſeveral times, ceaſe to eat, and employ themſelves in building a retreat, wherein they are to quit the life and form of a caterpillar, to give birth to the form of the Butterfly they contain within them. A few days are ſufficient to conduct ſome into a new ſtate of exiſtence. Others continue whole months and years in their ſepulchres. There are ſome ſpecies which plunge themſelves into a ſmall depth in the earth, after they are ſatiated with their food. In that ſituation they begin their efforts, and rend their robe, which, with the head, the paws, and entrails, ſhrink back, like dried parchment; and there remains a ſubſtance that reſembles a bean, or a kind of covering of a brown colour, with an oval form, the moſt pointed part of which terminates in ſeveral moving rings, whoſe dimenſions are gradually diminiſhed. This is called the chryſalis, and incloſes the embryo of the Butterfly, with ſuch fluids as are proper to nouriſh and complete its growth. When the creature has acquired its perfect form, and is invited by a genial warmth to quit the ſcene of its confinement, it burſts the large extremity of its incloſure, which always correſponds with its head, and is weak enough to be opened at the firſt effort.

Some caterpillars, inſtead of ſinking themſelves into the earth, prepare a lodgment under the protection of roofs, in the cavities of walls, and even in the heart of the wood. All of them have ſufficient abilities to ſecure themſelves a ſafe retreat, for the time they are to continue in the ſtate of aurelia's.

There are others who ſuſpend themſelves, with great dexterity, to the roofs of houſes, or the firſt ſtake that occurs in their way, and they proceed in the following manner: the caterpillar extracts, from her own ſubſtance, a glutinous fluid, which lengthens, and acquires a due conſiſtency, in proportion as ſhe advances her head from one place to another; and when ſhe has glued, and interlaced, ſeveral threads on ſome ſmooth place, to which ſhe intends to fix herſelf, ſhe inſinuates her hinder paws into a complication of the tiſſue, by means of the minute claws in which they terminate. In this manner ſhe accompliſhes her firſt faſtening; after which ſhe rears her head, and fixes a new thread on the lateral wood that correſponds with her fifth ring, and then, with a gentle deflection of her head, ſhe draws this thread in the form of a bow, around her back, and then faſtens it to the oppoſite ſide. She frequently repeats theſe motions, in order to conduct the thread from the left to the right, and from the right to the left. When this ſecond band, which ſuſtains the animal above the middle of her body, has been ſufficiently doubled and fortified, ſhe reſts upon it, and then agitates her body, till it is entirely covered with ſweat. She then burſts her ſkin, which gradually ſhrinks to the ſide where her paws are implicated in the wood. Theſe paws are, likewiſe, diſſipated like the reſt of her ſpoils; but all this is not ſufficient to diſengage the chryſalis; becauſe, inſtead of the paws, by which it was detained, the extremity of it has ſhot out little points, whoſe heads terminate like that of a muſhroom, or nails; and, as they are extended beyond the threads, they are ſufficient, with the band that traverſes the back, to faſten it, till the proper ſeaſon, when the papilio is to be diſcharged from her confinement.

Some caterpillars involve their bodies in a texture of thread and glue, and then roll themſelves over a bed of ſand, by which means they collect an incruſtation of ſmall grains, and build themſelves, in this manner, a monument of ſtone.

There are others who build in wood, and crumble into ſmall particles the ſubſtance of a willow, or ſome other plant to which they have habituated themſelves. They afterwards pulverize the whole, and form it, with an intermixture of glue, into a paſte, in which they wrap themſelves up. This compoſition dries over the chryſalis it ſurrounds, and which aſſumes much the ſame figure, ſo that it reſembles a mummy, which correſponds with the body it incloſes, and which ſerves it as a defence. If you preſs them a little, they will diſcover ſome ſigns of life, though their outward appearance indicates no ſuch thing.

The caterpillars we are moſt acquainted with, are found in great numbers upon elms, apple-trees, and buſhes. The papilio that proceeds from theſe, chuſes ſome beautiful leaf, on which ſhe fixes her eggs in autumn, and ſoon after dies, glued and extended on her beloved family. The ſun, whoſe rays have ſtill ſome power, warms her eggs, out of which, before the winter-ſeaſon, a multitude of little caterpillars ſpring, who, without ever having ſeen their mother, and without the leaſt model and inſtructions, immediately, with a kind of emulation, betake themſelves to ſpinning, and, with their threads, induſtriouſly weave themſelves beds, and a ſpacious habitation; where they ſhelter themſelves from the ſeverity of the ſeaſon, diſtributed into different apartments, without eating, and frequently without ſtirring abroad. There is only one little opening at the bottom of this manſion, through which the family, ſometimes, takes the air, towards noon, in a fine ſunſhine, and ſometimes in the night, when the weather is ſettled. When you would open their retreat, you muſt employ a little ſtrength to break the tiſſue that forms it, which is, generally, as firm as parchment, and not to be penetrated by rain, wind, or cold. There you will find the whole family repoſing on a ſoft and thick down, and ſurrounded with ſeveral folds of the web they have ſpun, which at once ſupplies them with their quilts, their curtains, and their tent.

How is it poſſible to be unaffected with this little miracle of nature! Open one of theſe aurelia's, and it will ſeem to preſent you with nothing but a kind of putrefaction, containing the elements of a better ſtate of exiſtence, and compoſing the nutrimental juices which contribute to the growth of a more perfect animal. The time for its enlargement, at laſt, arrives, and the creature then forces its way through the priſon that contained it. The head diſengages itſelf through the aperture, the horns lengthen, the legs and wings are extended, and, at laſt, the Butterfly takes its flight through the air, retaining no ſimilitude of its former condition. The caterpillar, which is changed into a nymph, and the Butterfly that proceeds from it, are two animals entirely different.

The firſt was altogether terreſtrial, and crawled heavily along the ground. The ſecond is agility itſelf, and is ſo far from limiting its motions to the earth, that, in ſome meaſure, it diſdains to repoſe on its lap. The firſt was all ſhaggy, and frequently of an hideous aſpect; the other is arrayed in colours of the moſt beautiful glow. The former, ſtupidly, confines itſelf to a groſs food; whereas this ranges from flower to flower, regales itſelf with honey and dews, and perpetually varies its pleaſure. This new animal enjoys all nature in full liberty, and is, itſelf, one of her amiable embelliſhments.

The arrangement of Butterflies into genera and claſſes are, in a great meaſure, taken from theſe ſeveral parts, and from the great uſes which they make of them. The general diſtinction is, that which divides them into the day and night kinds: we have, among the birds, ſome few that fly abroad only by night; but theſe bear only a ſmall proportion in number to the day-fliers: on the contrary, the number of Butterflies which we ſee fluttering about the fields and gardens, are ſcarce ſo many as thoſe which fly abroad only by night. We often meet with this, even in our houſes, flying about the candles, and the hedges ſwarm with them: in the day-time we find them hid under the leaves of plants, and often, as it were, in a torpid ſtate. In this condition they remain till evening, but they are ſo cunning in hiding themſelves at this time, that it is difficult to ſee one even in places where there are great numbers. The way to diſcover them, is to beat and diſturb the buſhes, or ſhake the branches of trees in places where they are ſuſpected to be, and they will often be driven out in ſwarms. In this caſe they never fly far, but ſettle again on the firſt tree or buſh they come to; and, in ſummer, if any one goes out into the fields or gardens, with a candle, in a calm and ſtill night, there will numbers of different kinds of them, almoſt immediately, gather about it. Theſe are called, by naturaliſts, night Butterflies, phalènæ, and moths.

The ſeveral kinds of Butterflies, that have thoſe various inclinations, have alſo external characters by which they may be diſtinguiſhed; all thoſe which have buttoned antennæ, or club antennæ, are of the diurnal kind, and are never ſeen flying about candles in the night. There are other forms of the antennæ alſo, which are peculiar to the day Butterflies; and the night ones are diſtinguiſhed by their having the plumoſe, the priſmatic, or the conic ones.

Thoſe which fly about our candles are always of one of theſe three kinds. It is not, indeed, to be wholly affirmed, that no one of theſe kinds is ever ſeen flying by day-light, ſince, in woods and thickets, we often ſee them fluttering about without having been diſturbed; but all that are thus caught flying are males, and are that time ſeeking after the females, to couple with them, theſe being all fixed immoveably under the leaves and on the branches of trees.

The common kinds that we ſee fly about from flower to flower, are all of the day kind: a few ſpecies of the phalenæ ſometimes flutter about the thiſtle flowers, and ſeem to ſuck them; but theſe are ſeldom ſeen; and among the moths, or night kinds, as we call them, there are a great many that never fly about by night any more than by day, and, indeed, make no uſe of their wings at all.

It is alſo a ſingular obſervation, that the moths which fly about our candles, whether in the houſe, or abroad in the gardens, are all males; the females never do it. The male of a glow-worm flies in the ſame manner at the candle, thinking it the light of his female; and it is poſſible, that the female moths may, in the night, yield a light that affects the eyes of the male of the ſame ſpecies, though it be inſenſible to our view.

The great general diſtinctions of the Butterflies into day and night kinds being made, it is neceſſary to have recourſe to numbers of other ſub-diſtinctions, in order to arrange them in any method; and theſe can, by no means, be taken from them in their prior ſtate of caterpillars, many of them being in that ſtate alike in all their general characters, though of different genera in their flying ſtate.

As the antennæ ſerve for diſtinctions of the Butterflies into claſſes, ſo do their trunks into genera; but theſe are only capable of diſtinguiſhing a few, the flat and the round being their principal diſtinction. Mr. Reaumur has obſerved, that the day Butterflies have all theſe trunks, but that many of the night kinds want them. The wings, however, give the greateſt variety of generical characters among theſe animals. The ſhape of theſe, and the manner in which theſe creatures carry them, when walking, and at reſt, ſerve as great and eſſential diſtinctions.

Claſs 1. contains thoſe Butterflies whoſe antennæ are terminated by buttons, and whoſe wings, when at reſt, are placed in a perpendicular direction to the thing the creature ſits upon, the under edges of which embrace the lower part of the body, and whoſe ſix legs are all employed in ſuſtaining the body, and in walking. The black-ſpotted white Butterfly, produced from the beautiful cabbage caterpillar, is one of the Butterflies of this claſs.

Claſs 2. contains the Butterflies of the ſame characters with the former in all reſpects, except that they uſe only four of their legs in ſuſtaining the body, and in walking. The two anterior legs in the flies of this claſs are held in a bent poſture, and are furniſhed with a downy part at their ends, and ſeem to ſerve as a ſort of arms. Theſe Butterflies, in general, are produced from the prickly caterpillars. The ſolitary nettle kind gives us an inſtance in its Butterfly.

Claſs 3. contains thoſe Butterflies which agree in all reſpects with the former, except that their two anterior legs, which they uſe as arms, and never in walking, are not terminated by downy ends, but are faſhioned like the other legs, at the extremity, only ſo ſmall, that it requires a microſcope to diſtinguiſh them. There is an inſtance of this claſs in a common grey and yellow Butterfly, that is found in paſtures among the graſs in June, July, and Auguſt.

Claſs 4. contains thoſe Butterflies which have buttoned antennæ, as the others, and which carry their wings, when at reſt, in a perpendicular direction to the thing they ſit upon; but, as the former have the inferior edge of their wings bent round the upper part of their body, ſo in theſe the inferior edge is bent upwards in both pair of wings, and embraces and covers the upper part of the body. However obvious this diſtinction may be, there is another yet more plain in this, that all of this claſs have one of the jags of the wing ſo far extended beyond the reſt of the verge, that it forms a kind of tail; and they are called the tailed Butterflies. Theſe uſe all their ſix legs in walking.

Claſs 5. contains thoſe Butterflies which have ſix real legs, which they uſe as ſuch, and their horns terminated by buttons as the others; but whoſe wings, when they repoſe, are not elevated perpendicularly to the thing they ſit on, as in the four preceding claſſes, but are held in an horizontal direction, or, at the utmoſt, never meet in an angle over the back. We have an inſtance of this claſs in a Butterfly bred from a ſmooth caterpillar of the marſhmallow.

Claſs 6. contains thoſe Butterflies which have club antennæ, that is, ſuch antennæ as gradually increaſe in thickneſs from their origin to their extremity. Theſe are that claſs of Butterflies which are always upon the wing, and buz about flowers without ever ſettling upon them. They dart their trunks into the flower while they ſuſtain themſelves in the air, and have a way of holding themſelves in poiſe, like a kite or other bird of prey; but, when they are buſy about the flowers, they have their wings in continual motion, and make a humming noiſe, like the humble-bees.

Claſs 7. In the laſt claſs are comprehended thoſe Butterflies whoſe antennæ are long at their origin, ſmaller afterwards, and finally terminated by an oval head; and which differ from the club antennæ in having no pencils of hairs at the end. This claſs is not very numerous, and the moſt frequent inſtance we have of it is in a painted kind, which we frequently find on blades of graſs, in meadows, in July. This flies little in the day time, but is uſually found fixed to a plant, as the moths are. *Reamur's Hiſt. Inſect.*

Butterfly-*ſhell*, in natural hiſtory, the Engliſh name for a beautiful ſpecies of the voluta. See *plate* VI. *fig.* 32.

The volutæ are the moſt beautiful ſhells of the whole body of ſea productions. See VOLUTA.

BUTTON.— The form and uſe of a Button are too familiar to need a deſcription. The matter whereof they are made is various; as metal, thread, ſilk, mohair, &c.

Method of making common **Buttons.**— Common Buttons are uſually made of mohair; ſome indeed are made with ſilk, and others with thread; but the latter are a very inferior ſort. In order to make a Button, the mohair muſt be previouſly wound on a bobbin. The mould is then fixed to the board by means of a bodkin thruſt through the hole in the middle of it; and the workman wraps the mohair round the mould in three, four, or ſix columns, according to the nature of the button.

Wrought **Buttons.**— The firſt part of the proceſs, in making theſe Buttons, is the ſame as the preceding; viz. the mould is covered with mohair in three, four, or ſix columns as before; after which they are ſtitched by various kinds of ſtitches, ſo as to repreſent different figures.

Horſe-hair **Buttons.**— The moulds of theſe Buttons are covered with a kind of ſtuff compoſed of ſilk and hair; the warp being Belladine ſilk, and the ſhoot horſe-hair. This ſtuff is wove with two ſelvedges in the ſame manner, and in the ſame loom, as ribbands; for the method of which ſee ribband Weaving. The ſtuff is cut into ſquare pieces proportionable to the ſize of the Button; theſe pieces are wrapped round the moulds, and their ſelvedges ſtitched together, which forms the under part of the Buttons.

Cleanſing of Buttons.— A Button is not finiſhed when it comes from the maker's hand; the ſuperfluous hairs and hubs of ſilk muſt be taken off, and the Button rendered gloſſy and beautiful, which they perform in the following manner:

A quantity of Buttons are put into a kind of iron ſieve, called by workmen a ſinging-box. Then a little ſpirit of wine being poured into a ſhallow iron diſh, and ſet on fire, the workman moves and ſhakes the ſinging-box, containing the Buttons, briſkly over the flame of the ſpirit, by which means all the hairs, hubs of ſilk, &c. are burnt off, without damaging the bottom. Great care muſt be taken that the Buttons in the ſinging-box be kept conſtantly in motion; for, if they are ſuffered to reſt over the flame, they will immediately burn.

When all the looſe hairs, &c. are burnt off by the flame, the Buttons are taken out of the ſinging-box, and put, with a proper quantity of crumbs of bread, into a leather bag, about three feet long, of a conical ſhape, the apex or ſmall end being cloſed up. The operator then takes one end of the bag in one hand, and the other in the other, and ſhakes them briſkly, and with a particular jerk; by which means they are rendered very gloſſy and fit for uſe.

Gold-twiſt Buttons.— The mould of theſe Buttons is firſt covered with ſilk in the ſame manner as common Buttons. The mould being overlaid with ſilk, it is covered with a thin plate of gold or ſilver, and then wrought over in different forms with purle and gemp. The former is a kind of thread compoſed of ſilk and gold wire twiſted together: and the latter capillary tubes of gold or ſilver, about a tenth of an inch long. Theſe are joined together by means of a needle filled with ſilk, thruſt through their apertures, in the ſame manner as beads or bugles.

The manner of making metal Buttons.— The metal to be uſed is firſt caſt into a ſmall ingot, and then flatted into thin plates, or leaves, of the thickneſs intended, at the flatting mill; after which, it is cut into little round pieces of a diameter proportionable to the wooden mould they are to cover: this cutting is performed with a ſharp punch, on a leaden block or table.— Each piece of metal thus cut, and taken off from the plate, is reduced to the form of a Button, by beating it ſucceſſively in ſeveral ſpherical cavities, with a round piece of iron in form of a puncheon; ſtill beginning with the flatteſt cavity, and proceeding to the more ſpherical, till the plate have got all the relievo required: and, the better to manage ſo thin a plate, they form ten, twelve, or even twenty-four, to the cavities at once; and alſo neal the metal to make it more ductile.

The inſide thus formed, they give an impreſſion to the outſide, with the ſame iron puncheon in a kind of mould, like the minter's coins engraven en creux, or indentedly, and faſtened to a block or bench, by means of the ſame kind of preſs uſed in coining. The cavity of this mould, wherein the impreſſion is to be made, is of a diameter and depth ſuitable to the ſort of Button to be ſtruck in it; each kind requiring a particular mould. Between the puncheon and the plate is placed ſome lead, called by workmen a hob, which contributes to the better taking off all the ſtrokes of the engraving; the lead, by reaſon of its ſoftneſs, eaſily giving way to the parts that have relievo; and as eaſily inſinuating itſelf into the trace, or engraving of the indentures.

The plate, thus prepared, makes the upper part or ſhell of the Button.— The lower part is formed of another plate, made after the ſame manner, but flatter, and without any impreſſion. To this laſt is ſoldered a little eye made of wire of the ſame metal, for the Button to be faſtened by.

The two plates are ſoldered together, with ſoft ſolder: and then turned in a lathe.— Ordinarily, indeed, they content themſelves to cover the naked mould with the ſhell; and in this caſe, for the faſtening, they paſs a thread or gut a-croſs through the middle of the mould; and the cavity between the top of the mould and the cap they fill with cement, in order to render the Button firm and ſolid; for the cement, entering all the cavities formed by the relievo of the other ſide, ſuſtains it, prevents its flattening, and preſerves its boſſe or deſign.

Button-Mould; ſee the article *Button*-Mould.

Button, among gardeners, denotes a flower or cluſter of leaves not yet expanded.

Buttons are a kind of ova, out of which ariſe either leaves alone, or intermixed with flowers. Leaf Buttons are ſmaller and more pointed than flower Buttons, which are bigger and rounder. Among trees which bear kernel fruit, each Button produces ſeveral flowers; and, among ſtone fruit-trees, each Button yields but one flower.

Button, *in fencing*, ſignifies the end or tip of a foil, being made roundiſh, and uſually covered with leather, to prevent making contuſions in the body.

Button, *in building*, denotes a ſlight faſtening for a door or window, made to turn on a nail.

Button *of the reins of a bridle*, is a ring of leather with the reins put through it, running all along the length of the reins.

Button *Antennæ*, a name given by naturaliſts to thoſe antennæ or horns, as they are called, of butterflies, which are ſlender and terminated at the top by a ſort of Button, in form of an olive, or part of one.

BY'SSUS, or Byssum, βύσσος, a fine ſort of thready matter produced in India, Egypt, and about Elis in Achaia, of which the richeſt apparel was intirely made, eſpecially that wore by the prieſts both Jewiſh and Egyptian.

Authors uſually diſtinguiſh two ſorts of Byſſus, that of Elis, and that of Judea, which was the fineſt. Of this latter were the prieſtly ornaments made. Bonfrerius notes, that there muſt have been two ſorts of Byſſus, one finer than the ordinary, by reaſon there are two Hebrew words uſed in ſcripture to denote Byſſus, one of which is always uſed in ſpeaking of the habit of the prieſts, and the other that of the Levites.

Byssus, in botany, a word uſed to expreſs a genus of moſſes the moſt imperfect of the whole claſs of vegetables. The characters of this genus are: the moſſes of it are compoſed of ſimple and uniform parts, and always appear in form of excreſcences, either of a woolly or of a duſty matter. It ſeems properly a genus of vegetables of a middle kind, between the muſhrooms and the moſſes, but moſt approaching to the latter, in that the ſeveral ſpecies of it are of a longer duration, and want that fleſhy texture which diſtinguiſhes the fungus claſs, and in that they never produce heads, nor have any thing of the figure or texture of fungi.

BU'ZZARD, *buteo*, a bird of the long-winged hawk kind, of the ſize of a pheaſant, or ſmall pullet. Its head is large and flat, and its beak ſhort, crooked, and of a bluiſh black, and covered above with a yellow ſkin down to the noſtrils. Its back and wings are of a reddiſh or yellowiſh brown, tending to black, or, as ſome call it, a ruſty black, ſometimes variegated with white ſpots near the ſhoulders. Its breaſt and belly are of a yellowiſh white, but on the breaſt there are ſeveral oblong ruſty-coloured ſpots. Its thighs are covered with yellowiſh white feathers, with tranſverſe ſtreaks of a ferrugineous colour; between its eyes and noſtrils there are ſeveral black briſtles. The tail is not forked; the legs are ſhort, thick, ſtrong, ſcaly, and of a yellowiſh colour. It feeds on moles, field mice, and other ſuch animals; ſometimes on ſmall birds, and ſometimes will ſeize on rabbits. In want of better food, it will alſo ſometimes live on beetles, worms, and the like. Its eggs are white, more or leſs ſprinkled with irregular red ſpots. In age, or by ſome other accidents, the head and back in this ſpecies are ſometimes found grey. *Ray's Ornithology.*

C.

CAABA, a ſquare ſtone edifice in the temple of Mecca, ſuppoſed to have been built by Abraham and his ſon Iſhmael; being the part principally reverenced by the Mahometans, and to which they always direct themſelves in prayer.

The word is Arabic, Caaba, and caabah, a denomination which ſome will have given to this building, on account of its height, which ſurpaſſes that of the other buildings in Mecca; but others, with more probability, derive the name from the quadrangular form of this ſtructure.

The length of the Caaba is about twenty-four cubits, its breadth twenty-three, and height twenty-ſeven cubits; the door, which is on the eaſt ſide, being four cubits from the ground, and the floor level with the bottom of the door. In the corner next this door, is the famous black ſtone, which is ſet in ſilver, and exceedingly reſpected by the Mahometans. The pilgrims kiſs it with great devotion, and it is by ſome called the right hand of God on earth. It is fabled to be one of the precious ſtones of Paradiſe, which fell down to the earth with Adam, and, being taken up again at the deluge, was brought back by the angel Gabriel to Abraham, when he was building the Caaba. It was at firſt whiter than milk, but grew black long ago; ſome ſay by the touch of a menſtruous woman, others by the ſins of mankind, others by the numerous kiſſes of the devotees. On the north ſide of the Caaba, within a ſemicircular incloſure, lies the white ſtone, ſaid to be the ſepulchre of Iſhmael, which receives the rain water that falls off the Caaba, by a ſpout formerly of wood, but now of gold. The Caaba has a double roof, ſupported within by three octangular pillars of aloes wood, between which, on a bar of iron, hang ſome ſilver lamps. The outſide is covered with rich black damaſk, adorned with an embroidered border of gold, which is changed every year, and was formerly ſent by the caliphs, afterwards by the ſultans of Egypt, but now provided by the Turkiſh emperors. At a ſmall diſtance from the Caaba, on the eaſt ſide is the ſtation or place of Abraham, where there is another ſtone wherein they pretend to ſhew the footſteps of that patriarch, ſuppoſed to have been made when he ſtood on it in building the Caaba, where it ſerved him for a ſcaffold, with this peculiar advantage, that it roſe and fell of itſelf, as he had occaſion.

CAAMI'NI, in botany, a name given by the Spaniards and others to the fineſt ſort of the Paraguay tea. It is the leaves of a ſhrub which grows on the mountains of Maracaya, and is uſed in Chili and Peru as the tea is with us. The mountains, where the trees which produce this valuable leaf grow naturally, are far from the inhabited parts of Paraguay; but the people of the place know ſo well the value and uſe of it, that they conſtantly furniſh themſelves with great quantities of it from the ſpot. They uſed to go out on theſe expeditions many thouſands together, and their country is left to the inſults of their enemies the mean time, and many of them periſh with the fatigue.

To remedy theſe inconveniences, they have of late planted the trees about their habitations; but the leaves of theſe cultivated trees have not the fine flavour or the virtues of the wild ones.

The king of Spain has permitted the Indians of Paraguay to bring to the town of Santfoy twelve thouſand arobes of the leaves of this tree every year; but they are not able to procure ſo much of the wild leaves annually; about half the quantity is the utmoſt they bring of this; the other half is made up of the leaves of the trees in their own plantations, and this ſells at a lower price, and is called pabos. The arobe is about twenty-five pounds weight; the general price is four piaſtres for the arobe, and the money is always divided equally among the people of the colony. *Obſerv. ſur les Coutumes de l'Amerique.*

CAB, or Kab, a Hebrew meaſure of capacity, equal to the ſixth part of the ſeah, or an eighteenth of the epha.

The Cab of wine contained two Engliſh pints; the Cab of corn $2\frac{5}{6}$ pints, corn meaſure.

CA'BALA *Vein*, in natural hiſtory, a name given by our Suſſex miners to one kind of the iron ore commonly wrought in that country. It is a ſtony ore, of a browniſh colour, with a bluſh of red, which is more or leſs conſpicuous in different parts of the ſame maſſes.

CA'BBAGE, *braſſica*, in botany, a genus of plants, whoſe characters are: the flower conſiſts of four leaves, and is of the cruciform kind; the piſtil which ariſes from the cup, becomes at length a long cylindrical pod, divided into two cells, which are filled with roundiſh ſeeds, by an intermediate membrane. Tournefort has enumerated twenty-five, and Mr. Miller twenty-two ſpecies of Cabbage.

All the common ſorts of Cabbages are largely cultivated about London. The common white, red, flat, and long-ſided ones, are chiefly for winter uſe. The ſeeds of theſe ſorts muſt therefore be ſown in the middle of March, in beds of good freſh earth; and in April, when the young plants will have about eight leaves a piece, they are to be prickled out into ſhady borders, about three inches ſquare; and, about the middle of May, they muſt be tranſplanted to the places where they are to remain: and this is commonly between cauliflowers or artichokes, at about two feet diſtance in the rows. They muſt be watered at times, and the earth muſt be houghed up about their roots, and kept clear from weeds.

Theſe Cabbages will be fit for uſe ſoon after Michaelmas, and will continue till February, if not deſtroyed by bad weather; to prevent which, the gardeners about London pull up their Cabbages about November, and trench the ground in ridges, laying their Cabbages againſt the ridges, as cloſe as poſſible on one ſide, burying their ſtems in the ground; and in this manner they let them remain till after Chriſtmas, when they cut them for market.

The Ruſſian Cabbage is ſmall, and not much cultivated now. It is to be raiſed as the others, but may be planted nearer, as not ſo large. It is fit for uſe in July.

The early Batterſea and ſugar loaf Cabbages are ſown for ſummer uſe, and are commonly called Michaelmas Cabbages. The ſeaſon for ſowing theſe is the beginning of July, in an open ſpot of ground. It is common to ſow ſpinage in the ſame beds with theſe, houghing it up from about their ſtalks in ſpring; in May and June theſe begin to turn their leaves for cabbaging, and may be brought to it much ſooner then naturally they would, by tying them about with an ozier band.

The Savoy Cabbages are for winter uſe, and are to be ſown about the beginning of April; they are to be treated as the common Cabbage, and planted out at two feet diſtance, in an open place.

The bore-cole may be cultivated in the ſame manner, but muſt be planted only at one foot diſtance; theſe are not fit to cut till the froſts have nipped them.

The method of getting good Cabbage ſeed is this: chuſe out ſome fair plants in October, pull them up, and hang them up three days, with the root upward, in a ſhady place; then plant them under a warm hedge, burying the whole ſtalk and half the Cabbage in the earth; cover them with culm, if the winter be ſevere, and in ſpring they will ſhoot out many branches. When theſe begin to pod, the ends of the upper ones ſhould be cut off, to give ſtrength to the other pods. The ſeed muſt be preſerved from the birds, by planting ſome lime twigs about the plants, where the catching one or two will intimidate the reſt. When ripe, it muſt be threſhed out, and kept for uſe. *Miller's Gard. Dict.*

The Cabbage removes, as it is ſaid, the conſequences of hard drinking; and it has been well known to be a cuſtom among many at this time, as well as among the antient Egyptians of old, to eat raw or boiled Cabbage, as a preſervative againſt the effects of wine. This ſeems to have ſprung from the opinion of the great antipathy of the plants to one another; it having been affirmed, that the vine and Cabbage will by no means grow together; and ſome of the moderns have endeavoured to account for this, from the nature of theſe two plants, by ſaying, that they are both ſo fond of nutritive juice, as greedily to ſuck up all the juices of the earth, and by that means, when planted near, to ſtarve one another. But we have no reaſon to have recourſe to theſe ſuppoſitions, ſince there is not the leaſt truth in the obſervation, but the vine and Cabbage grow as well together as any two plants in the world. *Ephemerid. German.*

CA'BBALA (*Dict.*)—This oral tradition has obtained ſo much credit among Chriſtians that ſome have put its authority on a level with holy writ; amongſt theſe is the famous Johannes Picus, whom a zealous attachment to the Romiſh religion carried beyond his reaſon. He imagined the cabbaliſtical books he had purchaſed, at no ſmall expence, authentic, thought them the work of Eſdras, and that they contained the doctrine of the ancient Jewiſh church. He thought he ſaw in them the myſtery of the Trinity, the incarnation, the redemption of mankind, the paſſion, death, and reſurrection of Jeſus Chriſt, purgatory, baptiſm, the abolition of the old covenant, and, in ſhort, all the opinions maintained and received by the Romiſh church: but his notions were exploded, his theſes were ſuppreſſed, and thirteen of his propoſitions condemned as heretical. The original of the Cabbala is very obſcure. Some tell us the angel Raziel, the inſtructor of Adam, gave him the Cabbala, a book containing the celeſtial ſciences, which on his expulſion from paradiſe he took away from him, but, moved by the intreaties of Adam, Raziel returned to him again. Others ſay Adam did not receive this book till after his fall. They tell us that Adam, on his humble ſupplication to God for comfort in his unhappy ſtate, received this book from Raziel to which they attribute all the pretended power of magic. They add that this book was handed down from father to ſon, and at laſt fell into the hands of Solomon, whom it taught to build the temple by the means of the worm Zamir, without the help of any inſtrument of iron. Iſaac Ben Abraham publiſhed a book to prove this, but the book was condemned to the flames by the Jews of his own tribe.

The learned are ſo much divided in their opinions concerning the origin of the Cabbala, that it is almoſt impoſſible to determine any thing certainly about it. Morus and Van Helmont are the firſt who have wrote on this ſubject, with deſign of clearing up the point: but in this they have ſucceeded very ill, having aſcribed falſe principles to the Cabbala, which is proved by Wachterus, in Judaiſm detected, page 2. To avoid falling into the ſame error we ſhall extract, what we advance on this ſubject, from thoſe authors who have wrote with the moſt perſpicuity and order on it. R. Iſaac Lorica and R. Abraham Irira among the moderns are moſt eminent. The firſt wrote the Druſchim, which contains a metaphyſical introduction to the Cabbala; the ſecond wrote a book intitled Schaar Haſcamaim, that is the Gate of the Heavens; theſe books are wrote with much clearneſs, and explain the foundation of the cabbaliſtical philoſophy, which depends on the following principles.

1. From nothing nothing can be produced; and on this one principle depends the whole of the cabbaliſtical philoſophy. The cabbaliſtical philoſophers were no ſtrangers to the term creation, but they underſtood the word in a very different light from the Chriſtian notion, which is, that God from nothing created all things. They did not borrow this principle from the Jewiſh church but the heathen philoſophers, who, looked upon it equally abſurd to aſſert any exiſtence was produced from nothing, as to ſay a thing is and is not. Spinoſa has urged this argument ſtrongly in favour of his opinion; Epicurus among the ancients advanced this doctrine againſt Heraclitus and the Stoics. But the ſuppoſition of a pre-exiſtent omnipotent cauſe at once deſtroys the force of it.

2. In conſequence of the firſt, no ſubſtance can have proceeded from nothing.

3. Even matter, therefore, could not have proceeded from nothing.

4. Matter, becauſe of the vileneſs of its nature, owes not its original to itſelf. The reaſon Irira advances, in ſupport of this principle, is, that matter in itſelf is without form, and is only one degree removed from non-exiſtence.

5. From whence it follows, that there is not in nature any ſuch thing as matter properly ſo called.

The philoſophical reaſon the cabbaliſts bring to maintain this principle is, the intention of the efficient cauſe to make a work like unto himſelf; now, the firſt cauſe being a ſpiritual ſubſtance, the productions muſt have been ſpiritual rather than corporeal ſubſtances; becauſe the former moſt reſemble the nature of the efficient cauſe. This reaſon they inſiſt on very ſtrenuouſly, and argue, that it is as great an abſurdity to ſay God created material ſubſtances, which are different from his own nature and eſſence, as to ſay God created darkneſs, ſin, and death; for, ſay they, matter is nothing but a privation of ſpirit, as darkneſs of light, ſin of ſanctity, and death of life.

6. From whence it follows that whatever exiſts is ſpirit.

7. This ſpirit is uncreated, eternal, intellectual, ſenſible, having in itſelf the principle of motion, infinite, independent, and neceſſarily ſelf-exiſtent.

8. This ſpirit is conſequently the enſoph or infinite God.

9. It follows therefore, that whatever exiſts, muſt be an emanation from this infinite ſpirit. As the cabbaliſts did not admit of a creation in ſuch a manner as the Chriſtians receive the doctrine of it, ſo they were obliged either to admit of a pre-exiſting matter, or maintain that the univerſe proceeded from God by way of emanation: the firſt opinion they dared not embrace, becauſe it was contrary to their tenets to admit of a material cauſe excluſive of God, and therefore fell into the doctrine of emanations, which they received from the orientals who were taught it by Zoroaſter, as appears from cabbaliſtical writers.

10. The nearer things are in their emanation from the divine ſource of all, ſo much are they more noble and divine; the more diſtant they are, ſo much leſs do they partake of the divine nature and perfection.

11. The world is diſtinct from God as the effect from its cauſe, not as a tranſient but a permanent effect. The world, therefore, being an emanation from God, is to be conſidered as God himſelf, who, being incomprehenſible in his eſſence, has choſen to manifeſt himſelf in his emanations.

Theſe are the principal doctrines of the Cabbala, from whence they have deduced a multitude of extravagant whims, which we do not think it neceſſary to trouble our reader with.

CA'BINET, a piece of joiner's workmanſhip. It is a kind of preſs or cheſt, with ſeveral doors and drawers, to lock up the moſt precious things, or only to ſerve as an ornament in chambers, galleries, or other apartments.

There are common Cabinets of oak, or of cheſnut; varniſhed Cabinets of China and Japan; Cabinets of inlaid work; ſome of ebony, and other ſcarce and precious woods.

The Cabinets of Germany were formerly in great repute in France, where they were very much eſteemed, on account of ſeveral mechanical rarities and curioſities, which they were filled with in the inſide. They are very much valued in foreign countries, and the Dutch carry ſome ſtill into the Eaſt; but they are almoſt intirely out of date in France, as well as the Cabinets of ebony, which came from Venice.

CABINET, in a garden, is a conveniency which differs from an arbour, in this, that an arbour or ſummer-houſe is of a great length, and arched over head, in the form of a gallery; but a Cabinet is either ſquare, circular, or in cants, making a kind of ſalon to be ſet at the ends or in the middle of a long arbour.

CABINET *of natural hiſtory*, a building containing all the curioſities of nature, digeſted in a proper manner.

Such a building might indeed be called, with more propriety, a muſæum or repoſitory; Cabinet here, therefore, muſt be underſtood in a larger ſenſe than the common acceptation of the word, as herein are exhibited to our view the animal, vegetable, and mineral kingdoms at once: in ſhort, an epitome of nature.

It is not certain whether the ancients ever formed any collections of this kind, or erected any ſtructures for the reception and diſpoſition of them. But it is not improbable, that Ariſtotle, ſupported by the generoſity and magnificence of Alexander the Great, built ſomething of this kind, at leaſt with regard to animals; becauſe the obſervations he has left us, are undoubtedly the reſult of anatomical obſervations, and the remarks he has made on the various ſpecies of animals ſhew our knowledge, even ſince the revival of letters, to be vaſtly inferior to his, in this reſpect.

The knowledge of natural hiſtory improves, as collections of this kind are made more perfect; and our own age has firſt ſet on foot eſtabliſhments that deſerve the name of Cabinets of natural hiſtory.

That in the garden of the king of France is reckoned one of the richeſt in Europe; a ſketch of it may not be diſagreeable.

In the animal kingdom are ſeen human ſkeletons of all ages, a numerous collection of bones remarkable for fiſſures, fractures, deformities, and diſeaſes. Several preparations of anatomy injected and dried: ſeparate parts preſerved in ſpirits. Some fine pieces of anatomy repreſented in wax, wood, &c. Some pieces of mummies and ſtony concretions extracted from human bodies, a large quantity of habiliments, arms, and inſtruments uſed by the ſavages, &c. brought from America and other parts of the world.

Among the quadrupeds a great number of ſkeletons and other pieces of oſteology, parts of the beaſts preſerved in ſpirits, ſome ſkins ſtuffed to reſemble the life, &c.

Fine ſkeletons of the largeſt and moſt uncommon birds, others preſerved in ſpirits, others ſtuffed, &c.

A numerous collection of ſea and river fiſh dried, others preſerved in ſpirits.

A vaſt number of different ſpecies of lizards; ſerpents, &c. collected in all parts of the world.

A very great ſeries of ſhell and cruſtaceous animals, &c.

And laſtly a prodigious number of inſects both of land and water; amongſt others, a papilionaceous ſeries almoſt complete, and a vaſt collection of falſe marine plants of all ſpecies.

In the vegetable kingdom are complete herbals furniſhed by Meſſ. Tournefort and Vaillant with numerous ſeries of roots, barks of trees, ſeeds, and fruits of plants; a collection of gums, reſins, balms, and other juices of vegetables almoſt complete.

In the mineral kingdom are collections of earths, common and figured ſtones, petrifications, incruſtations, ſtalactites; a fine ſeries of pebbles, fine ſtones, rough and poliſhed, ranged in plates and vaſes, &c. precious ſtones, cryſtals, all ſorts of ſalts and bitumens, mineral and foſſile ſubſtances; a collection of the minerals found in France and all the parts of Europe, eſpecially in the northern parts of the world, and principally America.

All theſe collections are ranged in a methodical order, and diſtributed in a manner moſt proper for the ſtudy of natural hiſtory. Every individual is marked with its proper title. The whole is placed under glaſſes with tickets, or diſpoſed in the moſt convenient manner for obſervation.

To form a Cabinet of natural hiſtory, it is not enough to collect without choice, and heap together all the objects we meet with in natural hiſtory, without taſte or order; we muſt know how to diſtinguiſh what ought to be rejected, what admitted. Order and relative diſtribution conſtitute the principal beauty of theſe collections, the ends of which are inſtruction and entertainment; and, without the merit of order and diſtribution, of what uſe is a great collection? What will it ſignify, whom will it improve, to amaſs in ſumptuous buildings, at great pains and expence, a multitude of productions, which are preſented to us in confuſion, and without any regard to the nature of the things themſelves, or the principles of natural philoſophy? I ſhould be apt to ſay to ſuch naturaliſts as theſe, Send back to the ſea your ſhells; reſtore to the earth its roots, ſeeds, and plants; cleanſe your apartments of this heap of dead bodies, of birds, fiſhes, and inſects: if you only make a chaos wherein I ſee nothing diſtinct, you know not how to diſplay the riches of nature; let men of ſo low a genius hew the ſtone, but leave to others the direction of the ſtructure.

M. d'Aubenton, who is demonſtrator and keeper of the king of France's cabinet, has given ſome excellent directions for the diſtribution and arrangement of ſuch collections.

The diſpoſition moſt proper for the ſtudy of natural hiſtory, ſays he, is a methodical order, which diſtributes whatever it contains into claſſes, genera and ſpecies. Thus the animal, vegetable, and mineral kingdoms will have their ſeparate apartments. The ſame order ſhould ſubſiſt between the genera and the ſpecies. The individuals of the ſame ſpecies ſhould be placed near, under, and round about it, never diſtant from it. Thus you will ſee the ſpecies in their genera, and the genera in their claſſes. Such an arrangement as this muſt tend greatly to the improvement of natural hiſtory; every thing becomes inſtructive; at one caſt of the eye, we not only have a real knowledge of the object we apply ourſelves to, but diſcover alſo the affinity it has with thoſe that ſurround it. The reſemblances indicate the genius, the differences mark the ſpecies. By following nature thus in all the variety of her productions, we paſs inſenſibly from one kingdom to another; the gradations prepare us, by little and little, for the great change, which is not ſenſible in the whole, but by comparing the two extremes.

England may be complimented on the poſſeſſion of Sir Hans Sloane's collection, and there is no room to doubt but it will be diſpoſed in the moſt elegant and methodical manner; becauſe the noble and learned perſonages, concerned in that affair, are moſt eminent for capacity and genius.

Cabinet, is ſometimes particularly uſed for a place at the end of a gallery, wherein are preſerved the paintings of the beſt maſters, conveniently ranged, and accompanied with buſts, and figures of marble and bronze, with other curioſities.

CA'BLE (*Dict.*)—In the manufacture of Cables, after the ropes are made, they uſe ſticks, which they paſs firſt between the ropes, of which they make the ſtrands, and afterwards between the ſtrands, of which they make the Cable; to the end that they may all twiſt the better, and be more regularly wound together: and alſo to prevent them from twining, or entangling, they hang to the end of each ſtrand, and of each rope, a weight of lead, or ſtone.

When the Cable is made, and twiſted as it ought to be, they untwiſt three or four turns, that the reſt may better remain in their proper poſition.

Cables that are too much twiſted, burſt very eaſily; and, when they are ſpun off, that is to ſay, not ſufficiently twiſted, they break.

The number of threads, of which a Cable ought to be compoſed, is always proportionable to its length and thickneſs; and it is by the number of threads that compoſe it, and make its diameter and circumference, that one may judge of its weight, and, conſequently, make an eſtimate of its value, which is an expeditious way of computing the worth of cordage. See Rope-*making*.

CA'BLING, in architecture, the figure of a ſtaff, or reed, either plain or carved, in reſemblance of a rope, or a ruſh, wherewith a third part of the flutings of a column are ſometimes filled up; hence called cabled flutings.

CABO'CHED, in heraldry; a deer's, leopard's, or bull's head, is ſaid to be Caboched, when it is borne full-faced, without any part of the neck. *Coats, Dict. Herald.*

CA'CAO (*Dict.*)—See *Plate* IX. *fig.* 4. where *n* is a young ſhoot of this tree, *o* its flower, *p* ripe fruit, *q* ripe fruit open, *r* kernel, *s* kernel open, *t* kernel diſſected.

In order to cultivate this plant in Europe, by way of curioſity, it will be neceſſary to have the nuts planted into boxes of earth (in the countries where they grow) ſoon after they are ripe; becauſe, if the nuts are ſent over, they will loſe their growing quality before they arrive. Theſe boxes ſhould be placed in a ſhady ſituation, and muſt be frequently watered, in order to forward the vegetation of the nuts. In about a fortnight after the nuts are planted, the plants will begin to appear above ground; when they ſhould carefully be watered in dry weather, and protected from the violent heat of the ſun, which is very injurious to theſe plants, eſpecially while they are young: they ſhould alſo be kept very clear from weeds, which, if ſuffered to grow in the boxes, will ſoon overbear the plants, and deſtroy them. When the plants are grown ſtrong enough to tranſport, they ſhould be ſhipped, and placed where they may be ſcreened from ſtrong winds, ſalt water, and the violent heat of the ſun. During their paſſage, they muſt be frequently refreſhed with water; but it muſt not be given them in great quantities, leſt it rot the tender fibres of their roots, which will deſtroy the plants; and, when they come into a cool latitude, they muſt be carefully protected from the cold, when they will not require ſo frequently to be watered; for, in a moderate degree of heat, if they have gentle waterings twice a week, it will be ſufficient.

When the plants arrive in England, they ſhould be carefully taken out of the boxes, and each tranſplanted into a ſeparate pot, filled with light rich earth, and plunged into a moderate hot-bed of tanners bark; being careful to cover the glaſſes in the heat of the day, to ſcreen the plants from the ſun: they muſt alſo be frequently watered; but it muſt be done with caution, not to rot their roots. In this hot-bed the plants may remain till Michaelmas, when they muſt be removed into the bark-ſtove, and plunged into the tan, in the warmeſt part of the ſtove. During the winter ſeaſon, the plants muſt be frequently refreſhed with water; but it muſt be given to them in ſmall quantities: yet in ſummer they will require a more plentiful ſhare. Theſe plants are too tender to live in the open air in this country, even in the hotteſt ſeaſon of the year, therefore muſt conſtantly remain in the bark-ſtove; obſerving, in very warm weather, to let in a large ſhare of freſh air to them, and in winter to keep them very warm. As the plants increaſe in bulk, they ſhould be ſhifted into larger pots, in doing of which, there muſt be particular care taken not to tear or bruiſe their roots, which often kills the plants; nor muſt they be placed in pots too large, becauſe that is a ſlow but ſure death to them. The leaves of theſe plants muſt be frequently waſhed, to clear them from filth; which they are ſubject to contract by remaining conſtantly in the houſe; and this becomes an harbour for ſmall inſects, which will infeſt the plants, and deſtroy them, if they are not timely waſhed off. If theſe rules are duly obſerved, the plants will thrive very well, and may produce flowers in this climate; but it will be very difficult to obtain fruit from them; for, being of a very tender nature, they are ſubject to many accidents in a cold country.

Cacao *preſerved*, or *ſweet-meats of Cacao.* They are made in the Antilles, are excellent, and far excel all the ſweet-meats made in Europe.

The Cacao which one would preſerve, muſt be gathered ſome time before it be quite ripe; the maturity of this fruit is known by its pods beginning to turn yellow; they muſt be choſen, therefore, ſome days before they begin to take that colour.

The nuts, which are then delicate and tender, are put to ſoak in freſh clear water, which muſt be changed every morning and every night during five or ſix days; after which they lard them with very thin bits of lemon-peel and cinnamon; then they make a ſyrup of the fineſt ſugar, but very thin, wherein they put the nuts: after it is taken from the fire, and ſufficiently clarified, they leave them in that ſyrup 24 hours. When they are taken out of it, and well dried, they make another ſyrup, but thicker, in which they leave them again a whole day. Laſtly, after they have thus paſſed them through five or ſix ſyrups, they make another, of a greater conſiſtency than the former, wherein they put muſk, ambergriſe, or other perfumes, people like them; and in this laſt ſyrup the nuts are kept for uſe.

When they would have them dry, they take them out of the laſt ſyrup; and, having drained them well, they plunge them into another ſyrup, very ſtrong of ſugar, and well clarified, and put them immediately into a ſtove, where they are candied. F. Labat, from whom this account is taken, obſerves, that this ſort of ſweet-meats requires a great deal of care, and conſumes a prodigious quantity of ſugar: he adds, that the confectioners of the French iſlands ſeldom make any, and cannot undertake it, or make it as it ſhould be, under a crown the pound. *Labat Nouveaux Voyages aux Iſles de l'Amerique.*

CACHE'XIA (*Dict.*)—Dr. James, for the illuſtration of the ſubject, has endeavoured to explain how a Cachexy may be, and generally is produced.

Suppoſe, ſays he, a perſon, of any conſtitution whatever, has his ſtomach and organs of digeſtion impaired by any accident; and that this perſon takes one or more hearty meals of any aliment which is ſuperior to the force of the digeſtive organs; and that, moreover, he uſes little or no exerciſe: upon this occaſion it is not likely, that the aliment ſhould be digeſted and aſſimilated, ſo as to produce good blood; but, in proportion as the aliment is more or leſs diſſolved, the partially diſſolved portions will ſtagnate in the firſt, or more remote ſeries of veſſels, that is, in the larger or ſmaller veſſels; and will cauſe various diſorders, according to the uſes and importance of the parts which they obſtruct.

Suppoſe the aliment ſo little diſſolved, that the largeſt particles which the lacteals can poſſibly admit, are by theſe conveyed to the receptacle of the chyle, and from thence to the maſs of blood; with which, circulating till they arrive at the lungs, they either paſs not at all, or with difficulty, through the minute veſſels of that organ, on account of their bulk; hence difficulty of breathing and palpitations ariſe: and, as the blood ſhould be farther elaborated, and receive its red colour in the lungs, this impediment will, in ſome degree, prevent them both: hence the blood will be pale, and the particles of which it conſiſts, will not be ſo perfectly mixed and united together, as to form a fluid adapted to the exigencies of the animal œconomy. For this reaſon, the watery particles readily ſeparate from the reſt, and loiter, or ſtagnate, in different parts, where they cauſe ſoft tumors, as under the eyes, and in the parts remote from the heart. As theſe large particles muſt, moreover, ſtagnate in the glands, and obſtruct them, the ſecretions of their reſpective fluids muſt be impaired. For this reaſon, many of the aqueous particles, which ſhould either be ſeparated for expulſion, or applied to particular uſes, are retained in the maſs of blood; the bile, alſo, a fluid of the utmoſt importance in digeſtion, as well as the pancreatic juice, becomes defective, inert, and languid; and all the ſolids are farther relaxed, and, amongſt them, the organs of digeſtion; whence every ſubſequent meal lays a new foundation for an increaſe of the diſorder, and all its ſymptoms.

I muſt add, that, when women have acquired ſuch a habit, the watery particles of the blood loiter, or ſtagnate; and the other particles are too large to paſs through the minute uterine veſſels, and form the catamenia.

From what has been ſaid, the reaſons are evident, why the eating chalk, cinders, dirt, unfermented, farinaceous vegetables, as oatmeal, and other indigeſtable ſubſtances, induce a chloroſis.

I cannot conceive it poſſible to adapt a method of cure to ſuch a diſorder as has been deſcribed, more likely to ſucceed, than that which conſiſts in ſupplying the organs of digeſtion with aliments the moſt eaſy of digeſtion, and which approach the neareſt to the nature of the ſound and healthful juices; in due and prudent evacuations of the firſt organs of digeſtion; in corroborating theſe organs, and ſupplying the deficiencies of bile, by aromatics, bitters, and, at laſt, by ſteel; in directing proper exerciſe; and in expelling the matter ſtagnating in the glands, and other parts, by the proper emunctories, when once ſufficiently reſolved, in the manner ſpecified above. *James, Dict. Med.*

Juncter, in his Conſpic. Med. has given us the following method of cure: the general method muſt be by correction of the vitiated humours; a reſeration of the viſcera; an evacuation of the humors, when thus prepared for it; and, finally, a reſtitution of the due tone to the ſolids.

For the firſt fortnight, the patient ſhould be treated with reſolvents and digeſtives; ſuch as *tartarum vitriolatum*, and abſorbents ſaturated with acids; as crabs-eyes with lemon-juice; and with aperient decoctions of the woods of guaiacum and ſaſſafras; as the roots of pimpernel, and the like; and, either during this time, or afterwards, evacuants are to be given; ſuch as ſena, jalap, and dwarf-elder. When the improper treatment of a fever has been the occaſion of the malady, the mild alexipharmics are to be given at times; and, when an obſtruction of the menſes is in the caſe, the time they are to be expected is to be carefully regarded, and emmenagogues and baths for the feet are to be ordered at thoſe periods. When obſtructions of the hæmorrhoidal diſcharges are the cauſe, then, after the firſt fortnight, leaches ſhould be applied to the hæmorrhoidal veins; and, if the diſeaſe has ariſen from long continued hæmorrhages, then analeptics are to be truſted to, with very gentle correctives, for fear of exciting new commotions in the blood; and, in theſe caſes, bleeding in the arm is ſometimes found neceſſary.

CACHU'NDE, the name of a medicine highly celebrated among the Chineſe and Indians; but, as the deſcribers of aromatics, and the later authors, has made no mention of it, Zacutus Luſitanus gives us the following method of preparing it, which, he ſays, was with great difficulty obtained of celebrated phyſicians, who had the health of the Eaſt-Indian viceroys, and other princes, for many years, committed to their care.

Take, ſays he, of the terra cimlia, or any other proper earth, two pounds; of amber, one pound; of muſk and ambergriſe, each, three ounces; of the beſt aloes-wood, by the Portugueſe called calambac, ten ounces; of prepared pearls, three ounces; of prepared rubies, emeralds, granats, jacinths, each four ounces; of red ſanders, four pounds; of yellow ſanders, three ounces; of maſtich, ſweet flag, galangal, cinnamon, aloes waſhed with juice of roſes, the beſt rhubarb, Indian mirobalans, Belloni mirobalans, wormwood, red coral, and Armenian bole, each two ounces; and of calcined ivory, three pounds and a half. The ingredients to be pounded muſt be reduced to a very fine powder; and, after having ſprinkled them with ordoriferous wines and balſams, and water diſtilled from the flowers of the cinnamon-tree, they muſt be dried in a ſhade, and mixed up with a ſufficient quantity of the fineſt white ſugar; then, with a mucilage of gum tragacanth and gum arabic, the whole is to be reduced to a very tenacious, viſcid maſs, which is of a pretty red colour.

Of this maſs various figures are formed, which the merchants convey to ſeveral parts of the world, but principally to Liſbon, the moſt celebrated emporium of the whole earth. The Indian princes, and the grandees of China, uſe this antidote in the following manner: in the day-time they keep a ſmall portion of it, about the bulk of a lentil, in their mouths; from this portion, a ſweet and fragrant liquor gradually and inſenſibly drops from the fauces to the ſtomach, and gives the breath ſo agreeable a flavour, that all who come near them are ſenſible of it. This medicine is truly worthy to be uſed by kings and grandees, for the preſervation of the natural heat; for it preſerves and defends the body from corruption, prevents the bad conſequences of a peſtilential air, removes melancholy and flatulencies, and wonderfully relieves thoſe who labour under melancholy diſorders. It removes palpitations of the heart, cures the cardialgia, the apoplexy, and the epilepſy. It refreſhes the animal and vital ſpirits, invigorates all the faculties, ſtrengthens the ſtomach, and reſiſts poiſons of every kind. It corroborates the brain, and is the moſt ſovereign remedy in the world againſt a ſtinking breath. It proves an incentive to venery, for which intention it is much uſed by both ſexes in the Indies. In ſhort, it is a truly royal medicine; for it protracts life, puts death at a diſtance, and is conſequently ſold at a high price. Whoever uſe it, cannot help admiring the happy effects produced by it. *Zacutus Luſitanus de Medicor. Princip. Hiſt. Lib.* 1. *Obſervat.* 37.

CADE'NE, one of the ſorts of carpets which the Europeans import from the Levant; they are the worſt ſort of all, and are ſold by the piece from one to two piaſters per carpet.

CÆCI'LIA, in zoology, the name of the ſlow-worm, or blind-worm, called by the Greeks typhlinus. It is a ſmall ſpecies of ſerpent, which has ſuch extremely ſmall eyes, that it has been uſually ſuppoſed to have none at all. It is diſtinguiſhed from all our ſnakes by its ſmallneſs, and by the ſhape of its tail, which runs out a great way beyond the anus, and yet is blunt, and conſiderably thick at the end. The colours vary much in the different ſexes, and probably often alſo in the ſame ſex; the common colour is a duſky greeniſh yellow on the back, the ſides are variegated with ſtreaks of black and white: it reſembles the viper in its manner of producing its young, which are put forth alive.

CÆ'MENT-*Pots*, in aſſaying, are veſſels made for the cementation of metals with ſalts, and the ingredients of the ſtrong acid menſtrua, where the force of thoſe menſtrua, and a ſtrong fire, are required together.

The pots are cylindrical veſſels, made of potters clay, with tiles adapted to them, and may be conveniently turned by the potters. The ſize of theſe veſſels muſt be proportioned to the quantity of cæment to be put in them. It is not prudent, however, to make them of more than eight or ten inches broad, becauſe, when they are larger, the fire acts but difficultly and unequally upon them, eſpecially on that part of the matter near the center.

It is to be obſerved, in making theſe veſſels alſo, that all kinds of clay contract and take up a ſmaller ſpace in the drying and baking; the purer clay will contract one tenth part of their diameter, but, the more ſand, or other dry powder, there is in the mixture, the leſs it contracts. If a veſſel, therefore, of any determinate ſize is to be made of clay without any admixture, it muſt be made one tenth larger than the expected ſize; if of clay with theſe admixtures, experience alone can ſhew what muſt be the exceſs in ſize, when moiſt. *Cramer, Art. Aſſ.*

CÆRU'LEUS, in zoology, a name given by authors to a bird of the thruſh or black-bird kind, and ſomewhat reſembling that ſpecies of black-bird commonly called the ſolitary ſparrow. It loves rocks and old buildings, and is thence called by ſome petrocoſſyphus, or the ſtone black-bird; and, from its colours, is called by the Germans blauvogel; it is of the ſize of a ſtarling; its breaſt, back, and neck, are of a very fine deep blue; it lives among the mountains; it ſings very ſweetly, and in winter loſes its fine blue colour, and becomes black.

CÆSALPI'NA, in botany, a plant ſo called by father Plumier, who diſcovered it in America, in honour to Andreas Cæſalpinus, who was an eminent botaniſt, and one of the firſt writers on a method of claſſing plants.

The characters are: it hath a flower of an anomalous figure, conſiſting of one leaf, which is divided into four unequal parts; the upper part is large, and hollowed like a ſpoon. From the bottom of the flower ariſes the pointal, amongſt many incurved ſtamina, which afterwards becomes a pod, including oblong ſeeds.

CA'FFA, cotton cloths, painted with ſeveral colours, and of divers deſigns. They are manufactured in the Eaſt-Indies, and ſold at Bengal. The length and breadth are not the ſame in all the pieces.

CAFFA'RD. They give the name of Caffard-damaſks to ſeveral ſorts of ſtuffs, in ſome of which the warp is of ſilk, or ferret, and the woof of thread; in others, both the warp and the woof are of thread, and ſome are intirely of wool.

CAFFI'LA, a company of merchants, or travellers, or rather a company compoſed of both, who join together, in order to go with more ſecurity through the dominions of the Grand Mogul, and through other countries on the continent of the Eaſt-Indies.

Caffila, ſignifies, alſo, in the ſeveral ports which the Portugueſe ſtill hold on the coaſt of the kingdom of Guzerat, or Cambaya, a ſmall fleet of merchant-ſhips, which ſail from thoſe ports to Surat, or come back from thence, under the convoy of a man of war, which the king of Portugal keeps there for that purpoſe.

CAGE, an incloſure made with wire, wicker, or other matter interwoven latticewiſe, for the detention of wild beaſts or birds.

CAGE, in carpentry, ſignifies an outwork of timber, incloſing another within it.

CAJ'OU, *Caſhew*, or *Caſſu*, an American fruit, ſhaped like a pear, having the large end next the ſtalk, and, at the ſmall end, a nut, in ſhape and ſize, reſembling a hare's kidney, which is the ſeed of the plant.

The Cajou is the fruit of the acajou, a tree frequent in Jamaica and the Caribbee Iſlands. The nut or ſeed, called in Engliſh the caſhew-nut, and ſometimes the apple-bean, bears a near affinity in figure, as well as in virtues, to the anacardium, or Malacca bean, of which ſome make it a ſpecies, under the denomination of anacardium occidentale.

Cluſius deſcribes the Cajou as reſembling a gooſe egg, both for ſize and figure, of a yellow colour, and ſweet; full of a liquor like that of a citron: both the fruit and nut are eaten in Jamaica with great pleaſure; as the former grows bigger, the nut diminiſhes. Between the rind and ſhell of the latter is a ſpongy ſubſtance full of a cauſtic oil, uſed againſt tetters, but which muſt be diſcharged by roaſting the nut in embers, before the kernel is eaten. The thin aſh-coloured ſkin wherewith the kernel is covered, is uſed as an exciter to venery.

CALA'BA, Indian maſtich-tree in botany, a genus of trees, whoſe characters are: it has a roſaceous flower, conſiſting of ſeveral petals which are placed in a circular order; from whoſe flower-cup ariſes the pointal, which afterwards becomes a ſpherical fleſhy fruit, including a nut of the ſame form.

This tree grows to a great magnitude in the warm parts of America, where it is a native. From the trunk and branches there iſſues out a clear gum, ſomewhat like the maſtich, from whence it received its name, the gum being uſed in thoſe countries as maſtich.

At preſent, this tree is pretty rare in England, it being ſo tender as not to bear the open air; ſo that it muſt be preſerved in ſtoves, with the moſt tender exotic plants. It is propagated by the nuts, which are frequently brought from America; theſe ſhould be planted in ſmall pots filled with freſh light earth; and plunged into an hot bed of tanners bark, obſerving to water the pots frequently, to forward the vegetation of the nuts, which, having hard ſhells, are pretty long before they break their covers, unleſs they have a good ſhare of heat and moiſture. When the plants are come up about two inches high, they ſhould be carefully tranſplanted, each into a ſeparate ſmall pot, filled with freſh light earth, and plunged into a moderate hot-bed of tanners-bark, obſerving to water and ſhade them until they have taken new root; after which time they ſhould have air admitted to them, in proportion to the heat of the weather, and the bed in which they are placed; and they muſt be frequently watered in warm weather. In this bed they may remain during the ſummer-ſeaſon; but at Michaelmas they ſhould be removed into the bark-ſtove, and placed in a warm ſituation. During the winter-ſeaſon theſe plants will require water pretty often; but it ſhould not be given to them in large quantities, eſpecially in cold weather, leſt it rot the fibres of their roots. As the plants advance, they muſt be ſhifted into larger pots, and treated in the ſame manner as directed for the coffee-tree, with which management this plant will thrive very well; and, as the leaves of theſe plants are long, ſtrong, and of a ſhining green colour, they make a pretty appearance in the ſtove, with other tender exotic plants. *Miller's Gard. Dict.*

CA'LABASH, in commerce, a light kind of veſſel made of the ſhell of a gourd, emptied and dried, ſerving for a caſe to put divers kinds of goods in, as pitch, roſin, and the like.

The word, is in Spaniſh, calabaça, which ſignifies the ſame.

The Indians alſo, both in the north and ſouth ſea, put the pearls they have fiſhed in Calabaſhes, and the Negroes on the coaſt of Africa do the ſame by their gold duſt.

CA'LAE, CALAEM, or CALAEMUM, denotes a ſpecies of Indian tin, which by force of fire is tranſmutable into ceruſs, like that made of our lead.

CA'LAMBAC, or CALAMBA, a reſinous or fragrant wood brought from the Eaſt-Indies. It is uſually called lignum aloes, or aloes wood.

There are three kinds of this wood, diſtinguiſhed by the names of Calambac, common lignum aloes, and calambour.

1. The Calambac, or fineſt aloes wood, is the moſt reſinous of all the woods we are acquainted with. It is of a light ſpongy texture, very porous, and its pores ſo filled up with a ſoft and fragrant reſin, that the whole may be preſſed and dented by the fingers like wax, or moulded about by chewing in the mouth in the manner of maſtich. This kind laid on the fire melts in great part like reſin, and burns away in a few moments with a bright flame and perfumed ſmell. Its ſcent, while in the maſs, is very agreeable. This is ſo variable in its colour, that ſome have divided it into three kinds; the one variegated with black and purple, the ſecond with the ſame black, but with yellowiſh inſtead of purple, and the third yellow alone like the yolk of an egg. This laſt is the leaſt ſcented of the three; theſe differences however are very trivial; the ſubſtance being in them all the very ſame in every reſpect except the colour, and that often altering very conſiderably in the keeping. This is brought from Cochin China.

2. The lignum aloes vulgare is the ſecond in value. This is of a more denſe and compact texture, and conſequently leſs reſinous than the other: There is ſome of it however that is ſpongy, and has the holes filled up with the right reſinous matter, and all of it, when good, has veins of the ſame reſin in it. We meet with it in ſmall fragments, which have been cut and ſplit from larger. Theſe are of a tolerable denſe texture in the more ſolid pieces, and of a duſky brown colour, variegated with reſinous blackiſh veins. It is in this ſtate very heavy, and leſs fragrant than in thoſe pieces which ſhew a multitude of little holes filled up with the ſame blackiſh matter that forms the veins in others. The woody part of theſe laſt pieces is ſomewhat darker than the others, and is not unfrequently purpliſh, or even blackiſh. The ſmell of the common aloes wood is very agreeable, but not ſo ſtrongly perfumed as the former. Its taſte is ſomewhat bitter and acrid, but very aromatic. Laid on the fire, or held on a hot iron, it does not melt away like the Calambac; but it exſudates a large quantity of a fine fragrant reſin, which ſmells extremely ſweet, while it burns. This wood is alſo brought from Cochin China, ſometimes alſo from Sumatra. It is but rarely found in our ſhops however, and the former, or Calambac, ſcarce ever at all. It bears ſo large a price upon the ſpot, that nobody ventures to bring it away.

3. The calambour, or, as ſome write it calambouc, a word approaching much nearer to Calambac, than the ſubſtances expreſſed by them do to one another. This is the wood that is moſt common in our ſhops, though it has of all the others leaſt title to be ſo, as it has the leaſt virtue, and contains the leaſt reſin of any. It is a light and friable wood, of a duſky and often mottled colour, between a duſky green black and a deep brown. It is leſs firm and ſolid than moſt of the officinal woods. Its ſmell is fragrant and agreeable, but much leſs ſweet than that of either of the others; and its taſte bitteriſh, but not ſo much acrid or aromatic as the others. We meet with this very frequent and in large logs, and theſe ſometimes intire, ſometimes only the heart of the tree, the cortical part being ſeparated. This is brought from the iſland of Timor, and ſome other places, and is the aloes wood uſed by the cabinet-makers and inlayers, but is very improperly uſed under the name of lignum aloes in the ſhops.

The Indians uſe the Calambac, by way of incenſe, burning ſmall pieces of it in the temples of their gods; and ſometimes their great people burn it in their houſes in times of feaſting. It is eſteemed a cordial, taken internally, and they ſometimes give it in diſorders of the ſtomach and bowels, and to deſtroy worms. It has alſo the credit of being a great thing for preſerving and ſtrengthening the memory. A very fragrant oil may be procured from it by diſtillation, which is recommended in paralytic caſes, from five to fifteen drops. It is at preſent however but little uſed, and would ſcarce be met with any where in the ſhops, but that it is an ingredient in ſome of the old compoſitions.

We are told in the Philoſophical Tranſactions, that the tree, while growing, abounds with a milky juice of ſo acrid and cauſtic a nature, that, if it gets into the eyes, it will occaſion blindneſs, and, if it only fall on any part of the ſkin, it will raiſe bliſters. If this be a fact, perhaps, there would be required ſome caution in the internal uſe of the true reſinous wood of this name; but, as to the common one we meet with, there does not ſeem to be much to be dreaded from that.

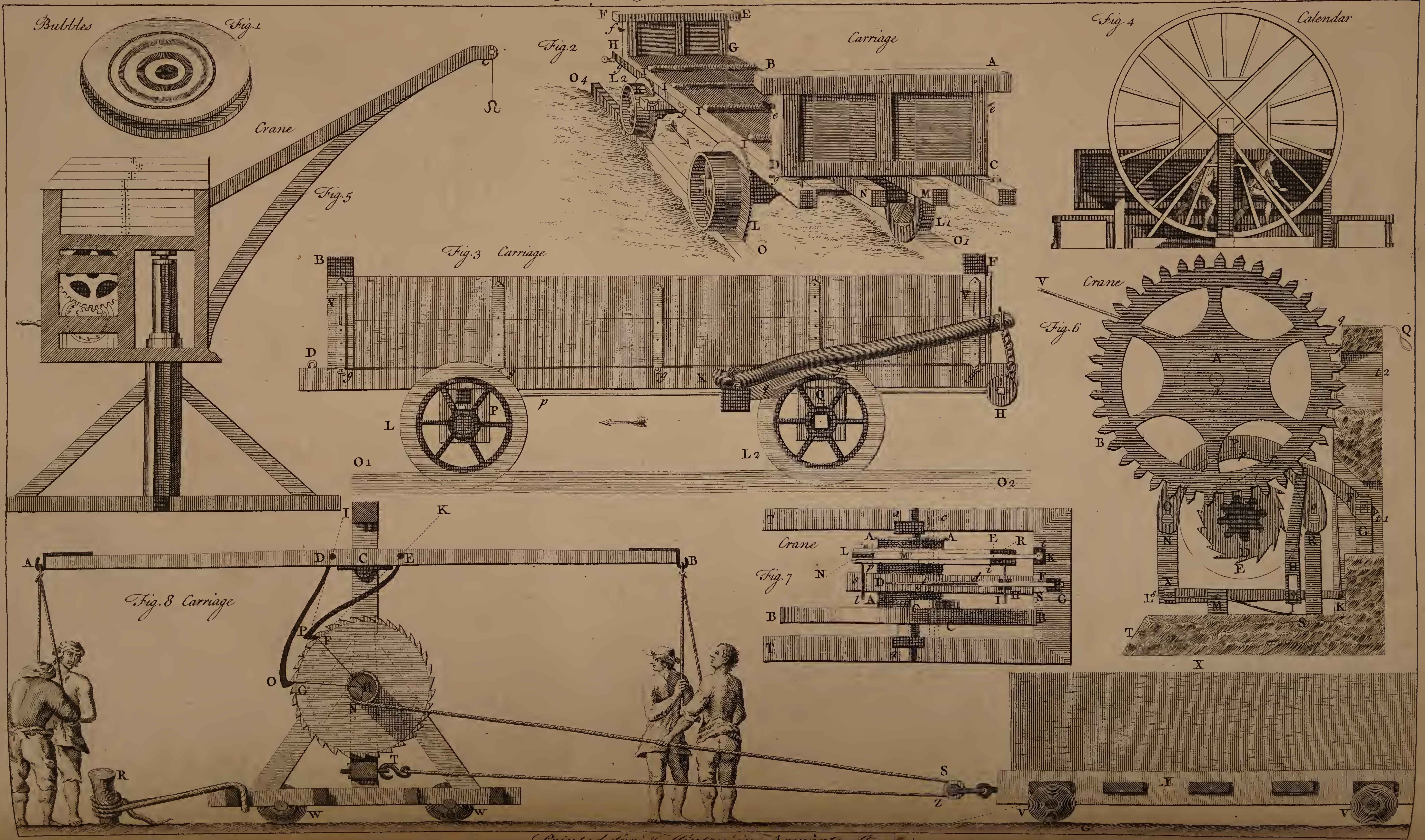
CALAMA'NCO, a woollen ſtuff manufactured in Brabant, in Flanders, particularly at Antwerp, Liſle, Tournay, Turcoin, Roubaix, and Lannoy. There are, alſo, a great many made in England. In France, they are of different breadths; ſome of $\frac{7}{16}$, others of $\frac{2}{8}$, of $\frac{7}{12}$, of $\frac{5}{8}$, or of $\frac{5}{12}$, of an ell, all Paris meaſure. As for the length of the pieces, there is nothing ſettled; the weavers make them longer or ſhorter, according as they pleaſe, or as they are commiſſioned by the merchants. This ſtuff has a fine gloſs upon it, and is checkered in the warp, whence the checks appear only on the right ſide. It is commonly wove wholly of wool; there are ſome however, wherein the warp is mixed with ſilk, and others with goat's hair. There are Calamancoes of all colours, and diverſly wrought; ſome are quite plain; others have broad ſtripes, adorned with flowers; ſome with plain broad ſtripes; ſome with narrow ſtripes; and others watered. This, alſo, is no inconſiderable branch of the woollen manufacture of England, both for home wear and foreign exportation. See WOOLLEN *Manufacture*.

CALAMI'TIS, is uſed for a ſpecies of artificial cadmia found adhering to the ſticks, ladles, and other utenſils wherewith they ſtir the copper when in fuſion in the furnace.

CALAMITA *Alba*, in natural hiſtory, the name of an earth dug in Spain and Italy, of a hard texture, a white colour, and ſtyptic taſte; they pretend that this attracts fleſh in the ſame manner as the magnet does iron, and thence call it magnes carneus.

CA'LAMUS *Scriptorius*, or *Arundo Scriptoria*. The ancients wrote on parchment or Ægyptian paper, with a reed made in the ſhape of a pen, and thence called Calamus ſcriptorius. We mention parchment or Ægyptian paper, becauſe our paper is of modern invention. The Arabians, Perſians, Turks, Greeks, and

PLATE XI. *Engraved for the* SUPPLEMENT. *Facing* Calendar.


Bubbles
Fig. 1
Crane
Fig. 5
Fig. 2
Carriage
F E f H G B A O4 L2 K I I g e e D C N M L L1 O O1
Fig. 4
Calendar
Fig. 3 Carriage
B F V V D g g g K g R q q Q P p L L2 H O1 O2
V Crane
Fig. 6
A a B P p Q q t2 t1 O N C D E F G R H I K L6 X M T S X
Crane
Fig. 7
T c A A E R L M t K N p f d i F D S G I H l A C B B C T
Fig. 8 Carriage
I K A D C E B P F O G H N T R S Z W W V Y V G

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and Armenians uſe it even at this day; and, though the Greek be a much finer character than ours, write it with great diſpatch and elegance.

CALA'SH, or Calesh, a ſmall light kind of chariot, or chair, with very low wheels, uſed chiefly for taking the air in parks and gardens.

In the Philoſophical Tranſactions, we have a deſcription of a new ſort of Calaſh, going on two wheels, not hung on traces, yet eaſier than the common coaches, over which it has this further advantage, that, whereas a common coach will overturn, if one wheel go on a ſurface a foot and a half higher than that of the other, this will admit of a difference of above 3 feet, without danger of overturning. Add, that it would turn over and over, that is, after being turned ſo as that the ſpokes are parallel to the horizon, and one wheel flat over the head of him that rides in it, and the other flat under him, it will turn once more, by which the wheels are placed in ſtatu quo, without any diſorder to the horſe, or rider.

CALCA'NEUM (*Dict.*) The body of the os calcis has ſix ſides, one poſterior, one anterior, one ſuperior, one inferior, and two lateral.

The poſterior ſide is broad, unequally convex, and, as it were, divided into two portions; one ſuperior, ſmall, and poliſhed; the other inferior, much larger, unequal, and rough, which, in children, is an epiphyſis, and may be named the tuberoſity of the os calcis. The lower part of it is bent downward, and terminates in two turbercles, or obtuſe points, which belong rather to the inferior than to the poſterior ſide of the bone.

The upper ſide may be divided into two parts, one poſterior and unequal, having a ſmall depreſſion; the other anterior, convex, and cartilaginous, proportioned to the great inferior cavity of the aſtragalus. This ſide is turned obliquely forward, and by this obliquity becomes part of the foreſide, the remaining part of which is loſt in the anterior apophyſis.

The lower ſide is narrow, and behind it lie the two tubercles, of which the internal is the biggeſt. They both ſerve for the inſertion of the aponeuroſis in the ſoal of the foot, but principally the biggeſt.

The two lateral ſides are continued over the anterior apophyſis. The external is gently convex and unequal, covered only by the common integuments and ligaments. The internal is hollowed and depreſſed.

The great or interior apophyſis lies in the ſame direction with the body, being a continuation thereof. It has five ſides or remarkable parts, and, were it not for the body, it would have a ſixth.

The upper ſide has an irregular and unequal depreſſion, which, together with that in the apophyſis of the aſtragalus, forms a conſiderable foſſula. At its anterior extremity, there is a ſmall cartilaginous ſurface, anſwering to one of thoſe in the apophyſis of the aſtragalus.

The anterior ſide of the apophyſis is broad, oblique, cartilaginous, partly convex, and partly concave, and articulated with a little ſurface of the os cuboides. This is the foreſide of the whole os calcis, when conſidered without any diviſion.

The outſide of the apophyſis is very rough, being a continuation of the outer ſide of the body, with a tubercle or eminence at the place where theſe two ſides meet, which, however, is not found in all ſubjects. On the lower part of this tubercle, is a cartilaginous ſurface, for the paſſage of the tendon of the peronæus longus: ſometimes we ſee only ſome ſmall veſtiges of this eminence, and often none at all. We ſometimes meet with another ſmall cartilaginous ſurface lower down, and more forward, near the anterior extremity of the apophyſis, for the paſſage of the ſame tendon. The lower ſide is a tuberoſity, continued from the ſide of the body, and deſigned for the inſertion of muſcles.

The lateral apophyſis is almoſt common to the body, and to the great anterior apophyſis, and increaſes the cavity on the inſide of the os calcis. On its upper part, it has a very ſmooth cartilaginous ſurface, articulated with one of the inferior ſurfaces of the aſtragalus. This apophyſis is very low down, and its inferior part is ſmooth for the paſſage of tendons.

The os calcis has four cartilages, of which three are ſuperior, one large, and two ſmall, for its triple articulation with the aſtragalus; the fourth is anterior, for the os cuboides. To theſe muſt be added a ſmall thin cartilage, of a kind of ligamentary ſubſtance, under the tubercle on the outſide of this bone. *Winſlow's Anat.*

Factitious **CALCE'DONY**, in chemiſtry.—As the agate jaſper, and Calcedony have a great affinity, the ſame proceſs may ſerve to imitate theſe three kinds of precious ſtones. Diſſolve one ounce of ſilver in aqua-fortis. Then take of lime, pewter, cinnabar, bole armeni, crocus martis, crude antimony, minium, orpiment, white arſenic, and æs uſtum, of each half an ounce: reduce theſe ingredients to a fine powder, and pour a ſufficient quantity of aqua-fortis upon it, drop by drop, very ſoftly, for it will make a conſiderable efferveſcence; when the efferveſcence is over, pour more aqua-fortis on it, and put the veſſel in a digeſtion of a moderate heat: after a few days draw off the aqua-fortis by diſtillation, and the powder will remain of a greeniſh red, which muſt be reduced by levigation to an impalpable powder. Then to twelve ounces of cryſtal fritte add two ounces of this powder, at four different times, one half ounce each time; ſtir this mixture carefully, while in fuſion, over a proper heat. At the end of twenty-four hours the operation will be performed.

CALDA'RIUM, in the antient baths, denoted a brazen veſſel or ciſtern, placed in the hypocauſtum full of hot water, to be drawn thence into the piſcina or bath, to give it the neceſſary degree of heat.

CA'LENDAR, in mechanics (*Dict.*)—The Calendar is compoſed of two thick cylinders, or rollers, of very hard and poliſhed wood, round which, the ſtuffs which are to be calendered are rolled very ſmooth.

Theſe rollers are placed croſs-ways, between two very thick boards, of poliſhed wood, which are longer than they are broad; ſome call them tables.

The undermoſt board, which ſerves as a baſe for the whole machine, is fixed, and placed level, on a ſolid foundation of brick-work. The uppermoſt board is moveable, though loaded with large ſtones, cemented together, weighing twenty-thouſand pounds, or more.

A cable wound round the tree, or axis, of a large wheel, ſomething like that of a crane to raiſe ſtones, and tied with ſtrong rings to this uppermoſt board, ſerves to move it, ſometimes one way, ſometimes another, according as the men that walk in the wheel ſet it a going. It is this alternate motion, together with the prodigious weight of the uppermoſt board of the Calendar, that renders the ſtuffs ſmooth and gloſſy, or gives them the waves, by making the cylinders, on which they are put, roll with great force over the undermoſt board.

When they would put a roller from under the Calendar, to put on another, they only incline the undermoſt board of the machine. See a ſection of the Calendar *plate* XI, *fig.* 4.

The dreſſing alone, with the many turns they make the ſtuffs and linens undergo in the Calendar, gives the waves, or waters them, as the workmen call it. It is a miſtake to think (as ſome, and thoſe not a few, modern authors, have aſſerted) that they uſe rollers with a ſhallow indenture, or ingraving, cut into them.

There is at Paris a very extraordinary Calendar, called, by way of eminence, the royal Calendar. It was made by the order of the late Monſieur Colbert, miniſter and ſecretary of ſtate, and ſuperintendant of the arts and manufactures of that kingdom.

The undermoſt table of this Calendar is a block of very well poliſhed marble, and the uppermoſt is lined underneath with a copper-plate, all of a piece, and extremely well poliſhed, wherein it differs from the other Calendars, whoſe tables, or boards, are commonly of wood only.

There are ſome Calendars without wheels, which are moved by a horſe, tied to a wooden bar, which turns ſometimes to the right, and ſometimes to the left, a great pole, placed upright, at the top of which, about a kind of drum, is wound a cable, the two ends of which, being faſtened to the two ends of the uppermoſt board of the Calendar, ſet it a going. The Calendars moved by horſes are not reckoned ſo good as thoſe with wheels, the latter having a more uniform and certain motion.

At Paris, none but the principal maſter-dyers have the liberty of keeping Calendars at their own houſes; at Amiens, and other places, every one may have them who pleaſes.

Aſtronomical Calendar, an inſtrument engraved upon copper-plates, printed on paper, and paſted on board, with a braſs ſlider which carries a hair, and ſhews, by inſpection, the ſun's meridian altitude, right aſcenſion, declination, riſing, ſetting, amplitude, &c. to a greater exactneſs than our common globes will ſhew.

Reformed or *corrected* Calendar, that which, ſetting aſide all apparatus of golden numbers, epacts, and dominical letters, determines the equinox with the paſchal full moon, and the moveable feaſts depending thereon, by aſtronomical computation, according to the Rudolphine tables.

This Calendar was introduced among the proteſtant ſtates of Germany, in the year 1700, when eleven days were at once thrown out of the month of February: ſo that, in 1700, February had but eighteen days: by this means, the corrected ſtile agrees with the Gregorian. This alteration in the form of the year they admitted for a time, in expectation that, the real quantity of the tropical year being at length more accurately determined by obſervation, the Romaniſts would agree with them, on ſome more convenient intercalation.

Conſtruction of a Calendar, or *Almanack*. 1°. Compute the ſun's and moon's place for each day of the year, or take them from Ephemerides. 2°. Find the dominical letter, and, by means thereof, diſtribute the Calendar into weeks. 3°. Compute the time of Eaſter, and thence fix the other moveable feaſts: 4°. Add the immoveable feaſts, with the names of the martyrs. 5°. To every day add the ſun's and moon's place, with the riſing and ſetting of each luminary; the length of day and night; the crepuſcula, and the aſpects of the planets. 6°. Add, in proper places, the chief places of the moon; and the ſun's entrance into the cardinal points; i. e. the ſolſtices and equinoxes; together with the riſing and the ſetting, eſpecially heliacal, of the planets, and chief fixed ſtars. Means for each whereof will be found under the proper heads. The duration of the crepuſcula, or the end of the evening, and beginning of the morning twilight, together with the ſun's riſing and ſetting, and the length of days, may be transferred from the Calendars of one year into thoſe of another: the differences in the ſeveral years being too ſmall to be of any conſideration in civil life.

Hence, it appears, that the conſtruction of a Calendar has nothing in it of myſtery, or difficulty, if tables of the heavenly motions be at hand.

Gelalean Calendar, is a correction of the Perſian Calendar, made by order of Sultan Gelaleddan, in the 467th year of the Hegira, and in the 1389th of the Chriſtian æra.

CA'LENDS (*Dict.*) — To find the day of the Calends anſwering to any day of the month we are in, ſee how many days there are yet remaining of the month, and to that number add two; for example, ſuppoſe it the twenty-fourth of June, it is then the eighth of the Calends of July, for June contains thirty days; twenty-four taken from thirty, there remains ſix, to which two being added makes the ſum eight.

The Calends of January were the moſt conſiderable, being particularly conſecrated to Juno, and the god Janus. On this day, the magiſtrates entered upon their offices, and feaſts were kept every-where, and preſents exchanged between them, in token of friendſhip; for they believed, if they diverted themſelves well in the beginning, they ſhould paſs the whole year ſo.

On the Calends of March, they took their leaſes, &c. in regard the year, as fixed by Romulus, commenced on that day: Hence, the Calends of March was a fatal day to debtors, becauſe their leaſes expired on that day, which made Horace call them triſtes calendas.

The Roman writers themſelves were at a loſs for the reaſon of this abſurd and whimſical manner of computing the days of the month; yet, it is ſtill kept up in the Roman Chancery, and, by ſome authors, out of a vain affectation of learning, preferring it to the common more natural and eaſy manner.

CA'LENTER, a name given by the Perſians to their treaſurer, and receiver of the rents of their provinces. He overſees the king's revenues, receives and gives an account to the council, or by the king's order to the cham, who is governor of the province.

CALF, *vitulus*, in zoology. There are two ways of breeding Calves that are intended to be reared; the one is to let the Calf run with its dam all the year round: this is the method in the cheap breeding countries, and is generally allowed to make the beſt cattle. The other way is to take them from the dam after they have ſucked about a fortnight; they are then to be taught to drink fleet milk, which is to be made but juſt warm for them, it being very dangerous to give it them too hot.

The beſt time of weaning Calves is from January to May; they ſhould have milk for twelve weeks after, and, a fortnight before that is left off, water ſhould be mixed with the milk in larger and larger quantities. When the Calf has fed on milk about a month, little whiſps of hay ſhould be placed all about him in cleft ſticks to induce him to eat. In the beginning of April, they ſhould be turned out to graſs; only, for a few days, they ſhould be taken in for the night, and have milk and water given them; the ſame may alſo be given them in a pail, ſometimes in the field, till they are ſo able to feed themſelves that they do not regard it. The graſs they are turned into muſt not be too rank, but ſhort and ſweet, that they may like it, and yet get it with ſome labour.

Calves ſhould be always weaned at graſs, for, if it be done with hay and water, they often grow big-bellied on it, and are apt to rot. When thoſe among the males are ſelected, which are to be kept as bulls, the reſt ſhould be gelded for oxen: the ſooner the better. Twenty days old is a very good time, or any thing between that age and ten days. About London, almoſt all the Calves are fatted for the butcher. The reaſon of this is, that there is a good market for them, and the lands here are not ſo profitable to breed upon as in cheaper countries. The way to make the Calves fat and fine is, the keeping them very clean, giving them freſh litter every day, and hanging a large chalk-ſtone in ſome corner where they can eaſily get at it to lick it, but where it is out of the way of being fouled by their dung and urine. The coops are to be ſo placed as not to have too much ſun upon them, and ſo high above the ground that the urine may run off. They alſo bleed them once when they are a month old, and a ſecond time before they kill them; this is a great addition to the beauty and whiteneſs of their fleſh; the bleeding is by ſome repeated much oftener, but this is ſufficient.

Calves are very apt to be looſe in their bowels; this waſtes and very much injures them. The remedy is, to give them chalk ſcraped into milk, pouring it down with a horn; if this does not ſucceed, they give them bole armenic in large doſes, and uſe the cold bath every morning. If a cow will not let a ſtrange Calf ſuck her, the common method is to rub both her noſe and the Calf's with a little brandy: this generally reconciles them after a few ſmellings. *Mortimer's Huſbandry.*

Calf's *ſkins*, in the leather manufacture, are prepared and dreſſed by the tanners, ſkinners, and curriers, who ſell them for the uſe of the ſhoe-makers, ſadlers, bookbinders, and other artificers, who employ them in their ſeveral manufactures.

Calf-ſkins, dreſſed in ſumac, denote the ſkin of this animal curried black on the hair ſide, and dyed of an orange colour on the fleſh ſide, by means of ſumac, chiefly uſed in the making of belts.

The Engliſh Calf-ſkin is much valued abroad, and the commerce thereof very conſiderable in France and other countries; where divers attempts have been made to imitate it, but hitherto in vain. Mr. Colbert, to whom France owes a great number of arts and eſtabliſhments of this kind, ſet on foot a company of undertakers in 1665, who ſet up a manufactory of this kind, under the denomination of bonnets tanneurs; but, after an hundred thouſand livres ſunk in the undertaking, they were forced to deſiſt.

CA'LIBER, or Caliper-*rule*, is an inſtrument, wherein a right line is ſo divided, as that, the firſt part being equal to the diameter of an iron or leaden ball of one pound weight, the other parts are to the firſt, as the diameters of balls of two, three, four, &c. pounds are to the diameter of a ball of one pound. The Caliber is uſed by engineers, from the weight of the ball given, to determine its diameter, or Caliber; or vice verſa.

The Caliber, in general, conſiſts of two thin pieces of braſs, ſix inches long, joined by a rivet, ſo as to move quite round each other; the head, or one end of the piece, is cut circular; and one half of its circumference is divided into every ſecond degree. On the other half are diviſions, from one to ten; each, again, ſubdivided into four: the uſe of which diviſions and ſubdiviſions is, that, when the diameter of a bullet, &c. not exceeding ten inches, is taken, the diameter of the ſemicircle will, among the diviſions, give the length of that diameter taken between the points of the Calibers, in inches and fourth parts.

The degrees on the head ſerve to take the quantity of an angle; the method of which is obvious. If the angle be inward, apply the outward edges to the planes that form the angle; the degrees, cut by the diameter of the ſemicircle, ſhew the quantity of the angle ſought. For an outward angle, open the branches till the points be outwards, and, applying the ſtreight edges to the planes that form the angle, the degrees cut by the diameter of the ſemi-circle ſhew the angle required, reckoning from 180, towards the right-hand.

On one branch of the Calibers, on the ſame ſide, are, firſt, ſix inches; and each of theſe ſubdivided into ten parts. Secondly, a ſcale of unequal diviſions, beginning at two, and ending at ten; each ſubdivided into four parts. Thirdly, two other ſcales of lines, ſhewing, when the diameter of the bore of a piece is taken with the points of the Calibers outwards, the name of the piece, whether iron or braſs; i. e. the weight of the bullet it carries; or that it is ſuch or ſuch a pounder from one to forty-two pounds.

On the other branch of the Calibers, on the ſame ſide, is a line of cords to about three inches radius; and a line of lines on both branches, as on the ſector; with a table of the names of the ſeveral pieces of ordnance. On the ſame face is a hand graved, and a right line drawn from the finger towards the center of the rivet: ſhewing, by its cutting certain diviſions made on the circle, the weight of iron ſhot, when the diameter is taken with the points of the Calibers. Laſtly, on the circle, or head on the ſame ſide, are graved ſeveral geometrical figures inſcribed in each other, with numbers; as a cube, whoſe ſide is ſuppoſed one foot; a pyramid on the ſame baſe and altitude, and the proportions of their weight, &c. a ſphere inſcribed in a cube; a cylinder, cone, circle, ſquare, &c.

Caliber, alſo ſignifies an inſtrument, or rule, uſed by carpenters, and bricklayers, to ſee whether their work be well ſquared. It is nothing but a piece of board, notched, or cut triangularly in the middle.

Caliber. The gunſmiths uſe ſeveral ſorts of tools to which they give that name, ſome of which are of wood, and others of ſteel.

The Calibers of wood are properly models, after which they cauſe to be cut, out of walnut-tree, aſh-tree, or maple-tree wood, the ſtocks on which they mount guns or piſtols, or other fire-arms. They are nothing but very thin pieces of wood, cut in the figure of the gun, piſtol, &c. that is to be mounted upon them: ſo that there are as many of thoſe Calibers as there are ſeveral ſorts of fire-arms, as fuſees, muſkets, piſtols, &c.

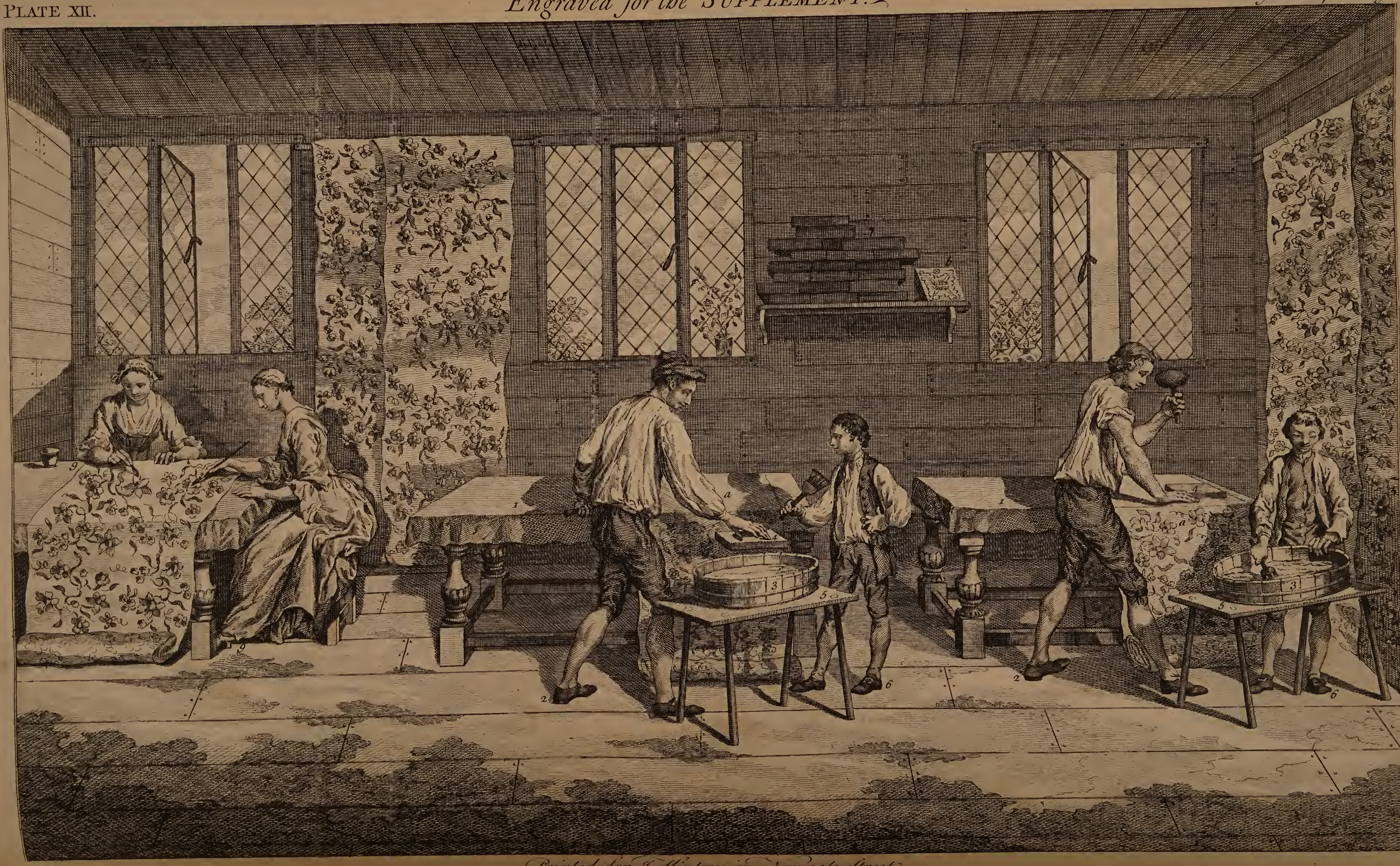
The ſteel Calibers in the gunſmith's buſineſs are of two ſorts, ſome double, and the others ſimple. The ſimple one is a kind of file, without either a handle or a tail, with holes of ſeveral diameters bored into it, at ſome diſtance from each other. They ſerve to make and fine the lower parts of ſcrews. The double Caliber differs from the ſimple one in this only, that it is compoſed of two files, placed the one over the other, and joined or faſtened together with a ſcrew at each end, by means of which they are put cloſer to, or further from each other, at pleaſure. The undermoſt handle has a handle alſo of ſteel, a little incurvated within: theſe laſt Calibers ſerve to turn, as it were, by a turning-wheel, the nuts, or knobs, of the plates that are put between them.

CALI'CO, or Callico, a kind of linen manufacture, made of cotton, chiefly in the Eaſt-Indies. There is a great trade in the province of Bengal in this commodity, which is tranſported in prodigious quantities into Perſia, Turkey, Arabia, Muſcovy,

PLATE XII.

Engraved for the SUPPLEMENT.

Facing Calico-*printing*



Printed for J. Hinton in Newgate Street.

Muſcovy, and all over Europe. Some of them are painted with flowers of various colours; and the women in the Indies make veils and ſcarfs of them, and, of ſome, coverlets for beds, and handkerchiefs. They make another ſort of this manufacture, which they never dye, and hath a ſtripe of gold and ſilver quite through the piece; and at each end, from the breadth of one inch to twelve or fifteen, they fix a tiſſue of gold, ſilver, and ſilk, intermixed with flowers; both ſides are alike. They make, alſo, other ſorts of cotton cloths at Brampour, becauſe there is no other province in all the Indies which has greater quantities of cotton.

At Seconge they are ſaid to make the beſt ſorts of Calicoes; in all other parts the colours are neither ſo lively nor laſting, but wear out with often waſhing; whereas thoſe made at Seconge grow the fairer, the more you waſh them. This is ſaid to ariſe from a peculiar virtue of the river that runs by the city, when the rain falls; for the workmen, having made ſuch prints upon their cottons as the foreign merchants give them, by ſeveral patterns, dip them into the river often, and that ſo fixes the colours, that they will always hold. There is alſo made at Seconge a ſort of Calico, ſo fine, that, when a man puts it on, his ſkin ſhall appear as plainly through it as if he was quite naked; but the merchants are not permitted to tranſport it, for the governor is obliged to ſend it all to the Great Mogul's ſeraglio, and the principal lords of the court, to make the ſultaneſſes and noblemen's wives ſhifts and garments for hot weather.

The city of Baroche, alſo, is very famous for trade, on account of the river, which has a peculiar quality to whiten their Calicoes, and which are, therefore, brought from all parts of the Mogul's territories thither for that end.

This manufacture is brought into this nation by the Eaſt-India company, which is re-exported by private merchants to other parts of Europe and America.

Calico-*printing*, the art of ſtaining Calicoes, &c. of various colours.

Method of printing **Calicoes**.—Before the operation of printing is performed, the cloth is carried to the printing-houſe in order to be properly prepared, which is done in the following manner: It is firſt laid to ſoak in water, and then well waſhed, and beat out; after which, it is put into a copper of water, rendered a little acid, by a proper quantity of ſpirit of vitriol, or juice of lemons; in this menſtruum it is kept in a midding degree of heat (but not ſuffered to boil) till it has ſufficiently imbibed the acid particles of the menſtruum. It is then taken out, and well waſhed; and, in order to free it entirely from the acid, it is ſcalded in a menſtruum compoſed of water and cow-dung; and then cleared again by waſhing, beating, &c. After which, it is thoroughly dried, and calendared.

The intention of this previous preparation, is to free the cloth from the alkaline particles it has acquired in the making, &c. for it is abſolutely neceſſary, that the cloth ſhould be entirely free from all alkaline or acid particles.

The pattern intended to be printed on the Calico, is drawn in water-colours on paper, and then cut on blocks, either of pear-tree or holley. But it muſt be obſerved, that no more of the pattern is cut on one block, than is of one colour. That is, if there are three different reds in the pattern, only that part of the drawing is cut on the block which is of the ſame colour. Whence it follows, that, as many different colours as there are in the pattern, ſo many different blocks will be neceſſary to print it. The colours uſed are black, two purples, and three reds; for, with regard to the yellows, blues, and greens, they are pencilled in.

The Calico is printed on a table about ſix feet long, and two feet broad, covered with a woollen blanket, on which the cloth is ſpread. On the left ſide of the table ſtands a ſhallow tub, containing the colour to be uſed; in this tub is a float or ſieve, compoſed of a broad aſhen hoop, and the bottom a ſheepſkin, upon which is a piece of ſuperfine broad-cloth. The colour in which this ſieve floats, is well ſtiffened with gum arabic or ſeneca, to prevent its ſplaſhing.

The ſieve being furniſhed by a boy with a proper quantity of colour, the printer dips his block into it, with his right hand, and places it on the cloth, ſtriking it with an oval mallet of lignum vitæ, with his left hand.

When he has printed the whole piece with one colour, it is printed over again in the ſame manner with another block, on which the parts of the pattern to be printed of another colour are cut. And in the ſame manner the whole is printed with the ſeveral colours intended.

In the printing-houſe there is a large fire to ſet the colours, to prevent their running.

After printing, it is carried to the ſtove-room, and hardened, but not ſuffered to be quite dry; and then put into a dye of madder, in which it is kept till the dye juſt begins to boil. After it is taken from the dye, it is well waſhed, beat, &c. and then put into a copper of water mixed with bran. It is then carried back to the printing-houſe, in order to have the blues, yellows, and greens, pencilled in. After which it is again waſhed, and ſent to the whitſters to be bleached. For the method of which, ſee the article BLEACHING, in the Dictionary.

Explanation of *Plate* XII, repreſenting part of the inſide of a Calico printing-houſe.

1 1, Two tables covered with blankets on which the Calico is printed.

a a, The Calico on the tables.

2 2, Two printers at work; the firſt of which is going to dip his print in the colour, and the ſecond has juſt placed his print on the Calico.

3 3, Tubs containing the colour.

4 4, Blocks on which the pattern is cut.

5 5, Stools that ſupport the tubs of colour.

6 6, Boys which ſtir the colour in the tubs, and keep a proper quantity in them.

7, Blocks, or prints, placed on a ſhelf in the printing-room; one of which, marked *b*, is placed with its face outward.

8 8, Pieces of Calico printed and hung up to ſet the colour.

9 9, Women pencilling the yellow, and blue colours.

The colours with which the Calico is printed, except thoſe which are pencilled in, are all compoſed of madder-dye, and a proper quantity of a fixed alkaline ſalt; this mixture turns black upon the Calico, but, when put into the copper of madder dye, turns of a beautiful red or purple colour; and, the greater quantity of alkaline ſalt there is in the mixture, the deeper the colour is after it comes out of the dye. Hence we ſee the reaſon why the cloth muſt be deprived of all its alkaline or acid particles; for the madder-dye will not ſtrike on any part of the cloth but where it is previouſly prepared by the ſalt: and, the ground being intended to be white, it is neceſſary that none of the alkaline menſtruum touch it; and, with regard to the ſlight tinge which the ground of the cloth receives from the madder-dye, it is entirely diſcharged in the bleaching.

The beautiful yellow colour which is pencilled in, is extracted from iron by ſtale ſmall beer, and the blues from indigo and turnſole by the help of urine. With regard to the green, it is compounded of the blue and yellow; the parts intended to be green being firſt covered with a blue, and afterwards with a yellow.

It appears highly probable that the Indians, for making the fine, bright, and durable colours wherewith their Calicoes and chinches are ſtained, uſe metalline ſolutions; for, ſome ſtained Calicoes having been kept for forty or fifty years, the bright colours have been obſerved to eat out the cloth, exactly in the ſame manner as the corroſive and acid ſpirits, which diſſolves metals, are found to do: whence, to imitate their richeſt and nobleſt colours, we are directed to uſe proper metalline ſolutions.

But it would be a farther ſtep towards perfection, not only in this art, but alſo in the art of painting, to prepare the fineſt colours without employing either acid or alkaline ſalts; which uſually ſubject colours to change, or elſe are apt to prey upon the cloth or canvas, as we ſee in verdigreaſe, the blue and green cryſtals of copper, &c. Whence we are directed, 1, to ſearch for menſtruums that are neither acid, alkaline, or ſaline; 2, for ſuch metalline calxes, precipitates, or powders as will not loſe their colours by being well waſhed, to get out their ſalts; 3, to prepare certain metalline matters by calcination, or the bare aſſiſtance of the fire; and, 4, to look out for native colours, wherein no ſaline matter abounds.

It may be worth the trying, whether certain metals are not ſoluble by triture, with the pureſt oils employed in painting, and ſuch as contain neither acid nor alkaline ſalts; or whether mere water, the white of eggs, ſaliva, gum-water, &c. may not, by the ſame means, be made to diſſolve them; ſo as that the metalline particles may be left behind upon Calicoes, cloths &c. when the aqueous or mucilaginous matter is dried, or waſhed away from them. But no great effect can be rationally expected in ſuch attempts, unleſs the triture be long continued, and mills, or other well adapted engines, be uſed for the purpoſe: for we find, in all inſtances, that metals muſt be reduced to very fine particles before they will tinge or colour.

CA'LIN, a kind of metal, finer than lead, but inferior to tin. It is very common in China, Cochinchina, Japan, Siam, &c. It is commonly uſed in the Eaſt-Indies for covering the roofs of houſes, as we do lead in Europe; they likewiſe make of it ſeveral pieces of furniture. The tea boxes which comes from China are made of Calin. They alſo make coffee-pots of it, ſome of which are even brought into Europe.

It is a mixture of tin and lead, and ſome other mineral, as zink, &c. rather than a metal of a new kind.

CA'LVINISTS, thoſe who follow the opinions of John Calvin, one of the principal reformers of the church, in the 16th century.

Calvin was born at Noyon, in Picardy, in the year 1509: he firſt ſtudied the civil law; afterwards retiring to Baſil, he turned his thoughts to the ſtudy of divinity, and publiſhed there his Inſtitutions, which he dedicated to Francis I. He was made profeſſor of divinity at Geneva, in the year 1536. The year following, he prevailed with the people to ſubſcribe a confeſſion of faith, and to renounce the Pope's authority: but, carrying the matter a little farther than was agreeable to the government, he was obliged to retire from Geneva; upon which he ſet up a French church at Straſburgh in Germany, and was himſelf the firſt miniſter of it: but, the town of Geneva inviting him to return, he came back thither in September 1541. The firſt thing he did, was to ſettle a form of diſcipline and conſiſtorial juriſdiction, with a power to inflict cenſures, even to excommunication; and he gained himſelf many enemies, by his inflexible ſeverity, in maintaining the rights and juriſdiction of his conſiſtory: he was a perſon of great parts, indefatigable induſtry, and conſiderable learning. He died in the 56th year of his age, in 1564.

The principal opinions of the Calviniſts are drawn from the writings of Calvin, contained in the forty articles of their Chriſtian faith, which they preſented to the French king, in their catechiſms and eccleſiaſtical diſcipline.

The Calviniſts are great advocates for the abſoluteneſs of God's decrees; and hold, that election and reprobation depend on the mere will of God, without any regard to the merit or demerit of mankind; that he affords to the elect an irremiſſible grace, a faith which they cannot loſe, which takes away the freedom of will, and neceſſitates all their actions to virtue.

In ſhort, they believe that God foreknew a determinate number whom he pitched upon to be the perſons in whom he would manifeſt his glory; that, having thus foreknown them, he predeſtinated them to be holy; in order to which he gives them an irreſiſtible grace, which makes it impoſſible for them to be otherwiſe.

This laſt is the principal point in which Calvin's heterodoxy differed from that of Luther, who always believed the real preſence in the ſacrament.

The Calviniſts reduce the number of the ſacraments to two; reject evangelical councils, and monaſtic vows; defend imputative righteouſneſs, and diſpute againſt the received notion of juſtification.

CA'LUMET, among travellers, a myſtic kind of pipe uſed by the American ſavages as the enſign of peace, and for religious fumigation.

The Calumet is a ſort of tobacco pipe, made of red, black, or white marble. The ſhank is decorated with rounds of feathers and locks of hair, or porcupines quills: in it they ſmoke in honour of the ſun.

The Calumet is the ſymbol and ſecurity of traffic; by it they pronounce life and death, peace and war: they alſo aſcribed to it a power of raiſing the ſouls of the dead.

CALX *antimonii*, a name given in the late London Diſpenſatory to the preparation of antimony, called before antimonium diaphoreticum. This is made by mixing antimony with three times its weight of nitre, throwing it into a hot crucible; and, when removed from the fire, waſhing it both from its ſalts and from ſuch parts as have not been well calcined; the waſhing is to be continued till the water come away taſteleſs, and the finer part is ſeparated for uſe by pouring off the water turbid, and leaving the coarſe particles behind, taking only the ſediment of this water. *Pemberton's Lond. Diſpenſ.*

Calx *viva*, quick-lime, that on which no water has been caſt ſince burning, in oppoſition to Calx extincta, that ſlaked by the effuſion of water.

CA'MERA *lucida*, a contrivance of Dr. Hooke, for making the image of any thing appear on a wall in a light room, either by day or night.

Oppoſite to the place or wall, where the appearance is to be, make a hole of at leaſt a foot in diameter, or if there be a high window with a caſement of this dimenſion in it, this will do much better without ſuch hole, or caſement opened. At a convenient diſtance to prevent its being perceived by the company in the room, place the object or picture intended to be repreſented, but in an inverted ſituation. If the picture be tranſparent, reflect the ſun's rays by means of a looking-glaſs, ſo that they may paſs through it towards the place of repreſentation; and, to prevent any rays from paſſing aſide it, let the picture be encompaſſed with ſome board, or cloth. If the object be a ſtatue, or a living creature, it muſt be much enlightened by caſting the ſun's rays on it, either by reflection, refraction, or both. Between this object and the place of repreſentation put a broad convex glaſs ground to ſuch a convexity as that it may repreſent the object diſtinctly in ſuch place. The nearer this is ſituate to the object, the more will the image be magnified on the wall, and the further the leſs; ſuch diverſity depending on the difference of the ſpheres of the glaſſes. If the object cannot be conveniently inverted, there muſt be two large glaſſes of proper ſpheres, ſituate at ſuitable diſtances, eaſily found by trial, to make the repreſentations erect. This whole apparatus of object, glaſſes, &c. with the perſons employed in the management of them, are to be placed without the window or hole, ſo that they may not be perceived by the ſpectators in the room, and the operation itſelf will be eaſily performed. *Philoſophical Tranſ.* N°. 38.

CA'MLET, or as ſome ſpell it Camblet, a plain ſtuff, compoſed of a warp and woof, and which is manufactured on a loom with two treddles, as linens and ſtamines are.

The Camlets are either longer or ſhorter, broader or narrower, according to their ſeveral kinds and qualities, and the places where they are manufactured. There are Camlets of all ſorts: ſome of goats hair, both in the warp and woof; and others, in which the warp is of hair, and the woof half hair and half ſilk; others again, wherein both the warp and woof are of wool; and, laſtly, ſome of which the warp is of wool, and the woof of thread.

Some are dyed in thread; that is to ſay, that the materials both of the warp and of the woof were dyed before they were wove, or wrought on the loom: others are dyed in the piece; others are marbled, or mixed; ſome are ſtriped, ſome waved, or watered, and ſome figured.

Camlets are proper for ſeveral uſes, according to their different kinds and qualities. Some ſerve to make garments, both of men and women, ſome for bed curtains, and other houſhold furniture.

Figured Camlets are thoſe of a ſingle colour, on which have been ſtamped, or imprinted, various figures, flowers, foliages, &c. This is performed with hot irons, which are a kind of moulds, that are paſſed under a preſs at the ſame time with the ſtuff. The figured Camlets come only from Amiens and Flanders. The trade of them was formerly pretty conſiderable; at preſent there are but few of them ſold, which ſerve commonly for church ornaments, or for making ſome houſhold furniture.

Waved Camlets are thoſe on which a kind of waves have been impreſſed, as on tabbies, by making them paſs ſeveral times under the calendar.

Water Camlets are ſuch, which, being taken from the loom, undergo a certain preparation with water, after which they are put into the hot preſs, that renders them ſmooth and gloſſy.

CAMP (*Dict.*— The origin of Camps is of a very great antiquity; we read of them among the Hebrews, who obſerved a ſtrict diſcipline, and an outward decency and purity; inſomuch that they were not allowed to eaſe nature, within the limits of the Camp; this promoted cleanneſs, and contributed to the preſervation of their health.

The Greeks had alſo their Camps, as we read in Homer, fortified with gates and ditches; though not ſo particularly deſcribed, as to be able from thence to give the reader a clear idea thereof. Among the Greeks, the Lacedemonians were reckoned the moſt dexterous at encampments: theſe made their Camps of a round figure, looking upon that as the moſt perfect and defenſible form of any other. We are not however to imagine that they thought this form ſo eſſential to a Camp, as never to be diſpenſed with, when the circumſtance of the place required it. Greek writers furniſh us with almoſt as many different encampments, as hiſtorical relations, and the Latins likewiſe; it ſeldom happening that the circumſtances of theſe are the ſame. Thus a general, when he is about to encamp, has always new occaſion to exerciſe his genius, and it is the part of a ſkilful officer to contrive ſuch new encampments as are ſuitable to time and place, and other circumſtances. The Lacedemonians, indeed, are ſaid to have been preſcribed a conſtant method of building towers and encamping, by their lawgiver, who thought a ſpherical figure the beſt fitted for defence, which was contrary to the cuſtom of the Romans, whoſe Camps were quadrangular: but all forms of that ſort were rejected by Lycurgus, the angles being neither fit for ſervice or defenſible, unleſs guarded by a river, mountain, wall, or ſome ſuch fortification. It is further obſervable of the Lacedemonians, that they frequently moved their Camps, being accuſtomed vigorouſly to proſecute all their enterprizes, impatient of delays.

When the Greeks were in danger of having their Camp attacked, it was uſual to fortify it with a trench and rampire, or wall, on the ſides whereof they erected turrets, not unlike thoſe upon the walls of cities, out of which they annoyed their enemies with miſſive weapons. Homer has deſcribed their works, *Iliad*, η. 136.

The manner of living in Camps depended upon the diſpoſition of their generals, ſome of which allowed their ſoldiers in all ſorts of exceſs and debauchery; others obliged them to the ſtricteſt rules of temperance and ſobriety; a remarkable inſtance whereof we have in Philip of Macedon, who, as Polynæus report, condemned two of his ſoldiers to baniſhment for no other offence, than becauſe he had found them with a ſinging-woman in his Camp. But the Grecian diſcipline was not always ſo ſevere and rigid, for their lawgiver allowed them greater liberty in the Camp than at other times, to invite them to ſerve with delight in the war; for, whilſt they were in the field, their exerciſes were more moderate than at home, their fare not ſo hard, nor ſo ſtrict a hand kept over them by their governors; ſo that they were the only people in the world to whom war gave repoſe. *Xenophon de Repub. Laced. Potter's Græc. Ant. Mountfaucon's Ant.*

The Camps of the Romans were generally of an exact ſquare form, or elſe oblong; though this, without doubt, was often accommodated to the ſituation of the place. Frontinus ſays, that Pyrrhus king of Epirus taught the Romans firſt to encamp; for, upon having defeated him and forced his Camp, they conſidered the form of it, and from thence modeled their own. But this is a miſtake; for, when Pyrrhus firſt ſaw the Roman Camp, he was aſtoniſhed at the form and diſpoſition of it, and ſaid thus to Megaces: ‘Hæc Barbarorum Caſtra non Barbara videntur. The Camps of the Barbarians have no Barbarian face.’ In ſhort, the art of encamping was known at Rome in the time of their kings; for they then fortified their Camps with towers and paliſadoes. Indeed, in the infancy of Rome, Camps were not very common, nor can it be ſuppoſed they ſhould, when the regal dominion was ſo ſmall, hardly extending itſelf beyond the territory of the city.

When the war was carried on at any conſiderable diſtance, their Camps were often made of freeſtone, as appears from Trajan's column. Theſe Camps, thus built, were often the origin of cities, but eſpecially the Camps called ſtativa, which were a ſort of ſtanding Camps, where armies lay for ſome time, or where they paſſed the winter, and which, for that reaſon, were called ſtativa hiberna. Of this ſort there were many upon the Rhine, to hinder the paſſage of the Germans into Gaul. Beſides theſe ſtativa hiberna, there were alſo ſtativa æſtiva, in which they paſſed the ſummer under tents. Within theſe Camps they pitched their tents, ſome whereof were made of gold and ſilk; ſome were of a ſquare form, and others round, terminating at the top in a cone. *Mountfaucon's Ant.*

The Turks, and ſome other nations of Aſia, who generally make war in plain, open countries, ſurround their Camp with an incloſure formed by their waggons, baggage, &c.

The preſent practice of European nations is very different from this: they make the ſafety of a Camp conſiſt in ſuch a diſpoſition as may render it moſt eaſy for the horſe and foot to be drawn out with the greateſt expedition, to face and fight the enemy.

Therefore, as the order of battle, fixed on by the general, ought to be looked on as the beſt diſpoſition in which an army can engage, it follows, that an army ought to encamp in ſuch a manner, as to be beſt able to form themſelves in ſuch a manner, upon occaſion, if the ground permits.

The order of battle, therefore, abſolutely determines the form of the encampment; which is agreeable to the remark of the marquis de Santa-Crux on this ſubject, viz. An army ought to encamp according to the order of its march, and march according to the order in which it is to fight.

As troops engage by battalions and ſquadrons, the tents muſt be erected in the ſame order, and the ſoldiers ranged in the Camp in the ſame manner they are in line of battle.

From whence it follows, that the extent of the particular Camps of the ſeveral battalions and ſquadrons, from right to left, muſt be equal to the front which theſe troops take up in the line of battle; and that there muſt be the ſame ſpaces between their reſpective Camps, as was obſerved in their march.

By this diſpoſition, the extent of the front of every Camp, from right to left, is equal to the front of the line of battle; and, an army being thus drawn up in line of battle, every battalion and ſquadron may pitch their tents behind them; after which, the troops may either go into the Camp, or march out, and engage in a moment, as it were, at the word of command.

If the front of the Camp be longer than the line of battle, the troops, in forming themſelves at the head of the Camp, muſt leave great ſpaces between each other, if they would cover it; if, on the contrary, the front of the Camp be ſhorter than the line of battle, the troops will not have room to form themſelves at the diſtances ordered by the general. To avoid both theſe inconveniencies, the front of the Camp muſt be proportional to the line of battle.

There is no certain rule laid down either by cuſtom or authors, who have wrote on the military art, relating to the diſtances to be obſerved between the parts of an army; as between battalion and battalion, ſquadron and ſquadron, &c.

M. de Bombelles obſerves, that this cannot be determined exactly, becauſe the extent of the Camp of every battalion in front depends on the ſpace wherein the general would have his army encamp. Yet he imagines, in ordinary ground, one hundred and twenty paces may be allowed for the front of a battalion, including its interval; ninety paces he allows for the encampment; and, conſequently, thirty remain for the interval.

Other authors do not make intervals between battalions, but allow thirty paces between regiment and regiment; but they do not ſupport this method by any good reaſon, and it ſeems only their intention to divide an army by regiments. Though this diviſion appears moſt agreeable to the preſent cuſtom, yet it muſt not be looked on as general, not having been always obſerved. M. Rozand, lieutenant-colonel and engineer in the troops of Bavaria, who publiſhed a very good treatiſe of Fortification in 1733, aſſerts, that he had always ſeen forty or fifty paces allowed for a ſquadron to encamp, and as much for the ſpace, or interval; that he has even ſeen one hundred paces allowed for the front of the Camp of every battalion, and as much for its interval. This practice, which is agreeable to the principles before laid down, may be looked on as an invariable rule, if the general chuſes to give battle with intervals equal to the fronts of the different troops of his army. But, however, he determines, his order of battle in the Camp of every reſpective corps and its interval muſt be proportional to the front.

It follows from the principles laid down, with regard to the extent, or front of the Camp, that there ought to be, before every corps, battalion, and ſquadron, an open ground for forming the army in order of battle.

Wherefore, if we are obliged to encamp in diſadvantageous poſts, the firſt thing we are to attend to, is to lay out the ground in ſuch a manner, that the troops may have an eaſy communication, and move without any obſtacle.

The order of battle being commonly a right line, on the ſide next the enemy, and the ſame line, too, if the ground permit, the colours and ſtandards are placed in it. This is the principal line; or, to expreſs ourſelves in terms of military fortification, this is the maſter-line of the Camp, on which all the reſt depend.

After having explained the principles in which the front of a Camp is formed, let us proceed to ſpeak of its depth. This is determined by the depth of the Camps of the battalions and ſquadrons, which we may reckon at twenty-four fathoms. The ſecond line muſt have the ſame ſpace before it as the firſt, quite clear, to draw the troops up in line of battle.

The diſtance from the head of the Camp, or firſt line, to the ſecond, is commonly three or four hundred paces, ſometimes five hundred, if the ground be ſpacious enough; but the diſtance never ſhould be leſs than two hundred paces; becauſe, otherwiſe, the rear of the Camp of the firſt line would interfere with the front of the Camp of the ſecond line.

In caſe of an attack, it is extremely beneficial to have a large ſpace of clear ground before the Camp; becauſe the troops of the ſecond line may march out through their intervals, and have opportunity of forming themſelves behind thoſe of the firſt, in order to ſupport them; and this is an advantage which ought never to be neglected, when it can be procured.

It ſometimes happens, an intrenchment is made before the front of a camp; in this caſe, there ſhould be no obſtacle to the communication of the troops between the Camp and the intrenchments.

In countries ſuch as Hungary, and the provinces bordering upon the Danube, where the Germans make war upon the Turks, the officers in general make uſe of tents: but, in Flanders, Italy, &c. which are often the ſeat of war, there are many villages and houſes, wherein the principal officers, as lieutenant-generals, and field-marſhals, have quarters. The quarter-maſters of the army appoint each a houſe in the villages contained within the extent of the Camp. Brigadiers even may lodge in a houſe, according to military law, if there be one at the rear of their brigade; but inferior officers, as colonels, and all below them, muſt encamp at the rear of their reſpective corps.

Care is always taken to lodge or diſpoſe the general officers on the ſide of the army which they command: that is, thoſe who command the right, on the right; thoſe who command the left, on the left; and thoſe who command the center, on the center. *M. le Blond's Eſſay on Encampment.*

Where the grounds are equally dry, thoſe Camps are always moſt healthful, which are pitched on the banks of large rivers; becauſe, in the hot ſeaſon, ſituations of this kind have a ſtream of freſh air from the water, ſerving to carry off the moiſt and putrid exhalations. On the other hand, next to marſhes, the worſt encampments are on low grounds, cloſe beſet with trees; for then the air is not only moiſt and hurtful in itſelf, but, by ſtagnating, becomes more ſuſceptible of corruption. However, let the ſituation be ever ſo good, Camps are frequently rendered infectious by the putrid effluvia of rotten ſtraw, and the privies of the army; more eſpecially, if the bloody-flux prevails; in which caſe, the beſt method of preventing a general infection, is, to leave the ground, with the privies, foul ſtraw, and other filth of the Camp, behind. This is to be frequently done, if conſiſtent with the military operations; but, when theſe render it improper to change the ground often, the privies ſhould be made deeper than uſual, and once a day a thick layer of earth thrown into them, till the pits are near full, and then they are to be well covered, and ſupplied by others. It may alſo be a proper caution, to order the pits to be made either in the front or rear, as the then ſtationary winds may beſt carry off their effluvia from the Camp. Moreover, it will be neceſſary to change the ſtraw frequently, as being not only apt to rot, but to retain the infectious ſteams of the ſick. But, if freſh ſtraw cannot be procured, more care muſt be taken in airing the tents, as well as the ſtraw. *Pringle, Obſerv. on the Diſeaſes of the Army.*

CAMPAIGN (*Dict.*)—The beginning of every Campaign is conſiderably more unhealthy than if the men were to remain in quarters. After the firſt fortnight or three weeks encampment, the ſickneſs decreaſes daily; the moſt infirm being by that time in the hoſpitals, the reſt more hardened, and the weather growing daily warmer. This healthy ſtate continues through the ſummer, unleſs the men get wet cloaths, or wet beds; in which caſe a greater or leſſer degree of the dyſentery will appear, in proportion to the preceding heats. But the moſt ſickly part of the Campaign begins about the middle or end of Auguſt, whilſt the days are ſtill hot, but the nights are cool and damp, with fogs and dews: then, if not ſooner, the dyſentery prevails; and, though its violence be over by the beginning of October, yet the remitting-fever, gaining ground, continues throughout the reſt of the Campaign, and never intirely ceaſes, even in winter quarters, till the froſt begin.

At the beginning of a Campaign, the ſickneſs is ſo uniform, that the number may be nearly predicted; but, for the reſt of the ſeaſon, as the diſeaſes are then of a contagious nature, and depend ſo much upon the heat of ſummer, it is impoſſible to foreſee how many may fall ſick from the beginning to the end of autumn. It is alſo obſerved, that the laſt fortnight of a Campaign, if protracted till the beginning of November, is attended with more ſickneſs than the firſt two months of the encampment; ſo that it is better to take the field a fortnight ſooner, in order to return into winter quarters ſo much the earlier.

As to winter expeditions, though ſevere in appearance, they are attended with little ſickneſs, if the men have ſtrong ſhoes, good quarters, fuel, and proviſions.

Long marches in ſummer are not without danger, unleſs made in the night, or ſo early in the morning, as to be over before the heat of the day. *Pringle, Obſerv. on the Diſeaſes of the Army.*

CAMPA´NULA, *bell-flower*, in botany, a genus of plants whoſe characters are: the flower conſiſts of one leaf; is ſhaped like a bell, and is, before blown, of a pentagonal figure; and, when fully opened, is cut into five ſegments at the top: the ſeed-veſſel is, for the moſt part, divided into three cells, each having an hole at the bottom, by which the ſeed is emitted.

Boerhaave has enumerated thirty-four, Tournfort eighty-ſeven, and Miller thirty ſpecies of this plant.

This plant is propagated either by ſowing the ſeeds in March, in a bed of light undunged ſoil, or by parting the roots; the latter method, being the moſt expeditious, is commonly practiſed; for every plant, taken from the roots in September or March, will grow, if rightly managed.

The peach-leaved bell-flowers may be raiſed from ſeeds, in the ſame manner, or be increaſed, by parting their roots in Autumn, which is the moſt expeditious method.

The Canterbury bells are biennial, ſeldom laſting longer than the ſecond year: theſe, therefore, are only raiſed by ſowing their ſeeds; the beſt ſeaſon for which is in the beginning of April; and in June the plants will be fit to tranſplant.

The Canary Campanula is one of the moſt beautiful plants of the green-houſe, it producing its flowers in the depth of winter; and continues them through the months of December, January, and February. This plant is propagated by parting its roots, the ſeaſon for which is in June, when the ſtems are quite decayed; and, in doing of it, great care ſhould be taken not to break or bruiſe their roots, which would endanger their decaying. The ſoil in which theſe roots ſhould be planted, muſt be one third freſh earth, a third part ſand, and the reſt lime-rubbiſh: this ſhould be well mixed and ſcreened, and, if laid together half a year before it is uſed, that it may incorporate, it will be the better.

When you plant the roots, give them a little water to ſettle the earth about them; but, afterwards, let your waterings be very ſparingly done, and but ſeldom repeated, until their ſtems begin to advance; after which, they muſt have it a little freely: for want of this caution, many of theſe, and other flowers-roots, which are kept in pots, are deſtroyed; for it is impoſſible to ſuppoſe, that a root, which is entirely at reſt, and deſtitute of leaves, ſhould be capable of diſcharging any quantity of moiſture: therefore let this caution be conſtantly obſerved. The ſtems of the flower will begin to appear in Auguſt; and, if the roots are ſtrong, will riſe to eight or nine feet in height; and in November, or ſooner, will begin to ſhew its beautiful flame-coloured flowers. When theſe ſtems begin to advance, we ſhould remove the plants into ſhelter, to guard them from morning froſts, or great rains; and, as the weather grows colder, they muſt be removed into a good green-houſe, where they ſhould have as much free air as poſſible, in open, mild weather. This plant will require the ſame proportion of heat as is allotted for the ficoides, and will thrive in the ſame houſe, better than amongſt orange-trees, &c.

CANA´DIAN, *Philoſophy.* We are indebted, for what we know of the ſavages of Canada, to the baron de Hontan, who reſided amongſt them near ten years. He tells us, that in ſome converſations with them, which he relates on the ſubject of religion, he did not always get the better in the diſpute. It is, indeed, ſurpriſing, a Huron ſhould uſe all the ſubtilty of logic, to combat the Chriſtian religion, and be as perfect in every trick of the ſchools, as if he had ſtudied Scotus. It has been ſuſpected, the baron had a mind to throw a ridicule on the religion he had been brought up in, and has put arguments in the mouth of a ſavage, he dared not make uſe of himſelf.

Thoſe who have neither ſeen nor read any authentic account of theſe ſavages, have conceited they were covered with hair; lived in the woods, like wild beaſts; had no ſociety, and bore but the figure of man: whereas theſe ſavages have really no hair on their bodies, excepting on their head and eyebrows, which many take pains to pull off: if accidentally a hair grows any where elſe, they are careful to pluck it out, even by the roots. They are born as white as Europeans, but their going naked, daubing themſelves with oil, and painting themſelves with different colours, which the ſun at laſt imprints on their ſkin, ſpoils their complexion; they are large men, ſuperior in ſtature to us; their features are regular; their noſe aquiline; are in general well-ſhaped; and it is a rarity to ſee any among them lame, blind, or deformed.

At firſt ſight, a man would ſcarce entertain a favourable opinion of theſe ſavages: they have a fierce look; a rough deportment; and, in meeting each other, they are ſo ſilent, and ſhew ſo little emotion, that it would be difficult for an European, ignorant of their cuſtoms, to believe this their manner of civility, and the ceremony in faſhion among them. They make a great jeſt of our compliments, uſing but few outward demonſtrations of kindneſs; but are, however, good, affable, and exerciſe to ſtrangers, and the unhappy, a charitable hoſpitality, that may ſhame all the nations of Europe; and an evenneſs of mind, which is neither altered by proſperity nor adverſity. This is in a great meaſure owing to their want of thoſe vicious reſentments, which luxury and abundance have introduced among us.

The following are principal points of their religion and philoſophy.

1. All the ſavages maintain there is a God; his exiſtence they prove by the formation of the univerſe, which manifeſts the almighty power of its author; from whence it follows, ſay they, that man is not the work of chance, but of a principle ſuperior in wiſdom and knowledge, which they call the great mind. This great mind contains all, appears in all, acts in all, and gives motion to all things. In ſhort, all we ſee, all we conceive, is this God, who ſubſiſts, without bounds, and without body, ought not to be repreſented by any figure whatever, and therefore they adore him in all his works. This is ſo true, that, when they ſee any thing remarkably fine, curious, or ſurpriſing, eſpecially the ſun and ſtars, they break out in this exclamation: Oh! great mind, we ſee thee every-where!

2. They ſay the ſoul is immortal, becauſe, if it were not, all men would be equally happy in this life; for God, being infinitely perfect and wiſe, could not have created ſome for happineſs, and others for miſery; they maintain, that God, for certain reaſons, above our comprehenſion, wills, that a certain number of beings ſhould ſuffer in this world, that he may recompenſe them in the next; and therefore cannot bear to hear Chriſtians ſay, ſuch a one was unhappy, becauſe he was killed, or burnt; aſſerting that what we call unhappineſs, is only in our own ideas; becauſe nothing is done, but by the will of this infinitely perfect being, whoſe conduct can neither be uncertain nor capricious.

3. The ſupreme mind has given men reaſon to enable them to diſcern good from evil, and to follow the rules of juſtice and wiſdom.

4. Tranquillity of the ſoul is highly pleaſing to the ſupreme mind; that, on the contrary, he deteſts the tumult of the paſſions, which makes men wicked.

5. Life is a ſleep, death an awakening, which gives us intelligence of things viſible and inviſible.

6. The reaſon of man not being capable of lifting itſelf up to the knowledge of things above the earth, it is needleſs and troubleſome to dive into inviſible things.

7. After death, our ſouls go into a certain place, in which we cannot tell whether the good are happy, or evil unhappy; becauſe we know not whether our ideas of happineſs and miſery coincide with thoſe of the ſupreme ſpirit or mind.

CA´NAL, (*Dict.*)—An artificial Canal is a place dug to receive the waters of the ſea, one or more rivers, &c. Rivers not only contribute to the natural riches of the country, by watering the ſoil through which they paſs, but make a kind of artificial riches in every province through which they flow, by rendering the convenience of merchandizes eaſy. The more their courſe is extended in any ſtate, and the more they communicate with each other, ſo much more the parts of that ſtate are connected together, and mutually diſpoſed to enrich each other. If nature has not done every thing to the higheſt perfection for man, man is to improve nature to the beſt advantage; and the Dutch, or, if we may credit travellers, the Chineſe, who poſſeſs a country of prodigiouſly larger extent, have ſhewn how far human induſtry may go in making Canals and rivers navigable; and their labours have been ſufficiently recompenſed.

But the benefit of Canals was apprehended in very early ages of the world. Herodotus relates, that the Cnidians, a people of Cacia, in Aſia minor, undertook to cut the iſthmus, which almoſt joins Cnidos to the continent, but that they were diverted by an oracle. Several kings of Ægypt have attempted to make a communication between the Red-ſea and the Mediterranean. Cleopatra had the ſame deſign. Solyman II, emperor of the Turks, employed five thouſand men to no purpoſe, in the ſame attempt. The Greeks and Romans projected a Canal croſs the iſthmus of Corinth, which joins Morea and Achaia, to make a communication between the Ionian ſea and the Archipelago. King Demetrius, Julius Cæſar, Caligula, and Nero, made vain attempts at the ſame thing. Under the reign of Nero, Lucius Verus, one of the generals of the Roman army in Gaul, undertook to join the Sone and the Moſelle, by a Canal, to make a communication between the Mediterranean ſea and German ocean, by the Rhone, the Sone, the Moſelle, and the Rhine; which he could not execute. Charlemagne formed a deſign of uniting the Danube and the Rhine, by making a communication between the Ocean and the Black-ſea, by a Canal from the river Almutz, which diſcharges itſelf into the Danube, to the river Reditz. He employed a vaſt number of hands, but different obſtacles, which ſucceeded each other, made him lay aſide this project. Bernard propoſes, in his treatiſe on the Junction of the Seas, a communication between the ſea of Provence and the ocean towards the coaſts of Normandy, by uniting the Ouche to the Armanſon, and ſo to go through France by the Rhone, the Sone, the Ouche, the Armanſon, the Yonne, and the Seine.

There are ſeveral great Canals in France; as that of Briare, begun under Henry IV. and finiſhed under Lewis XIII. by the care of cardinal Richlieu, which made a communication between the Loire and the Seine, by the Loing. It is eleven leagues in length, from Briare to Montargis. It enters the Loire below Briare, and, at Cepoi, ends in the Loing. The waters of this Canal are kept up by forty-two ſluices: theſe ſerve to carry up and down rafts of wood, and boats made of a proper length and depth for this navigation; a certain toll is paid at every ſluice, to defray the expence of keeping the Canal in order, and to reimburſe the proprietors.

The Canal of Orleans was undertaken in 1675, for the communication of the Seine and Loire; it has twenty ſluices; Philip of Orleans, regent of France, finiſhed it in the minority of Lewis XV. It bears the name of a town through which it does not paſs; beginning at Combleuſe, a mile and a half from Orleans.

The project of the Canal of Picardy, for joining the rivers Somme and Oiſe, was carried into execution under the miniſtry of the cardinals Richlieu and Mazarin; and finiſhed under the adminiſtration of M. de Colbert.

But one of the greateſt and moſt ſtupendous works of this kind is the Canal of Languedoc, which forms a junction of two ſeas. This great and uſeful plan was propoſed in the reigns of Francis I, Henry IV, and Lewis XIII; but not begun till the reign of Lewis XIV, wherein it was finiſhed. It begins with a reſervoir of four thouſand paces in circumference, and eighty feet deep, which receives the waters of the black mountain; theſe deſcend to Naurouſe, in a baſin four hundred yards long, and two hundred yards broad, lined with free-ſtone. Here is the point of ſeparation, where the waters diſtribute themſelves to the right and left, in a Canal ſixty-four leagues long, into which many leſſer rivers diſcharge themſelves; and this is kept up from one ſpace to another by one hundred and four ſluices. The eight ſluices, in the neighbourhood of Beſiers, make a very fine ſhew; they form a caſcade three hundred yards long, with an inclination of twenty-two yards.

This Canal is conducted in ſeveral places by aqueducts and bridges of an incredible height, which admit other rivers under their arches. In others, its way is cut through a rock, ſometimes above, ſometimes under ground, for the length of one thouſand paces. It joins the Garonne at one end, near Toulouſe; the other, croſſing the Aude twice, paſſes between Agde and Beſiers, and ends in the great lake which extends to Port Cette.

This Canal may ſtand in competition with the greateſt attempts of the Romans; it was projected in 1666; Francis Requet demonſtrated the practicability of it by many experiments made on the ſpot, and finiſhed it before his death, which happened in 1680.

We have but one remarkable Canal, and that made by other people, and ſuffered to decay by ourſelves. By this I mean that ancient Canal from the river Nyne, a little below Peterborough, to the river Witham, three miles below Lincoln, called by the modern inhabitants Caudike; which may be ranked among the monuments of the Roman grandeur, though it is now moſt of it filled up. It was forty miles long; and, ſo far as appears from the ruins, muſt have been very broad and deep; ſome authors take it for a Daniſh work. Morton will have it made under the emperor Domitian. Urns and medals have been diſcovered on the banks of this Canal, which ſeem to confirm that opinion. *Morton, Nat. Hiſt. Northampt.*

The great Canal of China is one of the wonders of art, made about eight hundred years ago; it runs from north to ſouth quite croſs the empire, beginning at the city of Canton. By it all kinds of foreign merchandize, entered at that city, are carried directly to Pekin, a diſtance of eight hundred and twenty-five miles. Its breadth and depth are ſufficient to carry barks of conſiderable burthen, which are managed by ſails and maſts, as well as towed by hand. On this Canal the emperor is ſaid to employ ten thouſand ſhips, abating one for a reaſon very peculiar. It paſſes through, or by, forty-one large cities; there are in it ſeventy-five vaſt locks and ſluices, to keep up the water, and paſs the barks and ſhips where the ground will not admit of a ſufficient depth of channel, beſides ſeveral thouſand draw and other bridges.

F. Magaillaine aſſures us, there is a paſſage from one end of China to the other, the ſpace of ſix hundred French leagues, always, either by Canals or rivers, except a ſingle day's journey by land, neceſſary to croſs a mountain; an advantage which this Jeſuit, who made the voyage himſelf, obſerves, is not to be found in any other ſtate of the univerſe.

CANA'RY-*birds*, a ſpecies of ſinging-birds, greeniſh in colour, formerly brought only from the Canary-iſlands, but of late chiefly from Germany and Switzerland; which laſt, called alſo German birds, are preferred to the former.

Canary-birds are diſtinguiſhed by different names, at different times and ages: ſuch as are about three years old, are called runts; thoſe above two are named eriffs; thoſe of the firſt year, under the care of the old ones, are termed branchers; thoſe that are new-flown, and cannot feed themſelves, puſhers; and thoſe brought up by hand, neſtlings.

Canary-birds are various in their notes, ſome having a ſweet ſong, others a laviſh note, others a long ſong, which is beſt, as having greateſt variety of notes. Some prefer thoſe that whiſk and chew like a tit-lark; others are for thoſe which begin like a ſky-lark, continuing their ſong with a long yet ſweet note; others chuſe thoſe which begin their ſong with the ſky-lark, and then run on the notes of the nightingale; others, again, prefer a loud note and laviſh, regarding little more than the noiſe.

CA'NCER (*Dict.*)—*To prevent* CANCERS. When there is danger of an approaching Cancer, the acrimony of the blood is, if poſſible, to be corrected by the uſe of both internal and external remedies, and a ſtrict regimen in regard to diet is to be obſerved. Broths and ſoups, made of the fleſh of young animals, and with proper herbs boiled in them, as ſcorzonera, and the others of that tribe, are very beneficial in theſe caſes; the moſt wholeſome drink is either fair water, or a decoction of China-root, or ſarſaparilla, or the like; and, when the pains are violent from the ſchirrus, which is now threatening to become a Cancer, white poppy-ſeeds may be added in conſiderable quantities to the decoction; and it may be ſweetened with a proper quantity of ſyrup of diacodium. Two or three times a day alſo ſhould be taken a doſe of Gaſcoin's powder, ſalt of wormwood, native cinnabar, crude, and diaphoretic antimony, adding to each doſe, as there ſhall be occaſion, half a grain of laudanum, to aſſuage the violence of the pain: great benefit is alſo ſometimes received in this caſe, by taking either the powder or juice of millepedes, with ſperma ceti.

Purges alſo of the mercurial kind do great ſervice, as do alſo bleeding and cupping frequently in the ſpring and autumn. A thin plate of lead, well impregnated with quickſilver, may alſo be very conveniently worn on the part, and with great advantage; for this method cannot but weaken the ſenſe of pain, and may often prevent a Cancer.

If the application of the plate of lead ſhall prove inſufficient, plaiſters and ointments, compoſed of ſuch ingredients as are known to aſſuage pains, may alſo be applied; the following are of this kind, and are frequently found of ſervice: take, of the unguentum diapompholygos, two ounces; of opium, half a ſcruple; mix theſe into an ointment, and frequently rub the part affected with it; or take, of an amalgama of quickſiver and lead, two ounces; mix this with a ſufficient quantity of ointment of roſes, or any the like unguent; then ſpread a part of it on a linen rag, and apply it in the manner of a plaiſter to the part; or take, litharge vinegar, an ounce; expreſſed oil of henbane-ſeeds, poppy-ſeeds, and the infuſed oil of roſes, of each two ounces; mix them, by a long and continued ſtirring together, into an ointment, adding, toward the end of the operation, purified opium, from ſix to ten grains, as the urgency of the ſymptoms may require: this is to be ſpread in like manner on linen rags, and applied at times to the part.

If the daubings of theſe ointments is diſliked, a refrigerant plaiſter may be uſed in their ſtead; ſuch is the lead plaiſter of Mynſycht, the plaiſter of red lead, or pompholyx, or the excellent plaiſter made by the following preſcription: take of the freſh and depurated juices of henbane, garden poppy, and water hemlock, of each four ounces; boil theſe to a thickneſs over a gentle fire, adding, toward the end of the boiling, eight ounces of white wax, and one ounce of oil of roſes, and make the whole into a plaiſter; or take, ſugar of lead, of ceruſe, the amalgamation of quickſilver and lead, and of the expreſſed oil of henbane-ſeed, and infuſed oil of roſes, of each two ounces; make theſe into a plaiſter. If the pains are very violent, a ſmall quantity of opium may be added to either of theſe plaiſters. *Heiſter's Surgery.*

CANCER, in the military art, denotes a long, ponderous beam, uſed for beating down walls, not unlike the manner of a ram.

CA'NCEROUS, or CANCEROSE, ſomething that belongs to, or partakes of the nature and qualities of a cancer.

CA'NDLE *, a cotton or linen wick, looſely twiſted, and covered with tallow, wax, or ſperma ceti, in a cylindrical figure; which, being lighted at the end, ſerves to illuminé a place in the abſence of the ſun.

A tallow Candle, to be good, muſt be half ſheep's tallow, half bullocks; that of hogs making them gutter, give an ill ſmell, and a thick black ſmoak.

Tallow Candles are of two kinds; the one dipped, the other moulded: the firſt, which are thoſe in ordinary uſe, are of an old ſtanding; the latter are ſaid to be the invention of the Sieur le Brez, at Paris. The manufacture of the two kinds is very different, excepting in what relates to the melting of the tallow, and making the wick, which is the ſame in both.

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* The word *Candle* comes from the Latin *candela*, and that from *candor* of *candeo*, I burn; whence alſo the middle-age Greek κανδήλα.

Method of making CANDLES. The tallows, being weighed and mixed in their due proportion, are cut or hacked into pieces, to facilitate their melting, and thrown into a pot, or boiler, having a cavity of ſome depth running round the top, to prevent its boiling over. Being thus perfectly melted and ſkimmed, a certain quantity of water is thrown in, proportioned to the quantity of tallow, which ſerves to precipitate the impurities of the tallow, which had eſcaped the ſkimmer, to the bottom of the veſſel. The tallow, however, intended for the three firſt dips, muſt have no water; in regard the dry wick, imbibing the water readily, makes the Candles ſplit and crackle in the burning. The melted tallow is now emptied through a ſierce into a tub, having a tap for letting it out, as occaſion requires. The tallow thus prepared, may be uſed, after having ſtood three hours, and will continue fit for uſe twenty-four hours in ſummer, and fifteen in winter.

—*For the wicks*, they are made of ſpun-cotton, which the chandlers buy in ſkeins, and wind off three or four together, according to the intended thickneſs of the wick, into bottoms or clues, whence they are cut out with an inſtrument contrived for that purpoſe, into pieces of the length of the Candle required; then put on the ſticks, or broches, or elſe placed in the moulds, as the Candles are intended to be either dipped or moulded.

Making of dipped CANDLES. The liquid tallow is drawn off, from the tub above-mentioned, into a veſſel called the mould, ſink, or abyſs, of an angular form, perfectly like a priſm, except that it is not equilateral; the ſide on which it opens being only ten inches high; and the others, which make its depth, fifteen. On the angle, formed by the two great ſides, it is ſupported by two feet, and placed on a kind of bench, in form of a trough, to catch the droppings, as the Candles are taken out each dip. At a convenient diſtance from this, is ſeated the workman, who takes two ſticks, or broches, at a time, ſtrung with the proper number of wicks, viz. ſixteen, if the Candles are to be of eight in the pound; twelve, if of ſix in the pound, &c. and, holding them equi-diſtant, by means of the ſecond and third finger of each hand, which he puts between them, he immerges the wicks two or three times for the firſt lay; and, holding them ſome time over the opening of the veſſel, to let them drain, hangs them on a rack, where they continue to drain and grow dry. When dry, they are dipped a ſecond time, then a third, as before; only for the third lay, they are immerged but twice, in all the reſt, thrice. This operation is repeated more or leſs times, according to the intended thickneſs of the Candle. With this laſt dip they neck them; i. e. plunge them below that part of the wick where the other lays ended.

It muſt be obſerved, that during the operation, the tallow is ſtirred from time to time, and the ſtock ſupplied with freſh tallow. When the Candles are finiſhed, their peaked ends, or bottoms, are taken off, not with any cutting inſtrument, but by paſſing them over a kind of flat brazen plate, heated to a proper pitch, by a fire underneath, which melts down as much as is requiſite.

Method of making mould-CANDLES. Theſe Candles are made in moulds of different matters; braſs, tin, and lead, are the moſt ordinary. Tin is the beſt, and lead is the worſt. Each Candle has its mould, conſiſting of three pieces, the neck, ſhaft, and foot: the ſhaft is a hollow metal cylinder, of the diameter and length of the Candle propoſed; at the extremity of this is the neck, which is a little metallic cavity, in form of a dome, having a moulding within-ſide, and pierced in the middle with a hole big enough for the wick to paſs through. At the other extremity is the foot, in form of a little tunnel, through which the liquid tallow runs into the mould. The neck is ſoldered to to the ſhaft, but the foot is moveable, being applied when the wick is to be put in, and taken off again when the Candle is cold. A little beneath the place where the foot is applied to the ſhaft, is a kind ſtring of metal, which ſerves to ſupport that part of the mould, and to prevent the ſhaft from entering too deep in the table to be mentioned hereafter. Laſtly, in the hook of the foot is a leaf of the ſame metal, ſoldered within-ſide, which, advancing into the center, ſerves to keep up the wick; which is here hooked on preciſely in the middle of the mould. The wick is introduced into the ſhaft of the mould, by a piece of wire, which, being thruſt through the aperture of the hook, till it comes out at the neck, the wick is tied to it; ſo that in drawing it back, the wick comes along with it, leaving only enough at the top for the neck; the other end is faſtened to the hook, which thus keeps it perpendicular. The moulds, in this condition, are diſpoſed in a table pierced full of holes, the diameter of each being about an inch: theſe holes receive the moulds inverted, as far as the ſtring in the foot. Being thus placed perpendicularly, they are filled with melted tallow, (prepared as before) drawn out of the tap into a tin-pot, and thence poured into the foot. After the moulds have ſtood long enough to cool, for the tallow to have arrived at its conſiſtence, the Candle is taken out, by taking off the foot, which brings the Candle along with it. Thoſe who aim at perfection in this work, bleach or whiten their Candles, by faſtening them on rods or broches, and hanging them out to the dew, and earlieſt rays of the ſun, for eight or ten days: care being taken to ſkreen them in the day time from the too intenſe heat of the ſun; and in the night from rain, by waxed cloths.

Wax CANDLES, are made of a cotton or flaxen wick, ſlightly twiſted, and covered with white or yellow wax.—Of theſe there are ſeveral kinds; ſome called tapers, uſed to illumine churches, proceſſions, funeral ceremonies, &c. and others uſed on ordinary occaſions.

For the firſt kind, their figure is conical, ſtill diminiſhing from the bottom, which has a hole to receive the hook of the candleſtick, the top of which ends in a point: the latter kind are cylindrical. The firſt are either made with a ladle, or with the hand.

Manner of making wax CANDLES *with the ladle.* The wicks being twiſted and cut of the proper length, a dozen of them are tied by the neck, at equal diſtances, round an iron circle, ſuſpended directly over a large baſon of copper tinned, and full of melted wax; a large ladle-ful of this wax is poured gently, by inclination, on the tops of the wicks, one after another; ſo that, running down, the whole wick is thus covered: the ſurplus returning into the baſon, where it is kept warm by a pan of coals underneath it. They thus continue to pour on the wax, till the candle arrives at its deſtined bigneſs: ſtill obſerving, that the three firſt ladles be poured on at the top of the wick, the fourth at the height of three fourths, the fifth at one half, and the ſixth at one fourth; by which means the candle arrives at its pyramidal form. The candles are then taken down hot, and laid aſide of each other, in a feather bed folded in two, to preſerve their warmth, and keep the wax ſoft: they are then taken and rolled, one by one, on an even table, uſually of walnut-tree, with a long ſquare inſtrument of box, ſmooth at bottom. The candle being thus rolled and ſmoothed, its big end is cut off, and a conical hole made in it.

Manner of making wax CANDLES *by the hand.* The wick being diſpoſed, as in the former, they begin to ſoften the wax, by working it ſeveral times in hot water, contained in a braſs caldron tinned, very narrow and deep. A piece of the wax is then taken out, and diſpoſed, by little and little round the wick, which is hung on a hook in the wall, by the extremity oppoſite to the neck; ſo that they begin with the big end, diminiſhing ſtill, as they deſcend towards the neck. In other reſpects, the method is the ſame here as in the former caſe, only that they are not laid in the bed, but are rolled on the table juſt as they are formed. It muſt be obſerved, however, that, in the former caſe, water is always uſed to moiſten the ſeveral inſtruments, to prevent the wax from ſticking; and, in the latter, lard, or oil of olives, for the hands, table, &c.

Cylindrical wax CANDLES, are either formed on the table or drawn. The firſt kind are made of ſeveral threads of cotton, looſely ſpun, and twiſted together, covered with the ladle, and rolled as the conical ones, but not pierced.

Wax CANDLES *drawn*, are ſo called, becauſe actually drawn, in the manner of wire, by means of two large rollers, or cylinders of wood, turned by a handle, which, turning backwards and forwards ſeveral times, paſs the wick through melted wax, contained in a braſs baſon; and at the ſame time through the holes of an inſtrument, like that uſed for drawing wire, faſtened at one ſide of the baſon: ſo that, by little and little, the candle acquires any bulk at pleaſure, according to the different holes of the inſtrument through which it paſſes: by this method, may four or five hundred ells length be drawn running. The invention of this was brought from Venice by Pierre Bleſimare, of Paris, about the middle of the laſt century.

CANI'CULAR year, annus canicularis, denotes the Egyptian natural year, which was computed from one heliacal riſing of Canicula to the next.

This is called annus canarius, and annus cynicus; by the Egyptians themſelves the Sothic year, from Soth a denomination given by them to Sirius. Some alſo call it the heliacal year.

The Canicular year conſiſted ordinarily of three hundred and ſixty-five days, and every fourth year of three hundred and ſixty-ſix days, by which it was accommodated to the civil year. The reaſon of their choice of Canicula before the other ſtars, to compute their time by, was not only the ſuperior brightneſs of that ſtar, but becauſe its heliacal riſing was in Egypt a time of ſingular note, as falling on the greateſt augmentation of the Nile, the reputed father of Egypt. Epheſtion adds, that, from the aſpect of Canicula, its habit and colour the Egyptians drew prognoſtics concerning the riſe of the Nile; and, according to Florus, predicted the future ſtate of the year. So that the firſt riſing of this ſtar was yearly obſerved with great attention.

CANKER, in medicine; ſee APHTHÆ, *Dict.* and *Sup.*

CANKER *in trees*, a term uſed by our farmers to expreſs a wound or blemiſh in the trunk of a tree, which does not heal up by nature, but will increaſe and damage, if not indanger the whole tree. Theſe wounds are ſometimes occaſioned by accidents, as blows, or by the branches of one tree galling another by the motion they are put into by the winds; if this latter be the caſe, the offending branch muſt be cut off, or drawn another way, or elſe all remedies are vain.

The wound muſt be cut and enlarged every way to the quick, and all the decayed wood muſt be taken clean out; then the whole internal ſurface of the wound muſt be rubbed over with tar mingled with oil, and after this it muſt be filled up with clay and horſe-dung mixed together, or with horſe-dung alone, which many eſteem beſt of all; in this caſe the dung muſt be bound over with a rag; hog's dung is by many preferred to horſe-dung for this purpoſe, and it is proper to add to this application the keeping of the roots cool and moiſt, by laying fern and nettles about them. If the Canker be only in one of the boughs of the tree, the ſhorteſt way is to cut off the bough at once; if that be a large one, it ſhould be cut off at ſome diſtance from the body of the tree; but, if a ſmall one, it ſhould be cut off cloſe. The adding a coat of dung, and pond or river mud, about the roots of trees, if they are ſubject to this from their ſtanding in a dry barren land, as is often the caſe, is a very good cure. *Mortimer's Huſbandry.*

CA'NNABIS, hemp in botany, a genus of plants whoſe characters are: it hath digitated (or fingered) leaves which grow oppoſite to one another: the flowers have no viſible petals; it is male and female, in different plants. This plant is propagated in the rich fenny parts of Lincolnſhire in great quantities, for its bark, which is uſed for cordage, cloth, &c. and the ſeeds afford an oil, which is uſed in medicine.

Hemp is always ſown on a deep, moiſt, rich ſoil, ſuch as is found in Holland, in Lincolnſhire, and the fens in the iſles of Ely, where it is cultivated to great advantage, as it might in many other parts of England, where there is the like ſoil; but it will not thrive on clay, or ſtiff cold land: it is eſteemed very good to deſtroy weeds, but it will greatly impoveriſh the land, ſo that this crop muſt not be repeated on the ſame ground.

The land on which hemp is deſigned to be ſown, ſhould be well plowed, and made very fine by harrowing; about the middle of April is a good ſeaſon for ſowing the ſeed: three buſhels will ſow an acre: in the choice of the ſeed, the heavieſt and brighteſt-coloured ſhould be preferred, and particular care ſhould be had to the kernel of the ſeed, ſo that ſome of them ſhould be cracked to ſee if they have the germ or future plant perfect: for in ſome places the male plants are drawn out too ſoon from the female, that is, before they have impregnated the female plants with the farina; in which caſe, though the ſeeds produced by theſe female plants may ſeem fair to the eye, yet they will not grow, as is well known to the inhabitants of Bickar, Swineſhead, and Dunnington, three pariſhes in the fens of Lincolnſhire, where hemp is cultivated in great abundance, who have dearly bought their experience.

When the plants are come up, they ſhould be hoed out in the ſame manner as is practiſed for turnips, leaving the plants a foot or ſixteen inches apart; obſerve alſo to cut all the weeds, which, if well performed, and in dry weather, will deſtroy them. This crop will require a ſecond hoeing about a month after the firſt, in order to deſtroy the weeds: if this be well performed, it will require no further care; for the hemp will ſoon after cover the ground, and prevent the growth of the weeds.

The firſt ſeaſon for pulling the hemp is uſually about the middle of Auguſt, when they begin to pull what they call the fimble-hemp, which is the male plant; but it would be much the better method to defer this for a fortnight or three weeks longer, until theſe male plants have fully ſhed their duſt, without which the ſeeds will prove abortive, produce nothing if ſown the next year, nor will thoſe concerned in the oil-mills give any thing for them, there being only empty huſks without any kernels to produce the oil.

The ſecond pulling is a little after Michaelmas, when the ſeeds are ripe: this is uſually called karle-hemp: it is the female plants, which were left at the time when the male were pulled. This karle-hemp is bound in bundles of a yard in compaſs, according to the ſtatute meaſure, which are laid in the ſun for a few days to dry; and then it is ſtacked up or houſed to keep it dry, till the ſeed can be threſhed out. An acre of hemp, on a rich ſoil, will produce near three quarters of ſeed, which, together with the unwrought hemp, is worth from ſix to eight pounds.

Of late years the inhabitants of the Britiſh colonies in North America have cultivated this uſeful plant, and a bounty was granted by parliament for the hemp, which was imported from thence; but whether the inhabitants of thoſe colonies grew tired of cultivating it, or the bounty was not regularly paid, I cannot ſay; but, whatever has been the cauſe, the quantity imported has by no means anſwered the expectation of the public, which is greatly to be lamented; becauſe, as this commodity is ſo eſſential to the marine, which ſhould be the principal object of this kingdom, the being furniſhed with it from our own plantations will not only ſave the ready money paid for it, but ſecure to the country an ample ſupply at all times without being obliged to our neighbours for it. *Miller's Gard. Dict.*

The ſociety for improving agriculture at Edinburgh has given us the following directions for propagating and dreſſing hemp:

1. Hemp, as well as flax, requires good ſeed; which ought to be renewed from time to time. The beſt is had from Riga or Narva. Hemp-ſeed is not ſo apt to degenerate as flax-ſeed is, and by change of ſoil it will much recover its vigour.

2. Hemp requires a deep, fat, brown ſoil, and may be ſowed on ground newly dunged; nay, if it is not ſufficiently rich and fat, it ought to be dunged over again. It muſt have the ſame plowings and harrowings as flax. Moiſt grounds, or ſuch as breed ruſhes, are altogether improper for hemp, till fully drained.

3. A boll of hemp-ſeed will ſuffice to ſow an acre of land, and ſo proportionally. The ſame ſeaſon of the year wherein you ſow flax, you ought alſo to ſow hemp; and your ground muſt be laid level and flat: when it is once ſown, and well covered with earth, ſo that the birds cannot come at it, you need have no further care of it, until it is ripe and fit to pull.

4. The male hemp is conſtantly ripe five or ſix weeks ſooner than the female. The way to know them is this: the male bears a bloſſom, but no ſeed; the female bears a ſeed. The way to know when the male is ripe, and fit for pulling, is by obſerving when the ſtalk as well as leaf is growing yellow; then that ſort of hemp is ripe: or if, in a fair morning, upon ſhaking of the ſtalks, you perceive much duſt to fall off from the bloſſom, the male hemp is fit for pulling.

5. You muſt obſerve the ſame caution in the pulling of your hemp as in your flax; for there are in hemp, as well as flax, diverſities of degrees of coarſeneſs and fineneſs: therefore, in pulling the male hemp, you muſt take care to ſort the coarſeſt together, the middle ſort likewiſe together, and ſo the fineſt by itſelf. Beware, in pulling it, that you do not break the ſtalks of your female hemp; for, by the breaking of the ſtalks, your ſeed, as well as hemp, will ſuffer. You muſt ſtill, as you have a ſufficient quantity of hemp, make ſmall ſheaves of it about the thickneſs of your thigh; tie them in the middle, and let them dry; for it is a certain rule, that hemp or flax ought never to be watered or graſſed until it is perfectly dry. If you deſign to water your male hemp the ſame ſeaſon that you pull it, you muſt tie it up in ſheaves, about the bigneſs of your waiſt, with three ſtrong ſtrings; one at each end, and one in the middle. It ought to be ſo moderately tied, that you need not fear its burſting; but at the ſame time not ſo hard but that the water may conveniently penetrate to all parts of it. In the tying up your ſheaves, you muſt ſet the one half of your roots one way, and the other half the other way, that all the ſheaves may be of equal thickneſs. If you forbear the watering that ſeaſon, you need not in ſuch caſe tie your hemp into big ſheaves; but when it is ſufficiently dry, ſo as to be out of danger of heating, you ought to put it in a dry barn, or ſtack it in the barn-yard, laying always the roots outward, as you would do corn; and there leave it till the ſeaſon offers for watering it. But all this while you muſt carefully obſerve to keep all your ſorts of hemp apart from each other.

6. When you come to water your hemp, you muſt make bundles or ſheaves, as already obſerved. It is needleſs to enlarge on the watering part, in regard it differs in nothing from what is ſaid under the article FLAX. Your pits for hemp ought to be deep and wide, becauſe of the great length which good hemp grows to. You muſt in all things obſerve the directions given in relation to the watering of flax; and, by trying the ſame experiments directed to make in reference to it, you will diſcover when your ſeveral ſorts of hemp may be fully watered.

7. When your hemp is well watered, you muſt take it up; and, having waſhed away the filth that clings to it, you muſt graſs it in the ſame manner as flax, obſerving the like rules and directions, as to each quality and ſort of hemp. This is ſtill to be underſtood, in caſe you deſign it for cloth: but, if you deſign it for cordage or nets, there will be no occaſion for graſſing it; but only, after it is taken out of the water, you may again ſtook it till it is dry; then put it into a dry barn, where you ought to let it ſweat for ſix weeks or two months, that it may work the more kindly. Note likewiſe, that male hemp is generally fitter for cloth than female, becauſe it is finer.

8. As for your male hemp, you will diſcover when it is ripe and fit for pulling by the following obſervations. When your hemp-ſeed is become large and well coloured, and the pods, or places where the ſeed is lodged, begin to open, ſo as through the ſmall clefts you may perceive the ſeed, you muſt forthwith pull it without loſs of time; for a ſmall delay may be fatal to the whole crop, both of ſeed and hemp. In the pulling it, you muſt obſerve the cautions given; that is, put the coarſeſt in the middle, and the fineſt ſorts all by themſelves; and you muſt be careful, as you pull your female hemp, not to ſhed the ſeed; but, when your hemp is dry, you ought to have a wooden ſtool, with a ſheet under it, and beat the ſeed into the ſheet, breaking your hemp as little as may be. The female hemp cannot well be watered the ſame year it is pulled; ſo you have nothing to do with it that year, but to fit it for the barn, the ſame way as you was directed to do with the male hemp. When the ſeaſon offers for watering and graſſing, you muſt purſue exactly the rules given in reference to the male hemp.

9. When your hemp is fit for breaking, you muſt make uſe of breaks, which are common in this kingdom. If the weather be fair, you ought to expoſe it to the ſun and air to dry it, that it may break more kindly; but, if it be moiſt and damp, you muſt then dig a pit or hole in the ground about four or five feet deep, at each corner whereof you muſt fix a wooden fork, which fork muſt be three or four feet high from the ground: on theſe forks place ſticks whereon to ſpread your hemp; ſpread it very thin; kindle a gentle fire in the pit of hemp-ſtraw, and therewith dry your hemp: it will dry in a very little time. Take great care not to over dry it, and, above all, not to ſcorch it. When it is dry enough, break it with your breaks, and afterwards rub and ſcutch it.

10. After you have cleared your ſeed from your hemp, you muſt be very careful, while the ſeed is new, to prevent its heating, by frequent turning. Keep it in a place that is dry, but not cloſe; for the air will help to preſerve it. When you have ſcutched your hemp, and wrought it clean from the ſtraw and roots, tie it up ſeverally, according as the kinds and ſorts of hemp are, and put it into a place moderately dry, (for the place where you keep hemp ought to be neither too dry nor too damp;) there keep it until you have occaſion to uſe it. The longer you keep your hemp in this manner, the better will it work, and the goods which it produces will prove the better.

11. The heckling of hemp is of courſe the next thing to be treated of. This is to be more or leſs done according to the uſe to which you deſign to apply it: as, for inſtance, if you deſign your hemp for groſs or coarſe yarn, you need not heckle it in that caſe, but with a large-toothed heckle. If you deſign it for finer uſes, you muſt begin with your coarſe heckle, and heckle it again in the ſecond heckle. If you would have your hemp brought to be yet finer, you muſt heckle it a third time, and in a finer heckle. You muſt always work hemp gradually, and not heckle it at firſt with your finer or fineſt heckle: for, if you do, you muſt expect more tow than hemp fit for uſe and ſervice. When you have a mind to have it extraordinary fine, you muſt not in the leaſt heckle it, but you muſt work it entirely by the help of a bruſh for that purpoſe, made of hogs briſtles, and ſtiffened artificially with glew. This bruſhing does not ſo wear and tear it as the heckles do, but by eaſy degrees ſeparates the threads and fibres thereof. Any body that has a mind to make trial of theſe bruſhes, may be furniſhed with them at Edinburgh for a trifle. A bruſh will laſt many years, if well and carefully uſed. Hemp requires heckles with longer and larger teeth than flax does. If you deſign your hemp for ſail-cloth, two hecklings will ſuffice; and thoſe hecklings are to be in the firſt and ſecond large heckles. But, if you deſign it for cordage, one heckling may be ſufficient, and you may have a heckle with wider and ſtronger teeth for that purpoſe than is uſual. You may mix tow together with your hemp in the making of your cordage; but it were better for the goods and for the buyer to have them made of hemp only; and the tow may be uſed for many profitable purpoſes by itſelf. At all times when you are to heckle or bruſh hemp or flax, you muſt begin with the ends which grew next the ground, becauſe they are ſtrongeſt; and, when they once divide, the other end is more eaſily wrought.

Of ſoftening HEMP *and flax*.—After beating and firſt heckling of the hemp, take a large pewter ſtoup, or white-iron flagon; fill it full of made-up heads of hemp cloſe packed, and put it in a pot of boiling water; the mouth of the ſtoup or flagon is to be ſtopped cloſe with a cloth, ſo as no water get into it. Let it boil full two hours, and it will make the hemp ſoft to heckle, and ſpin as fine as any lint. The cloth of hemp laſts longer than any cloth whatſoever; and the hards of it, when thus prepared, will make good and ſtrong ſhirting and ſheeting, or napry, for country-people.

The ſame method will ſoften flax, and make the fibres of it ſeparate the better after heckling.

CA'NNEL *Coal*, a black bituminous foſſil, frequent in Staffordſhire and Lancaſhire, of a fine hard texture, ſo as to receive a poliſh, and become of ſervice for divers works inſtead of ivory, but chiefly uſed for fuel, as affording a brighter and purer flame than the common ſea-coal. See COAL.

CA'NON, in eccleſiaſtical affairs, a perſon who poſſeſſes a revenue allotted for the performance of divine ſervice, in a cathedral or collegiate church.

Canons are of no great antiquity: Paſquier obſerves, that the name Canon was not known before Charlemaign: at leaſt, the firſt we hear of, are in Gregory de Tours, who mentions a college of Canons, inſtituted by Baldwin XVI, archbiſhop of that city, in the time of Clotharius I.

Originally Canons were only prieſts, or inferior eccleſiaſtics, who lived in community; reſiding by the cathedral church, to aſſiſt the biſhop; depending entirely on his will, ſupported by the revenues of the biſhopric; and living in the ſame houſe, as his domeſtics, or counſellors, &c. They even inherited his moveables, till the year 816, when this was prohibited by the council of Aix la Chapelle. By degrees, theſe communities of prieſts, ſhaking off their dependance, formed ſeparate bodies, whereof the biſhops, however, were ſtill heads. In the tenth century, there were communities or congregations of the ſame kind, eſtabliſhed even in cities where there were no biſhops: theſe were called collegiates, in regard they uſed the terms congregation and college indifferently: the name chapter, now given to theſe bodies, being much more modern. Under the ſecond race of the French kings, the canonical, or collegiate life, had ſpread itſelf all over the country; and each cathedral had its chapter, diſtinct from the reſt of the clergy. But they were not yet deſtined to a life ſo eaſy as now-a-days.

They had the name canon, from the Greek κανων, which ſignifies three different things, a rule, a penſion or fixed revenue to live on, and a catalogue or matricula. Hence, ſome ſay, they were called Canons, by reaſon of the penſion or prebend; (whence they are ſometimes alſo denominated ſportulantes fratres:) others hold, they were called Canons, becauſe obliged to live according to the canonical rules and inſtitutions, which were given them; and others, as M. de Marca, becauſe their names were inſerted in the matricula, or catalogue of the cathedral.

In time, the Canons freed themſelves from their rules, the obſervance relaxed, and, at length, they ceaſed to live in community, yet ſtill formed bodies; pretending to other functions beſides the celebration of the common office in the church, yet aſſuming the rights of the reſt of the clergy; making themſelves a neceſſary council of the biſhop; taking upon them the adminiſtration of a ſee during a vacancy, and the election of a biſhop to ſupply it. There are ſeven more chapters exempt from the juriſdiction of the biſhop, and owning no head but their dean. After the example of cathedral chapters, collegiate ones alſo continued to form bodies, after they had abandoned living in community.

CANON *of ſcripture*, a catalogue or liſt of the inſpired writings; or ſuch books of the bible as are called canonical, becauſe they are in the number of thoſe books which are looked upon as ſacred, in oppoſition to theſe, which either are not acknowledged as divine books, or are rejected as heretical and ſpurious, and are called Apocryphal.

The Canon of ſcripture may be conſidered either as Jewiſh or Chriſtian, with reſpect to the ſacred writings, acknowledged as ſuch by the Jews, and thoſe admitted by the Chriſtians.

The firſt Canon, or catalogue of the ſacred books, was made by the Jews, but who was the author of it, is not ſo certain. The firſt books of Moſes were, queſtionleſs, collected into one body, within a ſhort time after his death; ſince Deuteronomy, which is an abridgment of the other four, was laid in the tabernacle near the ark, according to the command he gave to the Levites. So that the firſt Canon of the ſacred writings conſiſted only of the five books of Moſes. There were no more added to them, till the diviſion of the ten tribes; ſince the Samaritans acknowledged none elſe. However, ſince Moſes, there were ſeveral prophets and other writers, divinely inſpired, who compoſed either the hiſtory of their times, or prophetical books, and divine writings, or pſalms to the praiſe of God; but it cannot be diſcovered, that, any time before the captivity, they were collected into one body, and comprized under one and the ſame Canon. It is evident, that, in our Saviour's time, the Canon of the holy ſcripture was already drawn up, ſince he cites the law of Moſes, the prophets, and the pſalms, which are the three ſorts of books of which that Canon is compoſed, and which he often ſtyles the ſcripture, or the holy ſcripture.

It is generally received that Ezra was the principal author of this Canon, though Nehemiah had ſome ſhare in it; and that he re-eſtabliſhed, corrected, and ordered the ſacred books to be written in new characters.

The Jewiſh Canon is generally called the Canon of Ezra; but it is certain, that all the books were not received into the Canon of the ſcriptures in his time; for Malachi, it is ſuppoſed, lived after him; and, in Nehemiah, mention is made of Jaddua the high-prieſt, and of Darius Codomanus, a king of Perſia, who lived at leaſt a hundred years after his time. Dr. Prideaux, with great appearance of reaſon, ſays, it is moſt probable, that the two books of Chronicles, Ezra, Nehemiah, and Eſther, as well as Malachi, were afterwards added in the time of Simeon the Juſt; and that it was not till then, that the Jewiſh Canon of the holy ſcripture was fully compleated. And, indeed, theſe laſt books ſeem very much to want the accuracy and ſkill of Ezra, in their publication; for they fall ſhort of the exactneſs found in the other parts of the Hebrew ſcriptures. There are ſome authors who pretend, that the Jews have made one or more Canons; and that they have added to the former the books of Tobit, Judith, Eccleſiaſticus, Wiſdom, and the Maccabees: But it is moſt evidently true, that the Jews had no other Canon but that of Ezra, nor confeſſed any other books for ſacred, but thoſe it contains. The two aſſemblies of the ſynagogue, which, as it is pretended, were held for that purpoſe, are mere chimeras; nor have any antient writers ſaid any thing of them.

As for the Chriſtian church, there is no doubt but it acknowledged thoſe books to be canonical, which were cited, as of divine authority, by Chriſt and his Apoſtles; the ancient catalogues of the canonical books of the Old Teſtament, which are to be met with in Chriſtian writers, are conformable to the Canon of the Jews, and contain no other books; the Chriſtian Church, for ſeveral of the firſt ages, receiving the inſpired writings no further than the Jewiſh Canon. The firſt, and moſt ancient catalogue of this kind, is that of Melito, biſhop of Sardis, who flouriſhed in the reign of Marcus Antoninus. It agrees with the Jewiſh Canon, excepting his omiſſion of Eſther, and that he makes Ruth and Judges two books. Origen has given us a liſt of the ſacred books, in which he takes in Eſther, and joins Ruth with Judges. St. Gregory Nazianzen divides the books of ſcripture into *Hiſtorical, Poetical*, and *Prophetical*: he reckons twelve hiſtorical books, viz. the five books of Moſes, with Joſhua, Judges, Ruth, the two books of Kings, Chronicles, and Eſdras. Five poetical books, Job, Daniel, and the three books of Solomon. Five prophetical books, viz. four great prophets, and twelve ſmall ones. The council of Laodicea was the firſt ſynod in which the number of the canonical books was aſcertained; this council aſſigns only twenty-two books to the Old Teſtament, including Eſther, and joining Baruch and the Lamentations with Jeremiah. St. Epiphanius, reckons twenty-ſeven canonical books of the Old Teſtament, yet he admits no more than are in the catalogue of Origen, and obſerves that the Jews had reduced them to twenty-two. The third council of Carthage, in the year 397, admitted the books of Wiſdom, Eccleſiaſticus, Tobit, Judith, and the two books of Maccabees into the Canon. The Church of Rome has agreed herein with that of Africa; for Innocent I, in his letter to Exuperius, places the ſame books in the Canon of ſcripture, as Pope Gelaſius, in the council held in the year 494; and the decree of Pope Eugenius, and the Canon of the council of Trent, agree with the Canon of the council of Carthage. That the council of Trent had no prior authority to proceed on, excepting ſome ſlender pretence from the council of Carthage above-mentioned, appears from the current teſtimony of the Latin Church.

As to the Canon of the New Teſtament, it is to be obſerved, that the four Evangeliſts, the acts of the Apoſtles, all the epiſtle of St. Paul (except that to the Hebrews) and the firſt epiſtles of St. Peter and St. John, have been received as a canonical by the unanimous conſent of all the churches in all times; the epiſtle of St. James, that of St. Jude, the firſt epiſtle of St. Peter, and the ſecond and third epiſtles of St. John, were not received by all the churches from the beginning as canonical, but have ſince been acknowledged as genuine, and therefore admitted into the Canon.

We muſt obſerve, that the Canon of the New Teſtament was neither ſettled by any ſynod, or ſingle authority: this collection was formed upon the unanimous conſent of all the churches, who, by conſtant tradition, reaching to the Apoſtolical age, had received ſuch a number of them as were written by inſpired authors.

CANO′NICAL, in philoſophical hiſtory, an appellation given by Epicurus to his doctrine of logic.

It was called Canonical, as conſiſting of a few canons, or rules for directing the underſtanding in the purſuit and knowledge of truth.

CANO′PUS, in aſtronomy, a bright ſtar, of the firſt magnitude in the rudder of Argo, a conſtellation of the ſouthern hemiſphere.

CANO′W, a kind of boat in uſe among the Indians of America.

The word is alſo written Canoo, Canoe, and Cannow. It is borrowed from the Spaniſh canoa, which ſignifies the ſame, and that from the language of the Indians.

The common Canows, among the Indians, are thoſe made of trees hollowed; being either greater or leſs, according to the ſize of the tree they are made of. They are rowed with paddles, and rarely carry ſails; the loading is laid at the bottom: but, having no ballaſt, they are frequently turned upſide down. They have no rudder, the want of which is ſupplied by the hind oars. The Negroes of Guinea uſe the ſame ſort of Canows, though made in a different manner. They are long-ſhaped, having room only for one perſon in width, and ſeven or eight in length; they ſhew little wood above the water; thoſe who row are extremely dextrous, not only in giving the ſtrokes with cadence and uniformity, by which their Canows ſeem to fly along the ſurface of the water, but, alſo, in balancing the veſſel with their bodies, and preventing their overturning, which otherwiſe, on account of their lightneſs, would continually happen.

Add that, when they are overturned, they have the addreſs to turn them up again in the water itſelf, and mount them anew. They venture as far as four leagues to ſea, but dare not to venture further.

They are uſually ſixteen feet long, and a foot or two wide, though there are ſome larger, as far as thirty-five feet long, five wide, and three high, uſed for the carriage of cattle, and expeditions in war. They are fitted with ſails made of ruſhes.

CA′NTO, denotes a part or diviſion of a poem, anſwering to what is otherwiſe called a book.

The word is Italian, where it properly ſignifies a ſong.

Taſſo, Arioſto, and ſeveral other Italians, have divided their longer or heroic poems into Canto's. In imitation of them, Scarron has alſo divided his Gigantomachia, and Boileau his Lutrin, into chants, or ſongs. The like uſage has been adopted by ſome Engliſh writers, as Butler, who divides his Hudibras, and Dr. Garth, his Diſpenſary, into Canto's.

Canto, in the Italian muſic, ſignifies a ſong: hence, Canto ſimplice is where all the notes or figures are equal, called alſo Canto firmo: Canto figurato, that where the figures are unequal, and expreſs different motions.

Canto, ſignifies alſo the treble part of a ſong; hence Canto concertante, the treble of the little chorus; Canto ripieno, the treble of the grand chorus, or that which ſings only now and then, in particular places.

CA′NTONING, in the military art, is a method of quartering troops in a town, where the garriſon is ſo numerous, that ſeveral regiments muſt be quartered on the inhabitants for want of caſerns or barracks to contain them.

In this caſe, they divide the town into as many parts as there are regiments to be ſo quartered, that the officers and ſoldiers of each may have a diſtinct part to themſelves. This, in the military phraſe, is called Cantoning of a town.

CA′NVAS, a very clear unbleached cloth of hemp or flax, wove very regularly in little ſquares. It is uſed for working tapeſtry with the needle, by paſſing the threads of gold, ſilver, ſilk, or wool, through the intervals or ſquares.

Moſt of the Canvas for tapeſtry, which is ſold at Paris, is made in the neighbourhood of Monfort l'Amours, and particularly at a place called Meſnil.

There is coarſe, middling, and fine Canvas: the fineſt are generally made of flax, and the others of hemp. All the pieces of Canvas are forty-five ells long, Paris meaſure. But their breadth is very unequal, ſome being a quarter of an ell wide, others a quarter and a half, half an ell, half an ell and $\frac{1}{16}$, half ell and $\frac{1}{8}$; $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{3}{4}$ and an half of an ell, Paris meaſure. There are, however, ſome from thirty to forty-five ells long, by two ells wide: but the weavers make none of that ſort, unleſs they are beſpoke by the merchants.

Though tapeſtry ſeems no great object of trade, yet, beſides what is uſed at Paris, and in the other great cities of France, they alſo export ſome into foreign countries, particularly into England, Poland, and ſome other places in the north of Europe.

Canvas, is alſo a coarſe cloth of hemp, unbleached, ſomewhat clear, which ſerves to cover women's ſtays, alſo to ſtiffen men's cloaths, and to make ſome other of their wearing apparel.

Canvas, is alſo a very coarſe cloth of hemp, unbleached, which ſerves to make towels. This ſort of Canvas is made in Normandy, in the neighbourhood of Alencon; and in Perche, towards Mortagne. It is commonly ſixty ells long, and $\frac{1}{12}$ of an ell broad, Paris meaſure.

Canvas, or *Kaneſas*. Thus the Dutch call a ſort of very coarſe cloth made of hemp, very ſtrong and very cloſe, which is made in Holland, and ſerves to make ſails for ſhipping.

Canvas, among painters, is the cloth on which painters uſually draw their pictures; the Canvas, being ſmoothed over with a ſlick-ſtone, then ſized, and afterwards whited over, makes what the painters call their primed cloth, on which they draw their firſt ſketches with a coal or chalk, and afterwards finiſh with colours.

Canvas is alſo a name ſometimes given to ſail-cloth.

CAP *of a gun*, is a piece of lead which is put over the touch-hole of a gun, to keep the priming from being waſted or ſplit.

CA′PER, *capparis* (*Dict.*)—At Toulon they cultivate theſe plants upon the walls, by ſowing of their ſeeds in the holes of the ſtone-walls, about three or four feet from the ground; ſo that the roots of the plants penetrate into the joints of the walls, and from thence draw their nouriſhment. In England it is very difficult to preſerve theſe plants, eſpecially if they are planted in earth; for theſe plants thrive much better in rubbiſh: ſo that, when any perſon is deſirous to cultivate them, they ſhould be planted in pots filled with lime-rubbiſh and ſand, and placed into a moderate hot-bed, to forward their making new roots; after which time they may be expoſed in the open air in ſummer; but in winter they muſt be ſheltered from ſevere froſt, which will deſtroy them. The ſtumps of theſe plants are generally brought over in plenty from Italy every year, by the perſons who bring over orange-trees and jaſmines; ſo that they may be purchaſed from them at a moderate price, which is by far the eaſieſt method of being furniſhed with theſe plants; for the ſeeds are not eaſily obtained from abroad, nor do they ſucceed very well with us: although theſe plants require ſhelter, when planted in pots, yet they will endure the ſevereſt cold of our winters, if growing in a wall. See *plate* IX. *fig.* 1, where *a*, *a*, are the flowers, *b*, the fruit, *c*, the fruit open, *d*, the ſeeds, *e*, the calix.

CAPH, a Jewiſh meaſure of capacity for things eſtimated by Kimchi at the thirtieth part of the log, by Arbuthnot at the ſixteenth part of the hin, or the thirty-ſecond of the ſeah, amounting to $\frac{5}{8}$ of an Engliſh pint. *Arbuthn. Tab. Anc. Coins*, &c.

CA′PITAL *of a lanthorn*, the covering which terminates the lanthorn of a dome, either in the figure of a bell, as that of the Sorbonne, or of a cupolo, or aſpiral, as that of the church of Sapienza, at Rome.

Capital *of a mill*, the covering thereof in the form of a cone, which turns vertically on the round tower, in order to expoſe the ſails to the wind.

Capital, amongſt merchants, bankers, and traders, ſignifies the ſum of money which individuals bring to make up the common ſtock of a partnerſhip, when it is firſt formed. It is alſo ſaid of the ſtock which a merchant at firſt puts into trade for his account. It ſignifies likewiſe the fund of a trading company, or corporation, in which ſenſe the word ſtock is generally added to it. Thus we ſay, the Capital ſtock of the bank, &c. The word Capital is oppoſed to that of profit, or gain, though the profit often increaſes the Capital, and becomes itſelf part of the Capital, when joined with the former.

Capital *Picture*, in painting, denotes one of the fineſt and moſt excellent pieces of any celebrated maſter.

F. Chamillard gives a liſt of the pieces of each famous painter, and the places where they are found. Such are the tranſfiguration of Raphael, in the church of St. Peter in Montorio, at Rome. The nativity of Coreggio, in the palace of the duke of Modena. The St. Peter martyr of Titian, at Venice, in the church of St. John. The paradiſe of Tintoret, in the hall of the great council in the ſame city. The judgment of Michael Angelo, in the pope's chapel in the Vatican. The St. Michael of Guido, in the Capuchin church at Rome. The St. Jerom dying, of Dominichini, in the church of St. Jerom de la Carita at Rome. The marriage of Cana, by Paolo Veroneſe, in the Louvre at Paris. Raphael painted a multitude of fine madona's, but the moſt capital, in the judgment of all the connoiſſeurs, is that in the palace of Chigi, repreſenting the holy Virgin holding the child Jeſus by the hand, and St. Joſeph approaching to kiſs him.

CA'PITIS *Nonus*, in anatomy, the name given by Fallopius to one of the muſcles of the head, deſcribed by Albinus under the name of the rectus capitis internus major, and by Winſlow and others under that of the rectus capitis anterior longus.

CA'PITO, in ichthyology; the chubb is called alſo by ſome authors the ſephalus and ſqualus, and in ſome parts of England the chevin. It is a longer-bodied fiſh than the carp, and its head is black, large, and ſomewhat flat. Its back is of a duſky green, and its belly and ſides are uſually white and ſilvery, but in the larger and fatter fiſh they become yellow, and ſpotted with ſmall black ſpots; its ſcales are very large, and its mouth ſmall.

It has no teeth either in the jaws, palate, tongue, or throat; its tail is forked, and all its fins are of a bluiſh black colour. Its belly is ſomewhat prominent; it is a river fiſh, and loves the covert of old ſtumps of trees and hollow banks, and gives the angler much diverſion; it will not live in ponds; it ſpawns in May, and is in beſt ſeaſon in April, when full of ſpawn, but is never a very delicate fiſh. *Ray's Ichthyogr.*

CAPI'TULUM, in the ancient military art, was a tranſverſe beam, wherein were holes through which paſſed the ſtrings whereby the arms of huge engines, as baluſtæ, catapultæ, and and ſcorpion, were played or worked.

CA'POC, a ſort of cotton ſo fine and ſo ſhort, that it cannot be ſpun; it is as ſoft as ſilk: they uſe it in the Eaſt-Indies, and even in Europe, to make beds, mattreſſes, cuſhions, pillows, &c. which are very eaſy and convenient. It ſerves alſo to line the palanquins. The Capoc is taken out of a large cod or pod, which contains it with ſeveral ſmall ſeeds, of the bigneſs of a pepper-corn. Though this pod be but two inches and a half in diameter, and four inches long, yet it yields a large handful and a half of Capoc. When uſed, care muſt be taken to leave no ſeeds among it; for the rats are ſo fond of them, that they would gnaw the coverings of the mattreſſes, or other furniture, to come at them, and ſo ſpoil them. The tree which bears this fruit, is really of the kind of cotton trees; it grows very tall, and the trunk of ſome is ſo thick, that a man cannot graſp it with both his arms; its branches ſpread very much, and divide and ſubdivide themſelves into three, to the very top. The leaves are large, and placed ſeven or eight on a ſtalk, ſpreading like a fan. The flower conſiſts of one leaf, divided into five lobes, as thoſe of all the cotton kinds are. This tree grows every-where in the Eaſt-Indies. The Capoc is ſent into Tartary, where there is ſome demand for it. There are ſeveral ſorts of trees that produce Capoc; but that which has been deſcribed is the beſt. The Capoc is looked upon as a ſort of wad; but the wad which comes from Egypt, is quite different from that of the Eaſt-Indies.

CA'PON, a caſtrated cock.—Capons, beſides their uſe for the table, ſerve to lead chickens, ducklings, turkey-pouts, peahens, pheaſants, or partridges, in lieu of their natural dams, over which they have ſeveral advantages, by the largeneſs of their body, which will brood, or cover, thirty or forty young.

CAPONIE'RE (*Dict.*)—*To conſtruct a* Caponiere.

From the exterior flanking angle D (*plate* XIV. *fig.* 1.) draw a line D *p* to the angle of the counterſcarp *p*; on each ſide of D *p* draw parallel lines, at the diſtances of 1 $\frac{1}{2}$, 2 $\frac{1}{2}$, and fifteen yards from D *p*; theſe lines, being limited by the lines of defence and counterſcarp, form the Caponiere.

This work, which can be uſed only in a dry ditch, ſerves, beſides its defence of the foſs, for a convenient paſſage between the town and its outworks; and, in this caſe, there is uſually a circular excavation made in the angle of the counterſcarp, out of which the troops may defile without being ſeen by the enemy.

CA'POT, at piquet, is when one of the gameſters wins all the cards, in which caſe he gains forty points.

CAPPA'DINE, a ſort of ſilk flock, taken from the upper part of the ſilk-worm cod, after the true ſilk has been wound off. It is called alſo laſſis and carbaſs, becauſe ſlight ſtuffs under thoſe names are made of it.

CAPRIFICA'TION *, a method of impregnating fig-trees, by means of certain inſects.

* The word is formed from *caprificus*, the wild fig-tree, from whoſe fruits the inſects are produced, which are the chief inſtruments of Caprification.

Caprification, or the manner of impregnating fig-trees, of which the ancients ſpeak with ſo much wonder, is not imaginary, as many have ſuppoſed. M. Tourneſort aſſures us, it is ſtill practiſed every year in moſt of the Grecian iſlands, by means of a ſort of gnats, or flies, peculiar to the country. The fig-trees there bear much fruit; but this fruit, in which part of the riches of the country conſiſts, would be of no advantage, if it was not managed in the following manner:

There are two ſorts of fig-trees cultivated in theſe iſlands; the firſt called ornus, from the Greek ἐρινεός, which is the wild fig-tree, or the caprificus of the Latins; the ſecond is the domeſtic fig-tree. The former bears three kinds of fruits, none of them fit to eat, but abſolutely neceſſary for ripening the domeſtic ones. Theſe fruits of the wild fig-tree are called fornites, cratitires, and orni.

The fornites appear in Auguſt, and continue unripe till November. In theſe ſmall worms are bred, from the puncture of certain gnats, obſerved only about the fig-trees. In October and November, the ſame gnats wound the ſecond fruits of the ſame trees. Theſe which are called cratitires only appear at the end of September, and the fornites fall gradually off, after their flies have quitted them. But the cratitires remain on the tree till May, and incloſe the eggs left by the flies of the fornites. In May, the third kind of fruit begins to bud on the ſame trees which bore the other two; this is by far the largeſt fruit, and is called ornus. When it is arrived at a certain magnitude, and its buds begin to open, it is wounded in that part by ſuch of the flies of the cratitires as can ſhift from one fruit to the other, to depoſit their eggs.

It ſometimes happens that the flies of the cratitires lie in ſome places, and do not come out, though the orni are fit for their reception. In this caſe, the cratitires muſt be fetched from elſewhere, and put on the extremities of thoſe branches whoſe orni are in a good forwardneſs, in order that they may wound them. If that ſeaſon be loſt, the orni fall, and the inſects of the cratitires fly away, finding no orni to prick. The peaſants who apply themſelves to the culture of fig-trees, are the only judges of the proper ſeaſon in which this may be prevented; in order to which they carefully obſerve the bud of the fig; for this part not only ſhews the ſeaſon of the fly's exit, but alſo that in which the fruit may be ſucceſſively wounded. If the bud be too hard and cloſe, the fly cannot depoſit its egg, and the fig drops, when the ſame eye is too lax and open.

But this is not all: theſe three kinds of fruit abovementioned are not good to eat; they are only appointed by the author of nature to ripen the fruit of the domeſtic fig-tree. The method of managing them is thus: in June and July the peaſants take the orni, when the flies are ready to come out, and hang them on the domeſtic fig-trees; ſeveral of theſe they ſtring on a ſtraw, and lay on the tree, more or leſs, in quantity, as they ſee occaſion. If they miſs this ſeaſon, the orni drop off, and the fruit of the domeſtic fig-tree, not ripening, falls alſo in a little time. The country people know ſo well theſe precious moments, that every morning, making their review, they lay only the beſt conditioned orni on the fig-trees, otherwiſe, they would loſe their harveſt. 'Tis true, they have a ſort of remedy for this, by ſtrewing on the domeſtic fig-trees the flowers of a plant called a ſcolimbros, in the tops of which flowers are ſometimes found flies fit to wound the figs; or poſſibly the flies of the orni feed on this plant. In fine, the peaſants manage the orni ſo well, that their flies ripen the domeſtic figs in about forty days.

Theſe figs are very good crude; to dry them, they are laid in the ſun for ſome time, after which they give them a heating in the oven, to preſerve them for the reſt of the year. They are the chief food of the peaſants of the Archipelago, whoſe ordinary fare is only barley bread and dry figs. Yet are theſe figs far from being ſo good as thoſe of Provence, Italy, and Spain; the heat of the oven deprives them of their fine reliſh, but, on the other hand, it deſtroys the eggs of the flies of the orni, which would infallibly produce little worms, which would deſtroy the fruit. This, one may ſay, is taking a great deal of pains for fruit that is naught at laſt. M. Tournefort could not enough admire the patience of the Greeks, who ſpent above three months in carrying the flies from one fig-tree to another; but he ſoon underſtood the reaſon, for, aſking them why they did not cultivate the French and Italian figs, he was anſwered, that the great quantity of fruit that their own trees yielded, made them preferable. In reality, one of theſe trees produces generally 224 pounds of figs, whereas the French trees yield not 25 pounds.

As to the manner wherein the puncture of the flies contributes to the maturation of the fruit, poſſibly it may be by lacerating the veſſels, and extravaſating the nutritious juice, when they depoſit their eggs; or, when, with the egg, they alſo convey ſome liquor which gently ferments with the juice of the fig, and ſoftens its pulp. Even the Provence and Paris figs ripen much ſooner by wounding their buds with a ſtraw or feather dipped in oil olives; plums or pears alſo, wounded by inſects, are found to ripen the ſooneſt, and in theſe the pulp about the wound is more exquiſite than the reſt. *Mem. Acad. Scienc. An.* 1705.

CA'PSTAN (*Dict.*)—The parts of a Capſtan are, the foot, which is the loweſt part; the ſpindle, the ſmalleſt part; the whelps, a ſort of brackets ſet into the body of the Capſtan cloſe under the bars; the barrel, the main body of the whole; the holes for the bars to be put into; the bars, which are ſmall pieces of timber by which the men heave; laſtly, the pawl, which is a piece of iron bolted to one end of the beams of the deck, cloſe to the body of the Capſtan, but ſo as that it have liberty to turn about every way; and againſt it do the whelps of the Capſtan bear, ſo as that by it the Capſtan may be ſtopped from turning back.

CA'PSULE, among botaniſts, a ſpecies of pericarpium compoſed of dry elaſtic valves, which uſually burſt open at the points: this kind of pericarpium ſometimes contains only one cell or cavity, ſometimes more; in the firſt caſe, it is called unilocular; in the ſecond, bilocular, trilocular, &c. according to the number of cells in it for the reception of ſeeds.

CAPUCHI'NE, the name of a particular ſpecies of pigeon, in ſhape and make much like the jacobine or jack, but ſomething larger than that; its beak alſo is longer, and it has a tolerable hood of feathers on the back part of its head, but has no cravat or chain down to the ſhoulders as that ſpecies has. Its marks are the ſame with the jacobine, and it ſeems to be no other than a baſtard breed, between that and a common pigeon. *Moore's Columbarium.*

CARA'COLI, a kind of metal, of which the Caribbees, or natives of the leſſer Antilles, make a ſort of ornament, in the form of a creſcent, which they alſo call Caracoli. This metal comes from the main land, and the common opinion is, that it is a compound of ſilver, copper, and gold, ſomething like the Corinthian braſs of old. Theſe metals are ſo perfectly mixed and incorporated together, that the compound which reſults from them, it is ſaid, has a colour that never alters, how long ſoever it remains in the ſea, or under ground. It is ſomething brittle, and they who work it are obliged to mix a large proportion of gold with it, to make the compound more tough and malleable under the hammer.

The Engliſh and French ſilver-ſmiths have made ſeveral experiments thereon, in order to imitate this metal; they who come neareſt to it, put, to ſix parts of ſilver, three of copper, and one of gold: the ſkilful found this imitated mixture, tho' very fine, was yet much inferior to that among the ſavages.

Father Labat, from whoſe relation this article is extracted, is of opinion that the Caracoli is a ſimple metal, as produced from the mines, and afterwards refined. They make with it, in the American iſlands, rings, buckles, heads for canes, and ſuch other ſmall works.

CA'RAITES (*Dict.*)—The Caraites are ſaid to glory in a deſcent from Eſdras, and to prove the ſucceſſion of their churches, by an exact catalogue of all thoſe perſons who have either taught or contended againſt Caraiſm. There are ſome who boaſt of a ſtill greater antiquity, pretending they are deſcended from the ten tribes led into captivity by Salmaneſer, but it is all fiction. There are many other accounts given of this ſect, which have not probability enough to be mentioned. It would be a difficult taſk to fix the exact time when Caraiſm began: Father Morin, Dr. Prideaux, and ſome others, with great probability, trace the original of this ſect to the eighth century. In fact, Caraiſm took its riſe from the publication of the Talmud; for we do not find, that the word Caraite was ſo odious before that time, as it has been ſince. On the contrary, by the term Caraite, was intended a perſon who had a conſummate knowledge of the ſacred ſcriptures. The compilation of the Talmud appearing in the beginning of the ſixth century, thoſe of the moſt learning among the Jews were preſently diſguſted at the ridiculous and incredible fables with which it was ſtuffed. They reſerved their belief for the written word, and admitted the other, as a work of human compoſition, proper to explain and interpret the ſcriptures in ſuch paſſages where it ſhould be found conducive to that purpoſe. However, this did not immediately produce a ſchiſm among them: but, about the year 750, Anan, a Babyloniſh Jew, of the race of David, and his ſon Saul, declared openly for the written word of God alone, and diſclaimed all traditions, except ſuch as manifeſtly agree with it, abſolutely denying them the ſame authority with the written ſcriptures. This declaration produced a ſchiſm: thoſe who maintained the Talmud, being almoſt all Rabbins, or diſciples of Rabbins, were called Rabbiniſts: the other, who admitted the ſcripture only as their rule, and made uſe of it for the refutation of the traditions, were called Caraites, or ſcripturiſts, from the word cara, which in the Babyloniſh language ſignifies ſcripture; as we ourſelves have ſeen ſome proteſtants who called themſelves evangeliſts, becauſe they would receive no other authority than that of the Goſpel; and rejected all traditions whatſoever. The Rabbiniſts then gave them the odious name of Samaritans and Sadducees; not becauſe they really were ſo, but becauſe they agreed with thoſe ſectaries on the head of traditions: though, ſince that time, there have been Jews who have imagined, that a Caraite was in reality a Samaritan and a Sadducee; and they have been the more confirmed in this error, for want of applying themſelves to hiſtory and chronology.

The Caraites are eſteemed to be men of the beſt learning, and the ſtricteſt probity, of all the Jewiſh nation: there are very few of them, if any at all, in theſe weſtern parts; moſt of them are to be found in Poland, Ruſſia, and the eaſtern countries, where they have their own ſynagogues, and obſerve ſuch ceremonies and cuſtoms as are peculiar to themſelves. Upon a computation made of their number, in the middle of the laſt century, it appeared to be between four and five thouſand, which is but a ſmall number in compariſon of the other Jews.

Our modern critics have been very groſly miſtaken, with regard to the Caraites, by too boldly relying on the authority of the Jewiſh writings; for the Rabbiniſts who are their inveterate enemies, have charged them falſly in almoſt every reſpect. It were to be wiſhed, that thoſe who ſend to the Eaſt for books, would get ſome of the Caraites books brought over, moſt of which are very learned, and there are but very few of them in Europe. Selden ſeems to have read moſt of them. There are ſome in the library of Leyden, but theſe are not much valued.

The author of the Caraite commentary, called Aaron, about the thirteenth age, whoſe manuſcripts are kept in the library of the fathers of the oratory at Paris, is very juſt in his account of the Caraites; he approves their books, which are in the Jewiſh canon, and reckons their number as the other Jews do; and, what is ſtill more remarkable, acknowledges them as they are pointed at preſent; for they have no other tranſcript than that of the Maſora; and, whenever they read in a different manner, it is as critics only.

CARBE'NSIS *Aqua*, in the materia medica, the name of a mineral water of Germany, of which Hoffman, from Petzlerus, has given the following account: all about the place of its origin, and along the canals through which it paſſes, it depoſits an earthy and ferrugineous matter, which concretes into a ſtony hardneſs. When any alcaline liquor, whether fixed or volatile, is added to theſe waters, they become turbid, and precipitate a whitiſh earthy matter to the bottom of the veſſel; after the evaporation of the water they leave a ſal enixum and an alcaline earth; two quarts of them yield two ſcruples, and ten grains of the earth, and twelve grains of the ſalt. If it be kept for any time in a glaſs, or earthen veſſel, it depoſits a ſediment of yellow, ochreous, earthy matter, and when immediately taken from the ſpring, it changes to a bluiſh brown colour, on being mixed with galls. It contains a very large portion of a ſubtile mineral ſpirit; for, if a long-necked veſſel be filled half full with it, and the orifice ſtopped with the thumb, the whole, on a little ſhaking, ſends up a froth to the top; and when the thumb is taken off, the water ſpirts out to ſeveral feet diſtance. It makes an efferveſcence, on mixing oil of vitriol with it, but this laſts but a very little time. From the whole it ſeems to contain a large quantity of calcareous earth, and ſome ſmall portion of ferrugineous matter; whence it purges both by ſtool and urine, though moſtly the latter way; the former operation which is pretty conſtant, is owing to this alcaline earth meeting with an acid in the prima via, and being by it changed into a bitter purging ſalt, of the nature of Glauber's. *Hoffman.*

CA'RBUNCLE, *Dict.* — Our jewellers, among whom it is very rare, know the Carbuncle by no peculiar name, and not only now, but for many ages back, this has been the caſe; and, while the genuine Carbuncle was often ſeen, it was yet generally thought not to exiſt, and this merely from an error: its name importing a reſemblance to a burning charcoal, the world, in general, grew into an opinion of its having the properties of a burning coal, one of which is the ſhining in the dark; and ſuppoſing that property ſtrongly commemorated in the name, and finding no gem which had it, they took it for granted that the Carbuncle no longer exiſted; nay, the fertile imaginations of ſome travellers have gone ſo far as to affirm, that a gem, with this property, is yet to be ſeen in ſome places, and given a thouſand abſurd relations about it.

To all this it is only to be anſwered, that the whole is an abſurd error; for that the ancients never attributed any ſuch quality to their Carbuncle, but that the whole reaſon of their giving the name anthrax to that gem was, that it was, of itſelf, of a very deep and ſtrong red, but when held up againſt the ſun, or when ſet upon a bright pale foil, it was exactly of that ſort of red colour which is ſeen in burning charcoal.

Theophraſtus, the greateſt naturaliſt of antiquity, aſſerts this in plain words, and calls the gem that had this property anthrax. Others of the ancients have called it the Garamantine or Carthaginian Carbuncle; and it has been ſuppoſed, by the better writers among the moderns, to be the ſame ſtone with the true garnet: this, however, on comparing the ſtones, appears

pears to be an egregious error, the difference in colour, and even in figure, between theſe two gems, being obvious and eſſential.

The Carbuncle is uſually found pure and faultleſs, and is of the ſame degree of hardneſs with the ſaphire, being ſecond only to the diamond. It is ever found naturally of an angular figure, ſmaller at the one end than at the other, and at the ſmall end tapering to a pointed pyramid, compoſed of the ſame number of planes with the column, which are ſix, and thoſe uſually very unequal. It is found adhering by its baſe to a heavy and hard ferrugineous ſtone of the emery kind, and is always more finely coloured towards the point, than at the baſe of the column. Its uſual ſize is near a quarter of an inch in length, and two thirds of that in diameter in the thickeſt part. Its colour is very beautiful, and a very deep red, reſembling that of a mulberry when nearly ripe, and, where paleſt, going off into a fine ſcarlet, and into a purpliſh or violet tinge of the garnet; but, when held up againſt the ſun, it loſes its deep dye, and becomes exactly of the colour of the burning charcoal; ſo, that the propriety of the name, given it by the ancients, immediately ſtrikes one, on making the trial. It bears the force of fire unaltered, not parting with its colour by it, as do moſt of the gems; nay, it even will not be at all affected by fire, nor become a whit the paler. This has been an experiment diligently tried by ſome of our jewellers, who, being diſguſted by its too deep colour, have endeavoured the rendering it more vivid and ſtriking to the eye, by diveſting it of a part of it by this means, but always without ſucceſs.

It is found only in the Eaſt-Indies, ſo far as is yet known, and that but very rarely.

The diſtinctions between the ſeveral red gems are very nice, and their names in ſome degree arbitrary. Many authors have confounded the Carbuncle with the ruby, and determined with Garcias, that every ruby that exceeds twenty-four caracts, in weight, was properly a Carbuncle. This gem, however, is by all trials proved to be evidently the Carbuncle of the ancients, and eſſentially different from the ruby in wanting the purpliſh tinge, into which the colour of that gem goes off, as is extremely evident in all the deep ones; this going off into a true ſcarlet, and for that reaſon giving the colour of a lighted charcoal in the ſun, which neither the ruby, garnet, nor any other gem can do, which has the blue or purple caſt. *Hill's Hiſt. of Foſſ.*

Artificial **CARBUNCLE.**— Take ten ounces of matter, prepared of natural cryſtal and ſaturnus glorificatus, and, having reduced them to an impalpable powder, add to it an ounce of gold calcined; mix the whole together, and put it into a good crucible, which muſt not be above half full; cover it and lute it well, let it dry; then put it into a glaſs-houſe-furnace for three days, bringing it by little and little nearer to the ſtrongeſt fire.

After three days, take out the crucible, and put the matter into a marble mortar, which pound to an impalpable powder, to which add its weight of ſal gemmæ, alſo in fine powder; which mix well together, and ſearce through a fine ſieve, the better to incorporate.

Put this powder into a new crucible, which you muſt not fill above half-way; which cover, lute, and dry as before: then put it into a glaſs-houſe furnace, bringing it nearer to the fire by little and little, where let it ſtand ten hours.

After this, take your crucible out of the furnace, and put it into that where they ſet their glaſſes to anneal; let it ſtand for ten or twelve hours; then take it out, and, by breaking it, you will find the matter tinged of a Carbuncle colour, the moſt lively and reſplendent that can be made by this art; whereof you may make what ſtones or works you pleaſe.

CARD, a ſort of inſtrument or comb, compoſed of a great number of ſmall pieces, or points of iron wire, a little incurvated like hooks towards the middle, and faſtened very cloſely together by the feet, in rows. A piece of thick leather, which keeps them faſt, is nailed by the edges on a flat piece of wood, which is an oblong ſquare, about a foot long, and near half a foot broad, with a handle placed in the middle, on the edge of the longeſt ſide: there are always two Cards, between which are put the materials that are to be worked.

The Cards are of very great uſe in the manufacturies, where they ſerve to comb, diſentangle, and range the wool and ſuch other materials, in order to put them in a condition to be ſpun, by the manufacturers of cloths, ſtuffs, ſtockings, hair, &c. or, to be uſed unſpun in ſeveral other works, in much the ſame manner as the wool and the hair, which the hatters employ in the manufacturing of hats.

CA′RDAMINE, *ladies ſmock*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of four leaves, and is of the cruciform kind; the piſtil ariſes from the cup, and becomes finally a long pod, which is divided by an intermediate membrane into two cells, and contains uſually roundiſh ſeeds. To theſe marks it is to be added, that the pods, when ripe, fly open with violence, and throw out the ſeeds to a conſiderable diſtance. The ſpecies of Cardamine, enumerated by M. Tournefort, are fourteen.

This plant is alſo known by the names of cuckow flower and meadow-creſſes. It is a kind of naſturtium, and is pungent and diſcuſſive, but is not uſed either in compoſition, or common preſcription.

CARDI′ACA, *motherwort*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the labiated kind; the upper lip which is imbricated, is conſiderably longer than the lower, which is divided into three ſegments; the piſtil ariſes from the cup, and is fixed in the manner of a nail into the hinder part of the flower; this is ſurrounded by four embryo's, which afterwards, ripening into as many angular ſeeds, are contained in, and occupy the whole ſpace of the cup, which before contained the flower.

The ſpecies of Cardiaca, enumerated by M. Tournefort, are three.

The Cardiaca is accounted attenuating, drying, deterſive, and cordial. It promotes urine and the menſes, is good in aſthma's and palpitations, and is ſaid to facilitate delivery. It may be taken either in powder, or in decoction.

CA′RDING, is the combing, diſentangling, and preparing wool, with the inſtruments called cards deſcribed above, that it may be fit for making the ſeveral works it is deſigned for. They alſo card wad, cotton, flax, hair, and other materials proper for ſeveral ſorts of manufactures.

Before the wool be carded, it muſt be greaſed with oil, of which one fourth part of the weight of the wool is required, for that which is deſigned for making the woof of ſtuffs, and the eighth part of that of the warp.

CARDI′OID, in geometry, is thus formed: let the diameter A B (*plate* XIV. *fig.* 2.) of the circle A M B A, revolve about the point A, and, on A B produced, let B *a*, M N, A D, M N, &c. be always equal to A B; then will the point *a* deſcribe a curve, which, from its figure reſembling a heart, is called Cardioid.

From the conſtruction it appears, that $AN = BA + AM$, and that N A N is always double of the diameter A B, and is biſected by the circle in M.

This curve is algebraical; if $AB = a$, $aE = x$, $EN = y$, its equation will be,

$$y^4 - 6ay^3 + 12x^2y^2 - 6ax^3y + x^4 = 0 + 12a^2y^2 - 8a^3y + 3a^2x^2.$$

CA′RDUUS *Stellatus.* Star-thiſtle. — The root of the ſtar thiſtle is ſingle, about a finger thick, long, and running deep into the ground, of a whitiſh colour, having a pretty thick cortical part. The lower leaves grow flat on the ground, encompaſſing the root in a circle, much cut in, or jagged to, the middle rib. The ſtalk is divided into numerous branches, ſpreading about, and ſeldom ariſing above two feet high, with a few leaves here and there at the diviſion of the ſtalks. The flowers grow thick upon the branches, conſiſting of reddiſh or purple fiſtular flowers, coming out of heads, which are compoſed of ſeveral ſcales, each ending in a long, ſtraight, hard, and ſharp thorn. The flowers paſs away in down, containing white, flattiſh, oblong ſeed. The ſtar-thiſtle grows near high-ways, and upon commons; and flowers in June.

The root is commended by ſome as a ſingular remedy againſt the ſtone, gravel, or cholic, by giving it either in decoction with wine or water, or in powder, with a convenient vehicle. *Miller's Bot. Off.*

Its leaves are very bitter, and give a faint tincture of red to the blue paper; the root gives it a deeper, and has the taſte of an artichoke. The ſtar-thiſtle contains a ſalt very like that which is natural in the earth; for its ſolution is very bitter, and loaded with ſal ammoniac and nitre. It is likely, that the ſal ammoniac predominates in this plant; for the nitre makes no impreſſion upon the blue paper, whereas the ſal ammoniac reddens it conſiderably: that, which is found in this plant, is joined with a conſiderable quantity of ſulphur and earth; thus the ſtar-thiſtle is febrifugous, vulnerary, and aperitive. For an intermitting fever they give to drink, at the beginning of the fit, four or ſix ounces of its juice. It removes the webs of the eyes, and cures wounds.

Camerarius affirms, that at Francfort they make uſe of the root of ſtar-thiſtle, inſtead of that of eryngo: it is employed in aperitive ptiſans and broths. One drachm of the ſeed of ſtar-thiſtle, infuſed in a glaſs of white wine, takes away the viſcid matter which obſtructs the urinary paſſages. *Martyn's Tournefort.*

CA′RIA, in natural hiſtory, a name given by authors to a very miſchievous ſpecies of ant, common in ſome parts of the Eaſt-Indies. This creature is larger than our ant, and is the common food of a great many other animals, as the ſquirrels, ſerpents, lizards, and a great many birds. In order to defend itſelf from ſo many enemies, it enters into large communities, which together erect great hills of earth, of five or ſix feet high. The fields in ſome places are full of theſe, and it is in vain to attempt beating them down, ſince they would be immediately made up again; the creature builds them with firm and tough clay, which it wets as it uſes it; and the walls, or outer caſe, are built ſo thick and firm that ſcarce any rain can hurt them. The whole ſpace within is full of different compartments, to every one of which there is a particular path-way; and theſe ſeparate paths, joining as they come near one another, make at length one great and general road to the door, or gate of the city. Theſe animals are generally buſied in their cells, and never go out, but at the neceſſary time to ſearch for food; this excurſion they always make regularly at one time of the day, and fall to work on the firſt corn, or other valuable plant, they find, which they gnaw off very quick, and carry into their habitation.

CARICATU'RA, in painting, an Italian word, principally applied to groteſque figures, which retain an extravagant and ugly, but real reſemblance of the perſon they are deſigned to repreſent, and laſh whomſoever the painter, carver, or graver, has a mind to ſatyrize, or divert himſelf with. Calot excelled in the Caricatura. But burleſque in painting, like burleſque in poetry, ſhould be confined within due bounds.

CA'RIES (*Dict.*)—A Caries is properly a diſorder in which the bone, from whatever cauſe, is deprived of its perioſteum, and, having loſt its natural heat and colour, becomes fatty, yellow, brown, and at length black; this is the firſt and lighteſt degree of the diſorder, and is what, according to Celſus, the ancients called os vitiatum, and the nigrities oſſium. But the greater degree of this diſorder is where the bone is eroded and eaten, and becomes uneven by reaſon of the number of ſmall holes, of which it is full, when it diſcharges a filthy ſanies, whoſe acrimony ſoftens, relaxes, and deſtroys the fleſhy parts that grow round it. This is a true Caries or ulcer of the bone, and every bone of the body is ſubject to this diſorder, and, though this ulcer may appear to be ever ſo ſafely or happily healed, yet, it too often happens, that, after the cicatrix is formed, and has been ſo for ſome time, a new abceſs will be made, the whole diſorder will return afreſh, and the acrimonious and corrupted matter which continually ſpews out from the carious bone, being collected within, will produce many grievous ſymptoms, and deſtroy the neighbouring fleſh again.

There have been many names, and many ſpecies reckoned of this diſorder, and of others that are of kin to it; it is called a Caries, a ſpina ventoſa, a ſpinæ ventoſitas, a gangrene, and cancer of the bone by Celſus, ſometimes by the Greek term teredo, and ſometimes pædarthrocaces. Some authors conſtitute as many ſpecies of this diſorder, as there are here accounted names of it; but there is ſo ſmall difference between theſe, that it will not warrant the making them ſo many ſpecies: they may very properly, however, be divided into two kinds, the one when the diſorder begins in the internal part of the bone, the other when it begins on the outſide, or from an external cauſe. This may be called a Caries, and that a ſpina ventoſa, or, where it happens in children, according to Severinus, a pædarthrocaces.

There are two principal cauſes of a Caries of the bones; the one where the bone is deprived of its perioſteum, by a wound, fracture, or other accident, and is corrupted, either by being expoſed to the external air, or heated with greaſy dreſſings; the other where the fluids are interrupted in their circulation by any external violence, or internal cauſe whatſoever, from whence an inflammation and ſuppuration ſucceed, and the bone and perioſteum ſuffer, to ſuch a degree, that, the veſſels, which are ſent to the part for its nouriſhment and ſupport, being inflamed and corrupted, the bone is brought into conſent, and quickly becomes carious: this diſorder, if not quickly remedied, ſpreads and communicates itſelf to the neighbouring parts of the bone, and makes the ſame progreſs as ulcers do in the ſofter parts. There are, therefore, ſeveral degrees of the Caries of the bones; the firſt, is when the bone is laid bare, looks greaſy, and turns yellowiſh: as ſoon as it becomes thoroughly yellow, brown, or black, the incipient Caries then degenerates into a worſe ſtate. The third degree is when the bone becomes uneven, rough, and rotten, and the greater eroſion the bones have ſuffered, the more rough and uneven they will appear. When the cranium is perforated through both its tables, or the tibia or femur are eaten through to the marrow, this is a Caries of a very bad kind; but the worſt of all Caries, and that in which the caſe may indeed be almoſt pronounced deſperate, is that which falls upon the joints, or thoſe parts of the bones which lie very deep, becauſe in this caſe there is no acceſs for the hands to clean the bone, and there is no remedy but the amputating the limb.

Many methods have been attempted for the cure of a Caries; the firſt and mildeſt is applied to the ſlighteſt degree of the diſeaſe, and is performed by the application of ſpirituous remedies, ſuch as ſpirit of wine, Hungary-water; or by ſlight balſamics, ſuch as the powder of birthwort, florentine, iris, myrrh, or aloes. Either of theſe powders is to be ſprinkled on the part, after the ſanies has been carefully wiped away with dry lint, and this continued till the cure is perfected. In a Caries that penetrates ſomewhat deeper, ſtronger remedies take place, ſuch as powder of euphorbium, or its eſſence, made in well rectified ſpirit of wine; or oil of cloves, cinnamon, or guaiacum; either of theſe may be touched on with a pencil, or laid upon dry lint, and applied: ſome alſo uſe the corroſive medicines, the phagadenic water, and ſpirit of vitriol, or of ſulphur; and, in the place of theſe, a ſolution of quickſilver in aqua-fortis may be uſed with great ſucceſs. When, by theſe means, an exfoliation of the bone has been produced, the buſineſs is then to treat it with balſamics.

A ſecond method of cure for a greater degree of Caries, is perforating the bone with the trepan, and dreſſing the part afterwards, either with balſamics or with dry lint. By theſe means the exfoliation of the bone is forwarded, and new-veſſels puſh themſelves through the foraminula, which, joining with the neighbouring fleſh, make a new covering for the bone.

The third method of cure is performed by the raſpatory, or chiſſel, taking off the corrupted or vitiated part of the bone, till all beneath appears white, or ruddy, and ſound: and the fourth, which is the moſt ancient, and the moſt ſpeedy, and certain method, is by the actual cautery, burning down the vitiated part of the bone. This method, however, is not neceſſary, except in great degrees of this diſorder; and, in the performing it, great care muſt be taken not to injure the neighbouring ſoft parts. For this reaſon, an aſſiſtant ſhould always draw back the lips of the wound both ways, while this is performed; and, if the opening be not wide enough, it ſhould be opened and enlarged by ſponge tents before, or widened by the knife, till the bone lies fair, and the part muſt be carefully wiped firſt with dry lint, from the ſanies; and, if there be any fungous fleſh, that muſt alſo firſt be removed. One application of the cautery, when the diſorder is conſiderable, will ſeldom prove ſufficient; it uſually requires to be repeated ſeveral times, at proper intervals; and, if the Caries be of ſuch extent that one cautery will not cover it all over, the firſt muſt be applied to the middle, and the ſucceeding towards its edges. This operation is not attended with any great pain, if care be taken not to injure any of the adjacent ſoft parts; for the bones are, in themſelves, free from any ſenſe of pain. Where the cranium is the ſeat of this diſorder, the cautery is attended with great hazard, as it is alſo in a Caries of the ribs, or ſternum, from the neighbourhood of parts of the utmoſt conſequence to life. The carpus and tarſus alſo will very badly admit of cauterizing, becauſe of the neighbourhood of the tendons and ligaments, which it is ſcarce poſſible to avoid injuring in the operation. After cauterizing the part, it is to be dreſſed with dry lint only, or, if the patient complain of great heat in the part, the lint may be dipped in ſpirit of wine before it is applied; afterwards balſamics are to be applied, till the part exfoliate, and then, if the cure be perfect, the vacuity will ſoon be filled with new ſound fleſh. But, if the bone remains bare, or the fleſh it is covered with, be ſoft and ſpongy, and does not adhere ſufficiently to the ſubjacent bone, or where the bone remains diſcoloured, in either of theſe caſes the cure will not ſtand, but the diſorder will break out again, unleſs prevented. In theſe caſes therefore, the work muſt be all done over again, the ſpungy fleſh removed, and the actual cautery again applied, otherwiſe the cure can never ſtand. *Heiſter's Surgery.*

CARLI'NA, in botany, the name of a genus of plants, the characters of which are theſe: the flower is naturally of the radiated kind; its diſk is made up of a number of floſcules, affixed to the embryo ſeeds, but its outward edge or circle not of ſemifloſcules, but merely of flat petals, affixed to no embryo's, but contained in the ſame general cup with the floſcules, which is large and prickly. The embryo's finally ripen into ſeeds, winged with down, and divided from one another by imbricated leaves.

CARLI'NÆ Radix, in the materia medica, the name of a root kept in the ſhops in ſome places, and diſtinguiſhed into two kinds, the white and the black; the white is the root of the common carline thiſtle, which produces no ſtalk; the other of the Carlina cauleſcens, called the black chamelion thiſtle. The white carline root is of the thickneſs of one's thumb, and is often two feet long; it is brown on the outſide, and white within, and ſhould be choſen plump, firm, and well dried. It is accounted a very great medicine in peſtilential diſeaſes.

The black is a ſmaller and ſhorter root than the white, and is much leſs eſteemed in medicine. The plant which produces the white grows very frequent with us on hilly places, and is a very ſingular plant, producing a number of fine long prickly and jagged leaves, and, in the center of them, a large purple flower, of the thiſtle kind, but growing cloſe to the ground: the other is very frequent in France, but is not met with in England.

Carline is eſteemed a very powerful ſudorific and alexipharmic. Schroder tells us alſo, that it is good againſt worms, and in dropſies; and that it is a powerful emmenagogue and diuretic. *Pomet's Hiſt. of Drugs.*

CARMI'NE (*Dict.*)—To make Carmine take five drachms of cochineal, thirty-ſix grains of chouan, eighteen grains of the huſk of the roucou, and the ſame quantity of roch alum; pulverize each of theſe ingredients apart in a clean mortar. Boil two pints and a half of clear river or rain water in a clean pot, and, while it boils, pour in the chouan, let it boil up three times, continually ſtirring the liquor with a wooden ſpatula; then paſs it through a clean linen cloth, put the water ſo ſtrained into a clean veſſel, ſet it on the fire; as ſoon as it begins to boil, put in the cochineal, let that boil up three times; then add the roucou, and boil it up once; laſt of all, pour in the alum, and at the ſame time take the veſſel off the fire. Immediately philtrate the liquid through a linen cloth, without ſqueezing, into a clean earthen or china diſh; let this red liquor ſtand for ſeven or eight days, then pour off gently the clear which ſwims on the top, and let the bottom or fæces dry in the ſun or a ſtove, and afterwards take it off with a bruſh or feather, and this Carmine will be of a fine powder and beautiful colour.

Obſerve Carmine is not to be made in cold weather, becauſe it does not precipitate readily but congeals and ſpoils.

The cochineal which remains in the linen cloath, after the liquor is ſtrained off, may be uſed over again; but the Carmine from this ſecond boiling will neither be ſo much in quantity, nor ſo good in quality, as the former.

Another method of making Carmine: take three pints of clean water, put them in a glazed earthen pan, ſet the pan before a coal fire, and add one grain of chouan; when the mixture boils, ſtrain it through a fine ſieve, then put this firſt water in the ſame pot over the fire again, and immediately add two drachms of meſtick or cochineal, and ſtir it once with your ſpatula. When the new mixture boils, add a grain of autour, and, directly after the autour, eight grains of cream of tartar finely pulverized, eight grains of white talc, and the ſame quantity of Roman alum powdered; let the whole boil two or three minutes, take it off the fire, let it cool without meddling with it, till it is lukewarm, and then the water will look redder than ſcarlet; paſs the liquor, when lukewarm, through a fine linen cloth into an earthen veſſel, leaving the groſs ſediment at the bottom of the pot to ſtrain off, and preſs into another veſſel, which will give you the common Carmine; let your veſſel ſtand three days, decant off the water, and the Carmine will remain at the bottom of the diſhes. Dry them in the ſhade, free from duſt, and you will procure about eighteen or nineteen grains of fine Carmine without reckoning the common.

Obſerve the talc muſt be cleanſed in the following manner to be uſed in this operation: take talc, calcine it in a good fire, then throw it into water, and knead it with your hands; when the water looks white, take it out with a cup and paſs it through a ſieve into a large veſſel, where let it ſtand two hours, in which time the talc will precipitate; then decant the water, dry the ſediment, and add eight grains thus prepared to make your Carmine.

Though the preceding methods may be good, we think the following which is that of Kunckel, deſerves the preference:

Take cochineal four ounces, alum well cleanſed one pound, and fine wool half a pound; pulverized tartar half a pound, wheaten bran eight large handfuls. Boil the bran in about twenty-four pints of water more or leſs at pleaſure; let this water ſtand for a night to ſettle that it may be very clear; and, to make it the clearer, filtrate it. Take a copper kettle of a ſufficient bigneſs to permit the wool to be at liberty; pour in equal quantities of bran water and common water in proportion to the quantity of wool you deſign to boil in it, put in your alum, tartar, and wool, then boil the whole for two hours, obſerving to ſtir the wool up and down, in order to cleanſe it thoroughly; after the wool has boiled its proper time, put it into a net, to let it drain; then take the other half of your bran water, to which add twenty-four pints of common water, and boil them well. In the heighth of the boiling put in your cochineal finely pulverized, mixed with two ounces of tartar; this mixture muſt be ſtirred inceſſantly to prevent it from burning. Put in the wool, boil it an hour and half, ſtirring as before directed; when it has taken the colour, put it again into a net to drain. It will now have a fine ſcarlet dye.

In order to extract the Carmine from the wool, take about thirty-two pints of clear water, in which diſſolve a ſufficient quantity of pot-aſh to make a ſtrong lye; cleanſe the lye by filtration, boil your wool in it till it has loſt all its colour, becomes white, and the lye has received all the tinge. Squeeſe your wool well, and paſs your lye through a filtrating bag. Then diſſolve two pounds of alum in water, pour this ſolution into the coloured lye, ſtirring the whole well; by this addition the dye will curdle and thicken; filtrate it again and it will come out quite clear; if it ſhould yet be tinged with the colour, it muſt be boiled over again, and a ſolution of alum added to it: at laſt it will curdle, and the colour or Carmine remain in the filtre. Care muſt be taken to pour freſh water on it frequently to take out the alum or any ſalts that may remain; then dry the colour and keep it for uſe, after having reduced it to an impalpable powder. If in the operation you find the water boil away too much, have boiling water at hand to add to it.

If you would make Carmine at leſs expence and trouble, you may omit tinging the wool, and make uſe of ſhreds of ſcarlet cloth, obſerving the proceſs as before directed. Kunckel aſſures us he has tried both methods, and always with ſucceſs.

Carmine is counterfeited by a preparation from Braſil or Fernambuca wood. They pound the wood in a mortar, and then infuſe it in white wine vinegar; then boil theſe ingredients together, and the froth affords a kind of Carmine, but vaſtly inferior to the beauty of that we have been ſpeaking of.

CARNATION, *caryophyllus*, in gardening, the name of a beautiful genus of flowers.

Theſe flowers, are propagated either from ſeeds (by which new flowers are obtained) or from layers for the increaſe of thoſe ſorts which are worthy maintaining; but I ſhall firſt lay down the method of propagating them from ſeeds, which is thus:

Having obtained ſome good ſeeds, either of your own ſaving, or from a friend that you can confide in; in the beginning of April, prepare ſome pots or boxes (according to the quantity of ſeed you have to ſow:) theſe ſhould be filled with freſh light earth mixed with rotten neats-dung, which ſhould be well incorporated together; then ſow your ſeeds thereon (but not too thick) covering it about a quarter of an inch, with the ſame light earth, placing the pots or caſes ſo as to receive the morning ſun only, till eleven of the clock; obſerving, alſo to refreſh the earth with water, as often as it may need it: in about a month's time your plants will come up, and, if kept clear from weeds, and duly watered, will be fit to tranſplant in the beginning of June, at which time you ſhould prepare ſome beds (of the ſame ſort of earth as was directed to ſow them in) in an open airy ſituation, in which you ſhould plant them at about three inches ſquare, obſerving to water and ſhade them as the ſeaſon may require, being careful alſo to keep them clear from weeds: in theſe beds they may remain until the beginning of Auguſt, by which time they will have grown ſo large as almoſt to meet each other; then prepare ſome more beds of the like good earth (in quantity proportionable to the flowers you have raiſed) in which you ſhould plant them at ſix inches diſtance each way, and not above four rows in each bed, for the more conveniently laying ſuch of them as may prove worthy preſerving; for in theſe beds they ſhould remain to flower.

The alleys between theſe beds ſhould be two feet wide, that you may paſs between the beds to weed and clean them.

When your flowers begin to blow, you muſt look over them to ſee if any of them promiſe to make good flowers; which as ſoon as you diſcover, you ſhould lay down all the layers upon them: thoſe which are well marked, ſhould be reſerved to plant in borders, to furniſh you with ſeed; and thoſe which burſt their buds, and ſeem to have good properties, ſhould be planted in pots, to try what their flowers will be, when managed according to art: and it is not till the ſecond year that you can pronounce what the value of a flower will be, which is in proportion to the goodneſs of its properties.

Having made choice of ſuch of your flowers as promiſe well for the large ſort, theſe you ſhould mark ſeparately, for pots, and the round whole-blowing flowers, for borders; you ſhould pull up all ſingle flowers, or ſuch as are ill-coloured, and not worth preſerving, that your good flowers may have the more air and room to grow ſtrong: theſe having been laid, as ſoon as they have taken root (which will be ſome time in Auguſt) they ſhould be taken off, and planted out, thoſe that blow large in pots, and the other in borders, as hath been already directed.

The beſt ſeaſon for laying theſe flowers is in June, as ſoon as the ſhoots are ſtrong enough for that purpoſe, which is performed in the following manner: after having ſtripped off all the leaves from the lower part of the ſhoot intended to be laid, make choice of a ſtrong joint about the middle part of the ſhoot (not too near the heart of the ſhoot, nor in the hard part next the old plant;) then with your penknife make a ſlit in the middle of the ſhoot from the joint upwards half-way to the other joint, or more, according to their diſtance; then with your knife cut the tops of the leaves, and alſo cut off the ſwelling part of the joint where the ſlit is made, ſo that the part ſlit may be ſhaped like a tongue: and that outward ſkin being pared off, which, if left on, would prevent their puſhing out roots; and having looſened the earth round the plant, and, if need be, raiſed it with freſh mould, that it may be level with the ſhoot intended to be laid, leſt by forcing down the ſhoot you ſplit it off; then with your finger make an hollow place in the earth, juſt where the ſhoot is to come, and with your thumb and finger bend the ſhoot gently into the earth, obſerving to keep the top as upright as poſſible, that the ſlit may be open; and, being provided with forked ſticks for that purpoſe, thruſt it into the ground, ſo that the forked part may take hold of the layer, in order to keep it down in its proper place; then gently cover the ſhank of the layer with the ſame ſort of earth, giving it a gentle watering, to ſettle the earth about it, obſerving to repeat the ſame as often as it is neceſſary, in order to promote their rooting. In about five or ſix weeks after this, the layers will have taken root ſufficient to be tranſplanted; againſt which time you ſhould be provided with proper earth for them, which may be compoſed after the following manner:

Make choice of ſome good up-land paſture, or a common that is of an hazel earth, or light ſandy loam; dig from the ſurface of this your earth about eight inches deep, taking all the turf with it; let this be laid in an heap to rot and mellow, turning it once a month, that it may ſweeten; then mix about a third part of rotten neat's-dung, or, for want of that, ſome rotten dung from a cucumber or melon-bed; let this be well mixed together; and, if you can get it time enough beforehand, let them lie mixed ſix or eight months before it is uſed, turning it ſeveral times, the better to incorporate their parts.

In the middle of February, if the ſeaſon is good, you muſt tranſplant theſe layers into pots for their bloom (which ſhould be about ſeven or eight inches over at the top in the clear;) in the doing of which, obſerve to put ſome pot-ſherds or oyſter-ſhells over the holes in the bottoms of the pots to keep the earth from ſtopping them, which would detain the water in pots to the great prejudice of the flowers: then fill theſe pots about half-way with the ſame good compoſt as was before directed, and ſhake the plant out of the ſmall pots with all the earth about the roots; then, with your hands, take off ſome of the earth round the outſide of the ball, and from the ſurface, placing one good plant exactly in the middle of each pot, ſo that it may ſtand well as to the height, i. e. not ſo low as to bury the leaves of the plant with earth; nor ſo high, that the ſhank may be above the rim of the pot; then fill the pot up with the earth before-mentioned, cloſing it gently to the plant with your hands, giving it a little water, if the weather is dry, to ſettle the earth about it; then place theſe pots in a ſituation where they may be defended from the north wind; obſerving to give them gentle waterings, as the ſeaſon may require.

In this place they may remain till the middle or latter end of April, when you ſhould prepare a ſtage of boards to ſet the pots upon, which ſhould be ſo ordered as to have little ciſterns of water round each pot to prevent the inſects from getting to your flowers in their bloom; which if they are ſuffered to do, will mar all your labour by deſtroying all your flowers in a ſhort time.

About the middle of April, your layers will begin to ſhoot up for flower; you muſt therefore be provided with ſome ſquare deal-ſticks, about four feet and half long, which ſhould be thicker towards the bottom, and planed off taper at the top: theſe ſticks ſhould be put carefully in the pots as near as poſſible to the plant without injuring it; then with a ſlender piece of baſs-mat faſten the ſpindle to the ſtick to prevent its being broken: this you muſt often repeat as the ſpindle advances in height; and alſo obſerve to pull of all ſide-ſpindles as they are produced, and never let more than two ſpindles remain upon one root, nor above one, if you intend to blow exceeding large. Towards the beginning of June your flowers will have attained their greateſt height, and their pods will begin to ſwell, and ſome of the earlieſt begin to open on the one ſide; you muſt therefore obſerve to let it open in two other places at equal angles: this muſt be done as ſoon as you perceive the pod break, otherwiſe your flower will run out on one ſide, and, be in a ſhort time paſt recovering, ſo as to make a compleat flower; and, in a few days after the flowers begin to open, you muſt cover them with glaſſes which are made for that purpoſe.

During the flowering ſeaſon, particular care ſhould be taken not to let them ſuffer for want of water, which ſhould by no means be raw ſpring-water; nor do I approve of compound waters, ſuch as are enriched with various ſorts of dung; but the beſt and moſt natural water is that of a fine ſoft river; next to that is pond-water or ſtanding water; but, if you have no other but ſpring water, it ſhould be expoſed to the ſun or air two days before it is uſed, otherwiſe it will give the flowers the canker and ſpoil them.

Thus having been full in the culture of this noble flower, I ſhall juſt mention that of the pink, which differs not in the leaſt from that of the Carnation in its manner of propagating, but only requires much leſs care, and need not be potted, growing full as well in good borders, where they make as elegant a ſhew, during the ſeaſon of flowering, as any plant whatever, and afford as agreeable a ſcent. *Mill. Gard. Dict.*

CARP, in ichthyology, a fiſh too well known to need deſcription. The Carp is the moſt valuable of all kinds of fiſh for the ſtocking of ponds. It is very quick in its growth, and brings forth the ſpawn three times a year; ſo that the increaſe is very great: the female does not begin to breed till eight or nine years old, ſo that in breeding ponds a ſupply muſt be kept of Carp of that age. The beſt judges allow, that in ſtocking a breeding pond four males ſhould be allowed to every twelve females. The uſual growth of a Carp is two or three inches in length in a year, but, in ponds which receive the fattening of common ſewers, they have been known to grow from five inches to eighteen in one year.

A feeding pond of one acre extent will very well feed two hundred Carp of three years old, three hundred of two years old, and four hundred of a year old. Carp delight greatly in ponds that have marley ſides; they love alſo clay ponds well ſheltered from the winds, and grown with weeds, and with long graſs at the edges, which they feed on in the hot months. Carp and tench thrive very faſt in ponds and rivers near the ſea, where the water is a little brackiſh, but they are not ſo well taſted as thoſe which live in clear water. No fiſh will thrive in a pond where there are many roach, except the pike which feeds on them. Grains, blood, chickens guts, and the like, may be at times thrown into ponds where there are Carp, to help to fatten the fiſh.

If the breeding and feeding this fiſh were a thing more underſtood than it is at preſent, the advantages might be very great, and fiſh-ponds become as valuable an article as gardens. The gentleman who has land in his own hands, may, beſides furniſhing his own table, and making preſents to his friends, raiſe a great deal of money, and very conſiderably improve his land at the ſame time, ſo as to make it really yield more this way, than by any other employment whatever. Suppoſe the place a meadow of forty ſhillings an acre, four acres of this in a pond will return every year, very eaſily, a thouſand fed carps from the leaſt ſize that is eaten to fifteen inches long, beſides pikes, pearch, tench, and other fry. Suppoſe the Carps are ſaleable at from ſixpence to a ſhilling a piece, they will bring twenty-five pounds, which is ſix pounds five ſhillings an acre for the land made into the pond.

When a great deal of water is deſigned to be brought, they firſt ſpit off the ground on which the bank is to ſtand, and form the pan of the pond. The gentleman who keeps land in his own hand, and will do this, will find no expence in making his pond, if near his other land; for the earth that is dug out may be laid on the lands, and will ſave all the price of manure for a long time.

If the ſoil about the waters be mooriſh, the making a pond will keep up a ſupply of water that will make it always moiſt, and it will ſerve excellently for the planting of oziers, which will turn to a very conſiderable account. If cattle graze near the large ponds, they will ſerve them for watering-places, and they will delight to ſtand in them in hot weather, in which caſe their dung which falls in is a fine food for the fiſh, at the ſame time that it does great good alſo to the cattle.

The Carp is a very cunning and wary fiſh; it very often eſcapes the net, and, when angled for, requires great ſkill and patience in the ſportſman to make any great work of it. The Carp always chuſes the deepeſt parts of ponds and rivers, and in the laſt it is generally found in places where the ſtream is leaſt perceptible. The Carp will never bite in cold weather, and in the hot months the angler can never be either too early in the morning, or too late in the evening, for the ſport; when he has once taken the bait, there is no fear of getting away, for he is one of the leather-mouthed fiſhes.

The tackle for fiſhing for Carp muſt be very ſtrong, and it will be proper to bait the place beforehand where he is to be fiſhed for, with a coarſe paſte. The red worm is the beſt bait in March, the cade in June, and the graſshopper in July, Auguſt, and September.

Not only theſe baits, but a ſweet paſte may be uſed in angling for Carp, with great ſucceſs. There are many kinds of theſe paſtes made up by the anglers, but the general baſis of them all is ſugar or honey with flour: theſe ſorts of paſtes are not only proper to bait the hook with, but they may be thrown into the water ſome hours before to draw the fiſh together. It may be proper alſo to bring the Carp to the place intended for the angling for them, by throwing in cow dung and blood, or bran and blood mixed together, ſome chickens guts cut ſmall, and ſmall pellets of theſe ſweet paſtes: this will learn them to frequent the place, as a part beſt ſupplied with food, and the having fed with ſafety before will make them the leſs ſuſpect the bait on the hook. A very much eſteemed paſte is made thus: take common wheat flour, and veal, or any other young meat, of each equal quantities; beat them together in a mortar, till the meat is thoroughly diſſolved or broke to pieces; then add about half the quantity of honey; beat it well together again, and finally add more flour till the whole is of a proper conſiſtence. This has the advantage of a paſte, and an animal bait at once, and hangs well to the hook, ſo that it ſeldom miſſes ſucceſs. *Mortim. Huſbandry.*

CA'RPENTERS.—The antiquity, utility, extent, and nature of their buſineſs are ſo well known, there needs no deſcription. A lad for this trade ought to be ſtout, ingenious, write a tolerable hand, underſtand arithmetic, geometry, and architecture, without which qualifications they are often a little better than labourers.

Their working hours are from ſix to ſix, and their wages commonly fifteen ſhillings a week, but ſome make more. With an apprentice they take from ten to twenty pounds.

To ſet up a ſort of a jobbing-maſter does not require a great deal beſides tools: but there are ſeveral degrees of them, up to what are termed maſter-builders, who had need to have a good deal of judgment and money too; and ſome of theſe are alſo ſurveyors and draughtſmen, whoſe chief buſineſs is to draw plans, ſurvey and eſtimate other men's works.

They were incorporated into a company in the year 1344, in the reign of king Edward III, with a power to make by-laws; and confirmed by king Edward IV. in 1474; livery-fine ten pounds.

Their hall is overagainſt London-wall, between great and little Moor-gates; and their court-day on the firſt Tueſday of the month.

They have a ſtand, in Cheapſide, in which they ſit to attend the lord-mayor, on the day of his inſtallation.

Arms, argent, a chevron ingrailed between three pair of compaſſes (pointing towards the baſe, and a little extended) ſable. Motto. Honour God.

CA'RPENTRY (*Dict.*)—Carpentry is the moſt antient of all kinds of architecture; its origin goes back as far as the beginning of the world. Men, at firſt, ignorant of what treaſures the earth contained within her womb, and knowing nothing but her external productions, felled trees in the foreſts to build their firſt cottages; they afterwards erected nobler buildings of the ſame materials. Architecture ſtands indebted to Carpentry for one of the pretteſt embelliſhments of its orders, if it be true that fluted columns are done in imitation of the contraction of the trunks of trees as they grow upward. This metropolis even to this day furniſhes remains of the antient cuſtom of building in wood, and ſhews our anceſtors preferred it even to ſtone. One may add, in favour of this art, the almoſt univerſal cuſtom of building in wood throughout all the northern countries.

The application of Carpentry in the art of building is infinitely uſeful; the Carpenter frames houſes, builds ſtair-caſes, lays floors; and the roofs of our public edifices and churches are generally framed in timber, as well as thoſe of our private houſes: by the help of this art are alſo made a number of uſeful machines.

The principal objections to it ariſe from the danger of fire, to which accident it is very liable; wherefore particular care ſhould be taken in all buildings to diſpoſe of the timber properly ſo as to guard againſt it. Carpentry is of late years brought to great perfection, eſpecially ſince builders and undertakers have joined the ſtudy of ſome parts of the mathematics to their experience and practice; it is to be wiſhed this was become more univerſal, though there is yet a great defect in this art for want of better methods with regard to the diſpoſition of the timber; for, by the number of pieces employed, and their miſapplication of them, the ſtrength of the timber is much leſſened; ſee the article TIMBER, under which are ſome remarks extracted from M. de Buffon.

CARPI'NUS, *the hornbeam*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the catkin kind, being compoſed of a number of ſmall leaves, affixed to an axis in a ſquamoſe manner, under each of which there ſtand a great number of ſtamina: theſe are the barren male flowers, the embryo fruits appearing in other parts of the tree, between the leaves of larger and more beautiful ſpikes; which finally become a fruit of an umbilicated kind, compreſſed and ſtriated, and containing a roundiſh nut or kernel pointed at one end.

CA'RRIAGE (*Dict.*)— *Private* CARRIAGES are thoſe which private people keep at their own expence, for their own conveniency, and that of their families; as theſe have no relation to the ſciences, it is needleſs to give an account of them in this work.

Public CARRIAGES are thoſe which every one is free to make uſe of, on paying ſo much a head for perſons, or ſo much per pound weight, for goods, merchandizes, or other effects.

There are again two ſorts of theſe Carriages, ſome of which no man can keep, or let out, at leaſt in France, but by virtue of a privilege; ſuch are the waggons, carts, covered waggons, and horſes belonging to, or under the direction of the poſt-office; as alſo the ſtage-coaches and boats which ſet out on a ſet day, for certain towns in the provinces, and likewiſe poſt-chaiſes, calaſhes, litters, and horſes.

The other public Carriages are thoſe which every one is at liberty to have, keep, and let out, after what manner, and to whom he pleaſes; ſuch as drays, cars without racks, the waggons and carts uſed by carriers, higglers, and others.

Water CARRIAGES are, in general, all thoſe veſſels which ſerve to carry perſons or merchandize by ſea, rivers, lakes, or canals, whether ſailed, rowed, or drawn by men or horſes; but the word Carriage is ſeldom uſed, when we ſpeak of ſhips, frigates, or other large veſſels, which ſail over the ſea.

A deſcription of the CARRIAGES made uſe of by Ralph Allen, Eſq; to carry ſtone from his quarries, ſituated on the top of a hill, to the water-ſide of the river Avon, near the city of Bath.

Theſe quarries are at the diſtance of a mile and an half from the river, and about 500 feet above the level of its ſurface, which makes a ſlope ſo ſteep, that the ſmall price the ſtone is ſold at, would hardly defray the charges of bringing it down without ſome proper contrivance, ſuch as the following, which is a great improvement on ſome Carriages and waggon-ways made uſe of at the coal mines near Newcaſtle.

Plate XI. *fig.* 2. repreſents this Carriage in perſpective, as ſeen from a diſtance of 12 feet from the left of the fore wheels, the height of the eye being about 6 feet. The geometrical plan was laid down from a ſcale of 20 to an inch; that is, every 20th of an inch anſwers to one inch in the machine.

Fig. 3. repreſents the elevation of one of the ſides of this Carriage, when both the fore-wheel and hind-wheel of that ſide are locked, from a ſcale of 20 to an inch.

From the conſideration of theſe two figures, it will appear, that this Carriage conſiſts of a ſtrong floor of oaken planks, three and a half feet wide, and about thirteen feet long, ſtrengthened above by ſeveral ribs to defend it from the ſtones that lie upon it, and fixed upon four beams of the ſame wood, about four inches ſquare and fourteen feet long.

At ſix inches from the ends are fixed the fore-ſide and back-ſide ſtrongly faſtened to the beams, and to the floor, by ſeveral ſcrews and nuts. See *fig.* 2.

To theſe two ends, when occaſion requires, may be faſtened two ſides made of planks thirteen feet long, which fit into the ſide of the outward beams by means of hooks and rings, and are kept up by means of latches to be ſeen in *fig.* 2, 3. Theſe ſides are alſo further ſtrengthened by a chain going acroſs in the middle of the Carriage.

At right angles under theſe beams, at a proper diſtance (ſee *fig.* 3.) are faſtened two ſtrong timbers, by means of large ſcrews and nuts. In theſe timbers well ſtrengthened and plated with iron, where the greateſt ſtreſs lies, are placed two ſemicylindrical pieces of braſs at each end, to ſerve as a collar for the axle-trees of the wheels, which, being well greaſed, turn with very little friction.

There is likewiſe under theſe four beams already mentioned another piece of timber of about ſix inches by four well faſtened to it, at right angles, and at ſuch a diſtance, as is ſeen in *fig.* 3.

This piece ſerves as a fixed point to place a lever, which locks, or keeps from turning, the hind-wheel, by preſſing upon it.

The axle-tree is about three inches diameter.

One of its ends is ſquare, the other round, and on theſe two ends the wheels are placed in an alternate poſition; that is, the right-handed fore-wheel is on a ſquare, and the left on a round part of the axle-tree, whilſt the right-handed hind-wheel is on a round end, and the left on a ſquare end of the axle-tree; thereby any one of the wheels may be locked ſeparately; for, when the wheel placed on the round end is locked, the other, together with the axel-tree, revolves within it; and, when the wheel which is faſtened on the ſquare is locked, the other revolves notwithſtanding as uſual upon the axel-tree, which is then unmoveable.

Theſe wheels are made of caſt iron about twenty inches diameter, and have a flanch ſix inches broad next to the Carriage, which hinders them from running off from the oaken frame on which they move.

The manner of locking and unlocking of the wheels is as follows: when either of the hind-wheels is to be locked, a ſtrong lever, which they call the jigg-pole, is placed on that end of the timber next to the wheel to be locked, and after it is paſſed the iron loop, to ſecure it the better, a chain coming from the roller, to be ſeen in *fig.* 3, is clapped over the extremity, and by means of a ſhort iron bar, and the rochet and clink, ſeen in *fig.* 3, one of the drivers, or perſons that attend the Carriage, in a very little time ſtops the wheel either partly or intirely. To unlock which, it is only lifting up the end of the clink or catch, made long on purpoſe; for then, the lever preſſing no longer, the chain is ſlackened, taken off, and the jigg-pole laid in the cart, till another occaſion ſerves. They have two jigg-poles, one for each hind-wheel.

The fore-wheels are locked, by means of a thick ſquare iron bolt, ſeen in *fig.* 3, coming out in the direction of the axle-tree, between the ſpokes, or radii, of the fore-wheels: theſe bolts are protruded forward to lock the wheels, and draw back to unlock them ſeparately. Towards the middle of the back-ſide are two iron rods turning ſeparately on the ſquare of an axle. When either of theſe is brought by the hand from a vertical poſition, in which they are drawn to an horizontal one, the iron rod, of which it takes hold by its lower end, is puſhed forward four or five inches, and ſhoots the ſquare bolt between the ſpokes, or radii.

When the wheel muſt be unlocked, this bolt is drawn back into its former poſition, by bringing the iron rod into its former vertical ſituation. As theſe Carriages are loaded with a conſiderable (often with upwards of four tons) weight of ſtone, when they come down the hill, all the contrivances explained above would be uſeleſs, and that great weight ſink the Carriage too deep into the ground, without pieces of oak laid all along the way which theſe Carriages then paſs over. Theſe are ſufficiently ſeen in *fig.* 2.

Although theſe Carriages are very heavy, even when empty, yet by means of the frame on which they move, and the little friction the axel-trees feel revolving in the braſs collars, two horſes not only draw them up the hill very eaſily when empty, but draw them along on the plain when loaded, at a very good rate. As ſoon as the Carriages come to the brow of the hill, the horſes are taken off, and one or more of the wheels locked by the driver, who ſtands behind, to moderate the motion as he thinks proper.

When the Carriages are come to the water-ſide, and have been unloaded, they change the horſes from end to end, ſo that the part of the Carriage which went before deſcending, becomes the hind-part in aſcending the hill, which avoids the trouble of turning with theſe wheels.

Theſe Carriages are loaded at the quarries, and unloaded at the water-ſide, by means of a very good and curiouſly contrived crane, fully deſcribed under the article CRANE.

Though the above deſcription is very intelligible, yet, to make every thing ſtill plainer, we ſhall further explain theſe curious Carriages by the following references.

Plate XI. *fig.* 2. ABCDIIIIHFEG, the body and bottom of the Carriage, without the ſides, which are put on upon occaſion, in the place BDHF, and faſtened by means of the hooks *g g g*, and the latches *e f*.

IIII, the croſs pieces on the bottom to ſtrengthen it.

MN, ſtrong pieces of timber under the bottom.

K, A croſs piece under the bottom, having an iron loop at the top, to receive the end of a lever, that preſſes on the hind-wheel L 2, to ſtop it from turning round when the motion is too rapid.

L, L 1, L 2, three of the four wheels, the fourth being out of ſight in this poſition of the Carriage, whoſe circumferences have a flanch on the inſide, that the other part may bear on the timbers, or waggon-way.

H, an iron roller for the chain to wind on, to hold down the ſtopping lever, as it preſſes on the hind-wheel.

O, O 4, O 1, &c. the waggon-way, or parallel timbers, laid with a deſcent, for the Carriages to run down by their own weight.

Fig. 3. FHDB, the right ſide of one of the Carriages, fixed, by means of the hooks at *g g g g*, and the latches *e f*, ſhewn in the fourth figure.

L, a fore-wheel, with a round hole in the nave, to receive a round end of the axis, that goes through the piece of timber P, from another part of which the bolt *p* is ſhot between the ſpokes, to ſtop the wheel from turning round, when the motion is to be retarded.

H *p*, an iron rod puſhed forwards from behind, to bolt or lock the fore-wheel above-mentioned.

L 2, a hind-wheel fixed upon, and turning round with the axis coming through the piece of timber Q, the end of which axis is made ſquare for that purpoſe.

RK, a lever, whoſe end goes through an iron eye on the timber K, having there its center of motion, with the compaſs-piece *q q*, to preſs on the upper part of the wheel L 2, to ſtop it, upon occaſion, from turning with the axis.

H, a roller, on which is wound the chain HR, which pulls down the end of the lever at R, and keeps it in its place, to preſs hard upon the wheel at *q q*.

O 2, O 1, the waggon-way which ſupports the ſtrong part of the circumference of the wheel, while the flanch, or larger circumference of each wheel, falls on the inſide of the timber, that the Carriage may not jump, or run out of the way.

A new CARRIAGE *for removing large weights by a ſmall force.*—The whole of this machine is ſhewn in *plate* XI. *fig.* 8. in ſo plain a manner, that a ſhort deſcription will be abundantly ſufficient. X is the load; ſuppoſe a block of ſtone of an extraordinary weight laid on the Carriage Y, which is ſupported on the wheels V V, and the other part of the machine on the wheels W W: in order to draw this Carriage, a pile, as R, is drove into the ground, to which the machine is faſtened by a rope, as ſhewn in the figure. Then a rope is paſſed through the pulley S, and one of its ends, as T, is faſtened, by means of a hook, to an eye-bolt in the machine; and the other end goes round the cylinder H, which is the axle-tree of the indented wheel F G. A B is a double lever, or balance, whoſe center of motion is at C. At a proper diſtance on each ſide of the center of motion, is a crotchet, as DO, EP, which move freely round on the iron pins D, E. Now it is evident, that, when the end A, of the balance AB, is pulled down, the points B and E will aſcend, and the crotchet EP will cauſe the wheel G to move round, and, conſequently, the the cylinder H; by which means the Carriage Y muſt advance. The ſame will follow when the end B is pulled down; for the points A and D will by that means aſcend, and the crotchet DO will cauſe the wheel G, with its axis H, to move round, and, conſequently, the Carriage Y to advance. It muſt alſo be obſerved, that, when the point B deſcends, the point E will alſo deſcend, and, conſequently, the crotchet EP will move farther towards G, and take hold of ſome other notch in the wheel: the ſame will follow with regard to the crotchet DO, when the point A deſcends. And, conſequently, by two ends of the balance AB, riſing and falling alternately, the Carriage Y will be continually advancing in proportion as the rope NS winds round the cylinder H. The motion, indeed, is but ſlow; but ſtrength is gained in the ſame proportion as time is loſt.

In conſtructing this machine, after determining the ſemi-diameter H G of the wheel, and the length of the crotchets from their centers of ſuſpenſion, the iron pins D and E muſt be placed in ſuch a manner, that the lines of direction G I, and F K, be tangents to the circumference of the wheel, at the points F and G, when the balance A B is in a horizontal ſituation.

Block-CARRIAGE, is a cart made on purpoſe for carrying of mortars, and their beds, from one place to another.

Truck-CARRIAGES, are two ſhort planks of wood, ſupported on two axle-trees, having four trucks, or wheels, of ſolid wood, about a foot and a half, or two feet diameter, for carrying mortars or guns upon battery, when their own Carriages cannot go, and are drawn by men.

Letter or *bill of* CARRIAGE, is a writing given to a carrier, or to the maſter of a waggon, cart, or other Carriage, containing the number and quality of the pieces, cheſts, bales, &c. of merchandizes which he is intruſted with, that he may demand the payment of the Carriage from thoſe to whom the merchandizes are directed, and that the perſon who receives them may ſee whether they be delivered to him in a good condition, in the ſame number as they were given to the carrier, or on the day ſet down in the bill of Carriage.

CA´RRIED *over*, with book-keepers, is the ſum total of the ſeveral ſums ſet down in one page, which ſum, when the page is full, is wrote down at the bottom of it, with theſe words before it, Carried over; to ſignify, that that ſum is Carried over to the next page, on the top of which it is ſet down, with theſe words before it, Brought over.

CA´RRIER, one who carries merchandizes, or other goods, from one place to another, in waggons, carts, or other wheel-carriages.

CARRIER *pigeon*, a ſort of pigeon uſed, when properly trained up, to be ſent with letters from one place to another.

It is larger in ſize than moſt of the other kinds. Its length from the tip of the back, to the end of the tail, being often fifteen inches; but its greateſt weight not twenty ounces. Its fleſh is firm, and its feathers cloſe; it is long-necked, and of a better ſhape than moſt other pigeons. The upper chap of the bill is half covered from the head with a white or blackiſh tuberous, ſurfuraceous fleſh, which projects or hangs over both its ſides, on the upper part neareſt the head, and ends in a point about the middle of the bill. This is called the wattle. The eyes are ſurrounded with the ſame ſort of corrugated fleſh, for the breadth of a ſhilling, and their iris is red. Their beak is long, ſtrait, and thick; their wattle generally broad acroſs the beak, ſhort from the head towards the point, and tilting forward from the head; and the head narrow, long, and flat; the neck very long and thin, and the breaſt broad; the feather is chiefly black or dun, though there are blues, whites, and pieds.

It has its name from its remarkable ſagacity in carrying a letter from one place to another. Though you carry them hoodwinked, twenty, or thirty, nay, ſixty, or an hundred miles, they will find their way, in a very ſhort time, to the place where they were bred.

CART, a vehicle mounted on two wheels, drawn by one or more horſes, uſed for the carriage of various ſorts of heavy things.

The word ſeems to be derived from the French charrete, which ſignifies the ſame; or rather from the Latin carreta, a diminutive of carrus.

A Cart differs from a wain, in that the former is drawn by horſes, and has two ſides called trills; whereas a wain is drawn by oxen, and has a wain-cope.

The parts and apparatus belonging to a Cart, are, the trill-hooks and back-band, which hold the ſides of the Cart up to the horſes; the belly-band, paſſing from one ſide, under the horſe's belly, to the other; the Cart-rails, being the two rails on the top of the Cart; Cart-ſtaves, thoſe that hold the Cart and the races together; Cart-body, all that part where the loading is laid for carriage, called, in Suſſex, the buck, q. d. belly of the Cart; Cart-ladders, the crooked pieces ſet over the wheels, to keep hay and ſtraw loaden off them; Cart-ſaddle, the leathern or wooden pannel, laid on the fillar-horſe; the floats, the under-pieces which keep the bottom of the cart together; the trigen, a pole to ſtop the wheel of a Cart when it goes too faſt down a ſteep place.

CACTOU´CHES, in heraldry, a name given to a ſort of oval ſhields, much uſed by the popes, and ſecular princes in Italy, and others, both clergy and laity, for the painting and engraving their arms on. Many ſuppoſe this form derogatory to the honour of the perſon; but, though the ſquare ſhield, with the rounded and pointed bottom, is more in uſe with us, as alſo with the French and Germans, yet this is ſuppoſed, more truly, the figure of the Roman ſhield, borne by the ſoldiery, and therefore more ancient and honourable than either that, or the indented ſhield of the Germans. *Neſbit's Heraldry, pag.* 12.

CA´RTWRIGHT, a perſon who builds carts, &c.

CARTWRIGHTS *timber*, is that which is uſed by the Cartwrights and coach-makers. This timber is of two ſorts, particularly elm-timber, which is chiefly uſed in Cartwrights work, namely, the round timber, and the hewn timber.

The round timber is that which is ſtill in logs, or blocks, that is to ſay, which has not yet been ſquared with the ſaw, and has the bark upon it ſtill; but has, nevertheleſs, been cut to a certain length, proportionable to the works in which the Cartwrights would uſe it.

Hewn timber is that which has been ſquared with the ſaw, and reduced to a thickneſs and ſize proper for other works of the Cartwright.

With the round timber they make the naves, or ſtocks of the wheels, the coach-beams, the jaunts, &c. The hewn timber ſerves to make the coach-ſtandards, poles, beams, &c.

Rules concerning round elm-timber uſed by CARTWRIGHTS.—The round timber for naves, or ſtocks of wheels, ought to be ſix feet and a half high, and ten inches diameter, at leaſt, at the thinneſt end; thoſe pieces which are from twelve to ſixteen inches diameter, are reckoned the beſt, becauſe they may ſerve for the largeſt cart-wheels.

The round timber for axle-trees muſt be ſix feet long, and from ſeven to eight inches diameter.

The pieces deſigned for pole, ought to be of ſeveral ſizes, according as they are intended for coaches, or for other carriages.

Thoſe for coaches muſt meaſure from ten to twelve feet in length, and the others from twelve to fifteen, without any knots, and be well bent.

For the jaunts, the pieces muſt be two feet eight or ten inches long, or even three feet.

Rules for the hewn timber uſed by CARTWRIGHTS.—The pieces of timber for ſupporting the ſtandard of a coach muſt be cut ſix feet and a half long, ſix or ſeven inches broad, and four or five thick.

The ſtandards, of ſix feet ſeven or eight inches long, five or ſix inches broad, and three or four inches thick.

And the poles, nine feet long, three inches and a half ſquare at the ſmalleſt end, and four inches at the thickeſt end.

It muſt be obſerved, that there are ſeveral other pieces of elm-timber uſed in the Cartwrights buſineſs, which they themſelves cut, the timber-merchants leaving ſeveral pieces, in the form of round timber, of divers ſizes and lengths, for which there are no ſettled rules, the workmen chuſing them at the ſales, or in the timber-yards, according as they find them proper for the ſeveral works wherein they would uſe them.

Other timber for CARTWRIGHTS.—The aſh timber is commonly cut into ſtandards and poles: ſome of it is alſo cleft in pieces of round timber, proper to make thoſe ſorts of carriages on which they carry wine in France. Theſe pieces of round aſh timber ought to be from ten to eighteen feet long, and eight or nine inches diameter.

The yoke elm-timber is commonly cut into axle-trees, and other pieces in which elm is uſed; but it is ſeldom employed but in thoſe provinces where elm is ſcarce.

Of the branches of elm and yoke-elm, which are not large enough to be cleft in round timber, or cut for the ſeveral pieces of Cartwrights work mentioned above, they commonly make the ſpokes of wheels, though they make them alſo ſometimes of other wood, and particularly of oak.

CA'RVING, the art of engraving or cutting figures in wood, &c.

To carve a figure or deſign in wood, it muſt firſt be drawn, or paſted on the wood; which done, the reſt of the block, not covered by the lines of the deſign, are to be cut away with little narrow pointed knives. The wood, fitteſt for this uſe, is that which is hard, tough, and cloſe, as beech, but eſpecially box. To prepare it for drawing the deſign on, they waſh it over with white lead, tempered in water, which better enables it either to bear ink, or the crayon, or even to take the impreſſion by chalking. When the deſign is to be paſted on the wood, this whitening is omitted, and they content themſelves to ſee the wood well planed. Then wiping over the printed ſide of the figure with gum tragacanth, diſſolved in water, they clap it ſmooth on the wood, and let it dry; which done, they wet it ſlightly over, and fret off the ſurface of the paper gently, till all the ſtrokes of the figure appear diſtinctly. This done, they fall to cutting, or carving, as above.

CARYOPHY'LLUS, *the clove* (*Dict.*)—The Dutch, who have ingroſſed all the clove-trees, make immenſe advantage of the fruit, which are ſo much eſteemed throughout Europe, and for which the Spaniards and Portugueſe ſtruggled ſo long, and to ſo little purpoſe. This valuable and noble ſpice grows only in the iſland of Amboyna, the Moluccas, which are five in number, and the iſlands of Meao, Cinomo, Cabel, and Marigoran.

The Indians call cloves callaſar, and the inhabitants of the Moluccas call them chinke. The trees which bear cloves, are much like our laurel-trees, only the leaves of the cloves are a little narrower, and reſemble the leaves of almond and willow-trees. The very wood and leaves taſte as ſtrong as the cloves themſelves. Theſe trees bear a great quantity of branches and flowers, and each flower brings forth a clove. The flowers are at firſt white, then green, at laſt they grow beautifully red, and pretty hard, and are properly the cloves. While they are green, they emit a moſt ſweet and comfortable odour. When they are dry, they are of a red colour; but, when gathered, they aſſume a ſmoaky black. They do not gather them one by one, as they do other fruit; but they tie a rope to the bough, and ſo ſtrip it off by force: that hurts the tree for the next year, but the year after it bears a great deal more. Others beat the trees with long poles, as we do walnut-trees, and the cloves fall down, and commonly the tree bears more fruit than leaves. They grow with little ſtalks, hanging on the tree like cherries: they ſell them with theſe ſtalks, dirt, and duſt together, to the Indians; but the cloves that are tranſported to Holland, are clean, and without ſtalks. If you leave them on the tree without gathering them, they grow thick, and are called the mother of cloves. The Javaneſe value theſe more than others; but the Dutch chuſe rather to buy the leaſt.

They never trouble themſelves to plant clove-trees; for the cloves that fall on the ground produce enough of them, and the rain makes them grow ſo faſt, that they bear fruit when they are eight years old, and continue bearing for above one hundred years. Some are of opinion, that clove-trees do not grow well on the ſea-ſide, or when they are too far from the ſea; but many ſeamen, who have been in the iſland, aſſure us, that they grow very well every-where, upon mountains, in the valleys, or near the ſea-ſide. They ripen from the latter end of Auguſt to the beginning of January. Nothing groweth about them, for their heat draws in all the nouriſhment and moiſture of the ground. See *plate* XIII. *fig.* 2. which repreſents a branch of the clove-tree; *d*, the common clove; *e*, its bloſſom; *f*, a ripe clove; *g*, fruit open; *h*, ſeed.

CARYOPHILLUS is alſo the name of a genus of plants, called in Engliſh Carnations. See CARNATION.

CA'SHOO, a medicinal and aromatic drug, which is reckoned among perfumes.

Caſhoo is extracted from a tree which is called *catee*, in the country where it grows. That country is a province of Indoſtan, or the mogul's empire, which is called Behar; the capital of it is Patna. This province, which the famous river Ganges croſſes, lies a hundred leagues above the kingdom of Bengal. Caſhoo is properly nothing but an extract made by a decoction and maceration of the parts of that tree, and rendered ſolid by evaporation. There are two ſorts of ſimple Caſhoo, the rough, and the purified, or refined; the latter is a compound of purified Caſhoo, mixed with aromatic drugs, and made into lozenges of ſeveral ſizes, the biggeſt of which are as large as a half-crown piece. This Caſhoo is made for the uſe of the Indians, who chew it, either alone, or mixed with pinang, or areca. Rough Caſhoo is a commodity which is brought down the Ganges as far as Bengal, whence it is diſtributed, by means of trade, throughout all the Indies, where there is a great conſumption of it; and to the Europeans, who ſend it into Europe, but moſtly purified; for Caſhoo is never uſed rough, neither in the Indies nor elſewhere.

They purify the Caſhoo to different degrees, according to the uſe which the Indians would make of it. It appears, that the Caſhoo which comes into Europe, is purified to the firſt degree only.

CASK, a wooden veſſel, in which is put wine, or any other liquor; and alſo ſometimes dry goods, as ſugar, almonds, &c. A Caſk in ſtaves, is that of which all the ſtaves are ready prepared, and want only to be joined and hooped. They often put them thus on board the veſſels deſigned for the American iſlands, becauſe they take leſs room, and can be eaſily made up, either with the hoops, which are alſo often carried in bundles, or made in thoſe places where wood proper for them is to be met with.

CASK-*gauging*, the method of finding the contents of all kinds of Caſks.

Under the article GAUGING in the Dictionary, we have enumerated the general forms, or varieties of Caſks, and, under the name of each ſolid, ſhewn the method of gauging it; to which we ſhall here add the two following, omitted in the Dictionary.

How to gauge a CASK *in the form of an hyperbolic ſpindle.* See *plate* XXXIII, *fig.* 17, in the Dictionary. The middle fruſtum of which GAHICF ſhall repreſent a Caſk, whoſe diameter at the bung $AC = 31$ inches, and the diameter at the heads GF, HI, are each 24 inches, and the length $KL = 32.5$ inches; and to find the content of this fruſtum in ale and wine gallons.

A general Rule for gauging a Caſk in the form of an hyperbolic ſpindle.

To twice the ſquare of the bung diameter add the ſquare of the head, and call this the firſt number. To the ſquare of the length add the difference of the ſquares of the bung and head diameters; multiply this ſum by fourteen times the ſquare of the difference between the bung and head diameters, which product is a dividend: from thirty-five times the ſquare of the length, take five times the ſquare of the difference of the head and bung diameters, and the remainder is the diviſor; the quotient of this diviſion call the ſecond number: then multiply the difference of the firſt and ſecond numbers, by the length of the Caſk, and that product divide by 1077.15 for ale, and by 882.354 for wine (which are no more than three times the diviſor for circles) will give the content in gallons reſpectively; = 74.5 ale gallons, or 91.2 wine gallons.

But the content of the middle fruſtum of the hyperbolic ſpindle may be more expeditiouſly found, by finding a mean diameter thus:

The Rule.

To the head diameter add two thirds of the difference of the diameters, and to this add one twelfth of the quotient found by dividing the ſquare of the difference of the diameters by the head added to twice the bung diameter, and this ſum is the mean diameter ſought.

How to gauge a CASK *in the form of a circular ſpindle.* See *plate* XXXIII, *fig.* 14, in the Dictionary.

Definition.

If the arch of the circle CAD be turned about upon its chord CD, it will deſcribe a ſolid CFAH, DIBGC, called a circular ſpindle.

A general Rule for gauging a circular ſpindle.

Firſt, to twice the ſquare of the bung diameter add the ſquare of the head diameter, and call that ſum the firſt number. Secondly, to the ſquare of the length add the ſquare of the head diameter, and from that ſum take the ſquare of the bung diameter, and multiply the remainder by fourteen times the ſquare of the difference of the head and bung diameters, and that product is a dividend; then multiply the ſquare of the length by 35, added to five times the ſquare of the difference of the diameters, and that ſhall be a diviſor; the quotient of this diviſion is the ſecond number. Then multiply the difference of the firſt and ſecond numbers by the length of

the

PLATE XIII. *Engraved for the Supplement* *Facing* Caryophyllus

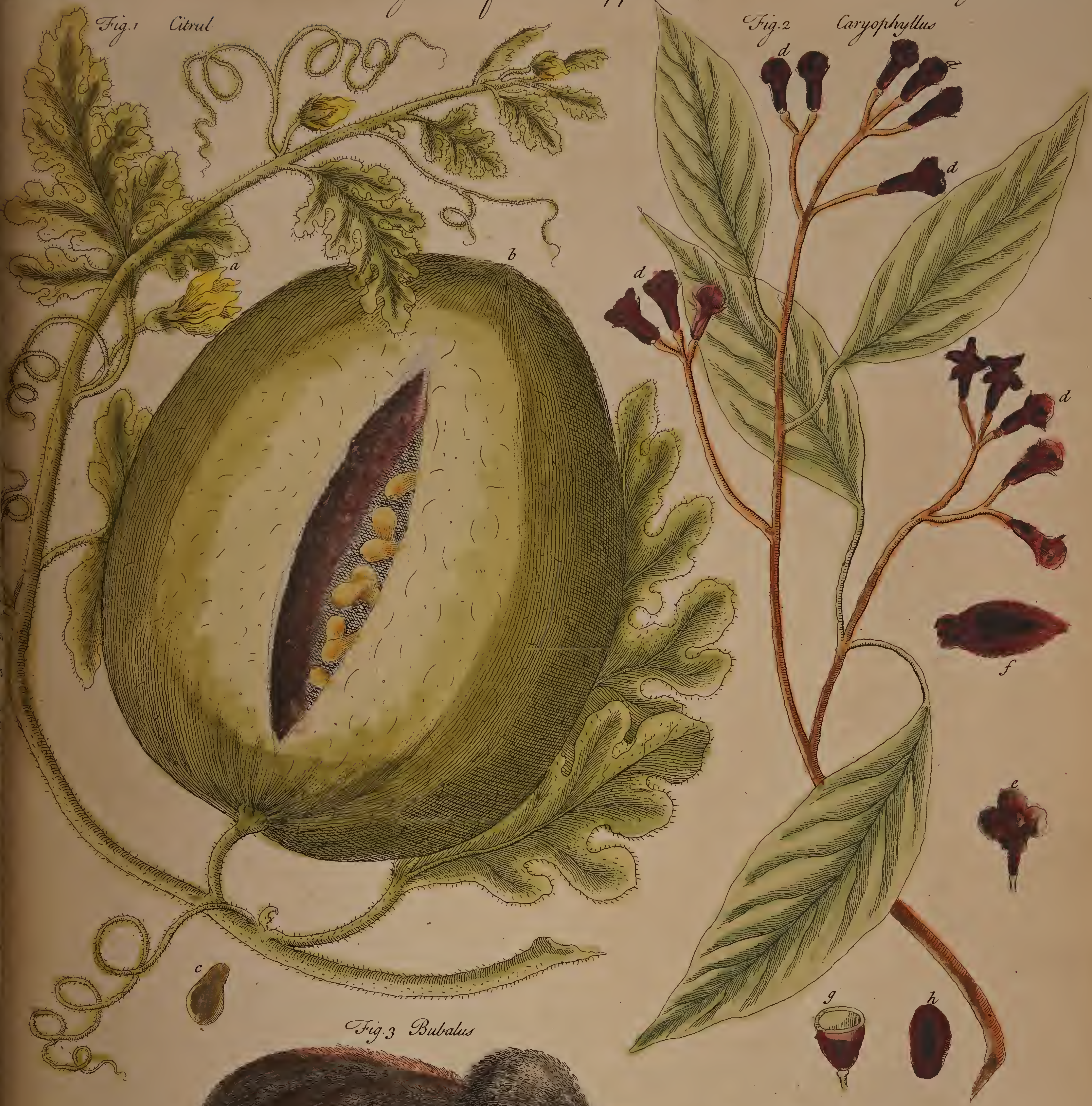
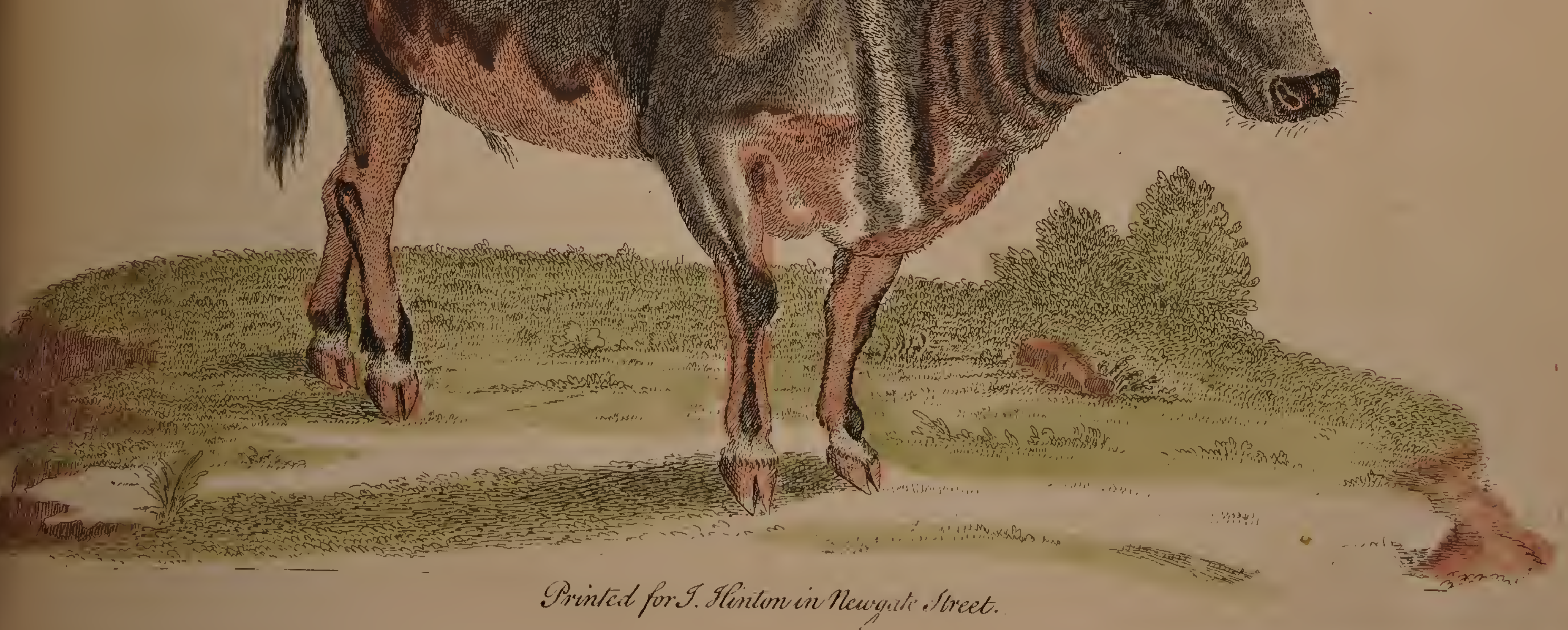


Fig. 3 Bubalus



Printed for J. Hinton in Newgate Street.

the Caſk, divide the product by 1077.15 for ale, and by 882.354 for wine, and this gives the content in ale and wine gallons reſpectively.

But the content of the circular ſpindle may be found more expeditiouſly, by finding a mean diameter thus:

The Rule.

To the head diameter add two thirds of the difference of the diameters, and to this $\frac{11}{66}$ of the ſquare of the difference of the diameters divided by the head, and twice the bung diameter, and this ſum is the mean diameter ſought.

As it is requiſite to find the length of a Caſk before the contents of it can be calculated, ſeveral inſtruments have been invented, but the ſliding callipers ſeem beſt adapted to this purpoſe; a view of which inſtrument, placed on a Caſk, is given in *plate* XXXIII, *fig.* 11, in the Dictionary.

CAS'KETS, in the ſea-language, are ſmall ropes made of ſinnet, and faſtened to gromets, or little rings, upon the yards; their uſe is to make faſt the ſail to the yard, when it is to be furled.

Breaſt-Caskets, are the longeſt and biggeſt of theſe, or thoſe in the midſt of the yard, betwixt the ties.

CAST, is particularly uſed to denote a figure, or ſmall ſtatue of bronze.

Cast, among wax-chandlers, denotes a ladle-ful of melted wax, poured on the wicks of candles, made by the ladle.

Cast, among founders, is applied to tubes of wax, fitted in divers parts of a mould of the ſame matter, by means of which, when the wax of the mould is removed, the melted metal is conveyed into all the parts which the wax before poſſeſſed.

Cast alſo denotes a cylindrical piece of braſs, or copper, ſlit in two, lengthwiſe, uſed by the founders in ſand, to form a canal, or conduit, in their moulds, whereby the metal may be conveyed to the different pieces intended to be Caſt.

Cast, among plumbers, denotes a little brazen funnel, at one end of a mould, for caſting pipes without ſoldering, by means of which, the melted metal is poured into the mould.

Cast of the country, with miners, the colour of the earth.

Cast, in falconry, denotes a ſet, or couple of hawks. *Dict. Ruſt.*

CASTA'NEA, *the cheſnut-tree*, in botany, a genus of trees, whoſe characters are: the flower is of the amentaceous kind, being compoſed of a number of ſtamina, ariſing from a five-leaved cup, and fixed to a ſlender capillament, or axis. Theſe are the male flowers, but the fruit grows on other parts of the tree: theſe are roundiſh, echinated, and open into four parts, and contain cheſnuts with their kernels.

M. Tournefort has enumerated four, and Mr. Miller five ſpecies of Caſtanea.

Theſe trees are propagated by planting them in February, in beds of freſh, undunged earth: the beſt nuts for ſowing are ſuch as are brought from Portugal and Spain, and are commonly ſold in winter for eating, provided they are not kiln-dried, which is generally the caſe of thoſe brought from abroad, which is done to prevent their ſprouting, or rooting, in their paſſage; therefore, if they cannot be procured freſh from the tree, it will be much better to uſe thoſe of the growth of England, which are full as good to ſow, for timber, or beauty, as any of the foreign nuts, though their fruit are much ſmaller; theſe ſhould be preſerved, until the ſeaſon for ſowing, in ſand, where mice, or other vermin, cannot come to them, otherwiſe they will ſoon deſtroy them. Before you ſet them, it will be proper to put them into water, to try their goodneſs, which is known by their ponderoſity; thoſe of them that ſwim upon the ſurface of the water, ſhould be rejected, as good for nothing; but ſuch as ſink to the bottom, you may be ſure, are good.

In ſetting theſe ſeeds, or nuts, the beſt way is, to make a rill with an hoe (as is commonly practiſed in ſetting kidney-beans) about four inches deep, in which you ſhould place the nuts, at about four inches diſtance, with their eye uppermoſt; then draw the earth over them with a rake, and make a ſecond rill at about a foot diſtance from the former, proceeding as before, allowing three or four rows in a bed, with an alley between, three feet broad, for a conveniency of cleaning the beds, &c. When you have finiſhed your plantation, you muſt be careful, that it is not deſtroyed by mice, or other vermin, which is very often the caſe, if they are not prevented by traps, or other means.

In April theſe nuts will appear above ground; you muſt, therefore, obſerve to keep them clear from weeds, eſpecially while young: in theſe beds they may remain for two years, when you ſhould remove them into a nurſery, at a wider diſtance. The beſt ſeaſon for tranſplanting theſe trees is either in October, or the latter end of February; but October is the beſt ſeaſon: the diſtance they ſhould have in the nurſery, is three feet, row from row, and one foot in the rows: you muſt be careful, in tranſplanting theſe trees, to take them up without injuring their roots, nor ſhould they remain long out of the ground; but, if theſe trees have a downright tap-root, they muſt be cut off, eſpecially if they are intended to be removed again: this will occaſion their putting out lateral roots, and render them leſs ſubject to miſcarry, when they are removed for good.

The time, generally allowed them in this nurſery, is three or four years, according to their growth; but, the younger they are tranſplanted, the better they will ſucceed; during which, you ſhould be careful to keep them from weeds, obſerving alſo to prune off the lateral branches, which would retard their upright growth; and, where you find any that are diſpoſed to grow crooked, either by their upper bud being hurt, or from any other accident, you may, the year after planting, in March, cut them down to the lowermoſt eye next the ſurface of the ground, which will cauſe them to make one ſtrong upright ſhoot, and may be afterwards ſtrained into good ſtraight trees; but this ſhould not be practiſed, unleſs the plants have abſolutely loſt their leading ſhoots; for, although the ſtems of the trees ſhould be very crooked, (as is generally the caſe with the trees when young) yet, when they are tranſplanted, and have room to grow, as they increaſe in bulk, they will grow more upright, and their ſtems will become ſtraight, as I have frequently obſerved, where there have been great plantations. But, in doing of this, you muſt be careful not to diſturb their roots, which, perhaps, might deſtroy them. Theſe trees require no other manure than their own leaves, which ſhould be ſuffered to rot upon the ground; and, in the ſpring of the year, the ground ſhould have a ſlight digging, when theſe ſhould be buried between their roots, but not too cloſe to the trees, which might be injurious to their young fibres.

After having remained three or four years in the nurſery, they will be fit for tranſplanting, either in rows, for avenues to a houſe, or in quarters, for wilderneſs plantations; but, if you intend them for timber, it is by much the better method to ſow them in furrows (as is practiſed for oaks, &c.) and let them remain unremoved; for theſe trees are apt to have a downright tap-root, which, being hurt by tranſplanting, is often a check to their upright growth, and cauſes them to ſhoot out into lateral branches, as is the caſe with the oak, walnut, &c.

CA'STLE, *caſtellum*, in hydraulics, is uſed for a kind of pavilion, or water-houſe, in which are incloſed the cocks of ſeveral water-pipes, with a little baſon, in order to make a diſtribution thereof.

CA'STOR, the name of a fixed ſtar, of the ſecond magnitude, in the head of the firſt of the Twins.

Its latitude northwards, for the year 1700, according to Hevelius, was 10°. 4′. 23″. and its longitude, of Cancer, 16°. 4′. 14″. It is alſo called Raſalgenze, Apollo, Aphellon, Avelar, and Arular. *Hevel. Fermam. Sobieſc.*

CAT-*gut*, a denomination given to ſmall ſtrings for fiddles, and other inſtruments, made of the inteſtines of ſheep, or lambs, dried or twiſted, either ſingly, or ſeveral together.

Theſe are ſometimes coloured red, ſometimes blue, but are commonly left whitiſh, or browniſh, the natural colour of the gut. They are uſed alſo by watch-makers, cutlers, turners, and other artificers. Great quantities are imported into England, and other northern countries, from Lyons and Italy. *Savar. Dict. Comm.*

Cat-*harpings*, are ſmall ropes, running in little blocks, from one ſide of the ſhrouds to the other, near the deck: their uſe is to force the ſhrouds, and make them tight, for the more ſecurity and ſafety of the maſts.

Cat, or Cat-*head*, in a ſhip, is a ſhort piece of timber, lying aloft right over the hawſer, having at one end two ſhivers, wherein is reeved a rope, with a great iron hook faſtened to it, called cat-hook.

Cat's-*head* is alſo a denomination given to a ſort of waſte ſtony lumps, not inflammable, found in coal-mines. In theſe there are frequently impreſſions of ferns. *Philoſ. Tranſ.* N°. 360.

Cat-*holes*, in a ſhip, are over the ports, as right with the capſtan as they can be: their uſe is to heave the ſhip a-ſtern, upon occaſion, by a cable, or hawſer, called ſtern-faſt.

Cat-*ſalt*, a name given by our ſalt-workers to a very beautiful granulated kind of common ſalt. It is formed out of the bittern or leach-brine, which runs from the ſalt when taken out of the pan. When they draw out the common ſalt from the boiling-pans, they put it into long wooden troughs, with holes bored at the bottom for the brine to drain out; under theſe troughs are placed veſſels to receive this brine, and acroſs them are placed certain ſmall ſticks, to which the Cat-ſalt affixes itſelf in very large and beautiful cryſtals. This ſalt contains ſome portion of the bitter purging ſalt, and is very ſharp and pungent, and is white when powdered, though pellucid in the maſs. It is uſed by ſome for the table, but the greateſt part of what is made of it, is uſed by the makers of hard ſoap.

Cat-*ſilver*, a name given to certain foſſil ſubſtances, uſually called alſo glemmer, and in Latin micæ. They are various ſpecies of the biacteria, or foliaceous talcs, in ſmall ſpangles.

CA'TACOMB, a vaſt aſſemblage of ſubterraneous ſepulchres about Rome, in Italy, chiefly at about three miles from that city in the Via Appia; ſuppoſed to be the ſepulchres of the martyrs; and which are viſited accordingly, out of devotion; and reliques thence taken, and diſperſed throughout the catholic countries, after having been firſt baptized by the pope, under the name of ſome ſaint.

Theſe Catacombs are ſaid by many to be caves, or cells, wherein the primitive Chriſtians hid, and aſſembled themſelves together; and where they interred ſuch among them as were martyred. Each Catacomb is three feet broad, and eight or ten high; running in form of an alley, or gallery, and communicating with others: in many places they extend within a league of Rome. There is no maſonry or vaulting therein, but each ſupports it ſelf: the two ſides which we may look on as the parietes, or walls, were the places where the dead were depoſited; which were laid lengthwiſe, three or four rows over one another, in the ſame Catacomb, parallel to the alley. They were commonly cloſed with large thick tiles, and ſometimes pieces of marble cemented in a manner inimitable by the moderns. Sometimes, though very rarely, the name of ſome of the deceaſed is found on the tile: frequently a palm is ſeen painted, or engraven, or the cypher X*p*, which is commonly read *pro Chriſto*.

The opinion held by many proteſtant authors is, that the Catacombs are heathen ſepulchres, and the ſame with the puticuli mentioned by Feſtus Pompeius; maintaining, that, whereas it was the practice of the ancient Romans to burn their dead, the cuſtom was, to avoid expence, to throw the bodies of their ſlaves to rot in holes of the ground: and that the Roman Chriſtians, obſerving, at length, the great veneration paid to relicks, reſolved to have a ſtock of their own: entering, therefore, the Catacombs, they added what cyphers and inſcriptions they pleaſed, and then ſhut them up again, to be opened on a favourable occaſion. Thoſe in the ſecret, add they, dying, or removing, the contrivance was forgot, till chance opened them at laſt. But this opinion has even leſs of probability than the former.

Mr. Monro, in the Philoſophical Tranſactions, takes a medium between the two extremes. He ſuppoſes the Catacombs to have been originally the common ſepulchres of the firſt Romans, and dug in conſequence of theſe two opinions, that ſhades hate the light, and they love to hover about the places where the bodies are laid.

Laying up the bodies in caves is certainly the original way of diſpoſing of the dead, and appears to have been propagated by the Phœnicians throughout the countries to which they ſent Colonies: the interring as we do now, in the open air, or in temples, was firſt introduced by the Chriſtians. When an ancient hero died, or was killed in a foreign expedition, as his body was liable to corruption, and for that reaſon unfit to be tranſported intire, they fell on the expedient of burning, in order to bring home the aſhes, to oblige the manes to follow, that ſo his country might not be deſtitute of the benefit of his tutelage. It was thus burning ſeems to have had its original; and by degrees it became common to all who could bear the expences of it, and took place of the ancient burying: thus Catacombs became diſuſed among the Romans, after they had borrowed the manner of burning from the Greeks; and now none but ſlaves were laid in the ground. Places, thus prepared, might afford convenient reſortments for the primitive Chriſtians, but could never be built by them. When the Empire became Chriſtian, they were again diſuſed; till the reading of I know not what author who mentions them, occaſioned them to be again looked into.—As to the famed cypher X*p*, it is obſerved to have been in uſe among the ancients, long before Chriſtianity aroſe. The abbot Bencini ſays, it was compoſed of the Greek letter X P, under which ſomething myſtical was comprehended; but no author gives any account what that myſtery was.

CATAPU'LTA (*Dict.*)—The Catapulta had a force, which it is not eaſy to comprehend, but which all good authors atteſt. Vegetius ſays, that the baliſta diſcharged darts with ſuch rapidity and violence, that nothing could reſiſt their force. Athenæus tells us, that Agiſtratus made one of little more than two feet in length, which ſhot darts almoſt five hundred paces. Theſe machines were not unlike our croſs-bows. There were others of much greater force, which threw ſtones of three-hundred weight, upwards of an hundred and twenty-five paces. We find ſurprizing effects of theſe machines in Joſephus: "The darts and force of the Catapulta deſtroyed abundance of people. The ſtones from the machines beat down the battlements, and broke the angles of the towers. There was no phalanx ſo deep but one of theſe ſtones would ſweep an whole file of it from one end to the other. Things paſſed this night that ſhewed the prodigious force of theſe machines. A man who ſtood by Joſephus, had his head taken off by a ſtone at an hundred and ſeventy-five paces diſtance."

Battering CATAPULTA.—*Plate* XIV. *fig*. 3, 4. repreſents the form and conſtruction of a Catapulta, that is ſuppoſed to carry an hundred weight, which may ſuffice as the doctrine of all the reſt to ſuch as carried twelve-hundred and upwards, it being eaſy to increaſe their powers.

The baſe is compoſed of two large beams 2, 3. The length of thoſe beams is fifteen diameters of the bore of the capitals, which meaſure will be explained when we deſcribe the capitals 9. At the two extremities of each beam, two double mortiſes are to be cut to receive the eight tenons of the two croſs beams 4, 5, each of them four of the diameters in length, without their tenon, obſerving to mark the center of them exactly by a line cut ſtrong in the wood 6. The croſs-beam 5 muſt be hollowed a little on the upper ſide, or made not ſo thick as that at the other end 4, to give the greater bent to the tree or arm 22, of which we ſhall ſoon ſpeak.

In the center of each of the beams of the baſe 2, 3, at the ſixth diameter of their length, a bore 8, perfectly round, ſhould be cut ſixteen inches in diameter: theſe bores muſt be exactly oppoſite to each other, and ſhould increaſe gradually to the inſide of the beams; ſo that each of them, being ſixteen inches on the outſide towards the capitals 9, ſhould be ſeventeen and an half at the opening on the inſide; the edges to be carefully rounded off. We come now to the deſcription of the capitals 9, which are in a manner the ſoul of the machine, and ſerve to twiſt and ſtrain the cordage, that are its principle, or power of motion.

The capitals 9 are either of caſt braſs, or iron, each conſiſting of a wheel with teeth, 10, of two inches and half thick. The hollow or bore of theſe wheels ſhould be eleven inches, and about a fourth in diameter, perfectly round, and with the edges ſmoothed down. The inward ledge muſt be four inches deep and one thick; but, as that thickneſs would make it larger by one inch than the outſide bore of the beams 2, 3, they muſt be cut to the depth of four inches ſo as to receive it exactly. As the friction would be too great, if the capitals rubbed againſt the beams by the extreme ſtraining of the cordage which draws them towards theſe beams, that inconvenience may be eaſily remedied by the means of eight little wheels 13 of an inch in diameter, and an inch and one ſixth in length, as in figure placed circularly, and turning upon axes as in *fig*. 4.

Theſe little wheels or cylinders of caſt braſs ſhould be round, and equal in their diameters, that the capitals may work equally on all ſides.

Upon this number of cylindrical wheels the capitals, 9, muſt be placed in the beams 2, 3, ſo that the cylinders do not extend to the teeth of the wheels, which muſt receive a ſtrong pinion 14. By the means of this pinion, the wheel of the capital is made to turn for ſtraining the cordage with the key 15. To the wheel a ſtrong ſtay 16 is annexed, and another of the ſame kind may be added, to prevent any thing from giving way through the extreme and violent force of the ſtrained cordage. Theſe precautions are neceſſary upon account of the cylindrical wheels, which, by entirely preventing the friction of the capitals, make them the more eaſy to give way through the extraordinary and almoſt inconceivable tenſion of the cordage.

This muſt be ſtill greater in a Catapulta carrying four-hundred weight or upwards. In ſuch large machines, the wheels ought to be multiplied, and, for the greater precaution, a ſtrong ſtay added to every wheel. We come now to the capital-piece, or piece within the capital, over which the cordage is folded, and which ſuſtains the whole force in ſtraining it to the proper height.

This capital-piece is a nut or croſs pin of iron, 17, hammered cold into form, that divides the bore of the capitals exactly in two equal parts at their diameters, into which it is inſerted at the depth of about an inch. This piece or nut ought to be about two inches and one third thick at the top 18, and rounded off and poliſhed as much as poſſible, that the cords folded over may not be hurt or cut by the roughneſs or edges of the iron. Its height ought to be eight inches, decreaſing gradually in thickneſs to the bottom, where it ought to be only one inch. It muſt be very exactly inſerted in the capitals: its depth of eight inches adds force to the engine, and prevents its giving way through the ſtraining of the cordage. Perhaps, its being caſt with the capital, and of the ſame metal, might have an equal, if not a better effect.

After applying the two capitals to the bores of the two beams in the baſe, in an exact line with each other, and fixing the two croſs diametrical nuts or pieces, over which the cordage is to fold, one end of the cord is put through the void ſpace of one of the capitals in the baſe, and made faſt to a nail withinſide of the beam. The other ſide of the cord is then carried through the bore in the oppoſite beam and capital, and ſo folded or wound over the croſs pieces of iron in the center of the two capitals till they are full, the cordage forming a large ſkain 20. When this is done, the laſt end of the cord is tied to the firſt which I have mentioned. The tenſion or ſtraining of the cordage ought to be exactly equal, that is to ſay, the ſeveral foldings of cord over the capital-pieces ſhould be equally ſtrained, and ſo near each other, as not to leave the leaſt ſpace between them. As ſoon as the firſt folding or bed of cord has filled up one whole ſpace or breadth of the capital-pieces, another muſt be carried over it; and ſo on, always equally ſtraining the cord till no more will paſs through the capitals, and the ſkain of cordage entirely fills them, obſerving to rub it from time to time with ſoap. The cord may alſo be carried through with both ends, taking it from the center.

At three or four inches behind the cordage, thus wound over the capital-pieces, two very ſtrong upright beams 21 are raiſed: theſe are poſts of oak fourteen inches thick, croſſed over at top by another of the ſame ſolidity. As this part of the machine is two or three inches behind the ſkain of cordage, it muſt have a ſmall obliquity towards the cordage, in ſuch a manner, that, the arm or tree 22 fixed at the bottom, exactly in the center of the cordage, half of which holds it on one ſide, and half on the other, it is neceſſary, I ſay, that the arm ſtrike with ſome obliquity againſt the cuſhion or ſtomacher 23, which muſt be placed exactly in the middle of the croſs beam 24. Without this obliquity the ſpring of the cordage would be

Fig. 1 Caponiere

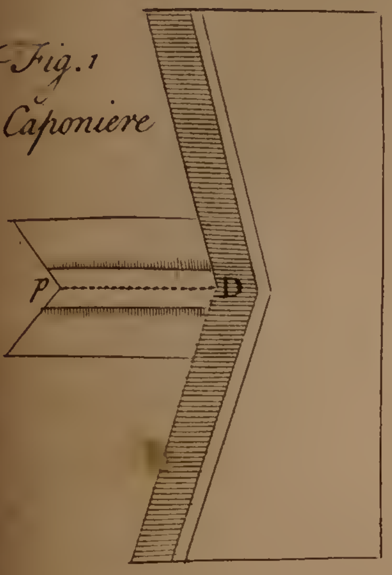
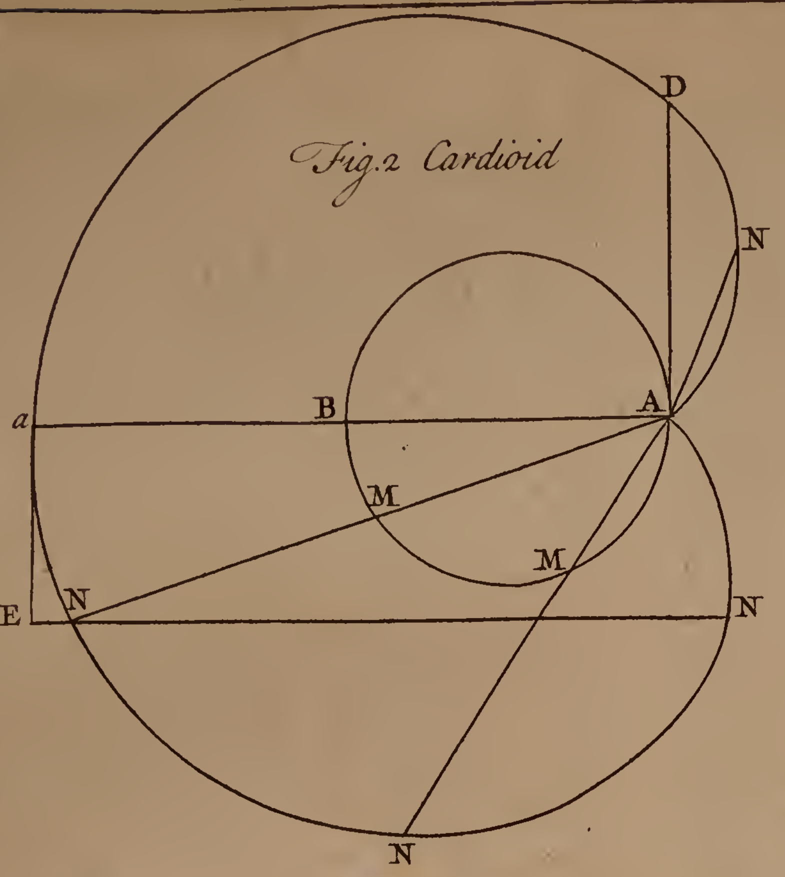
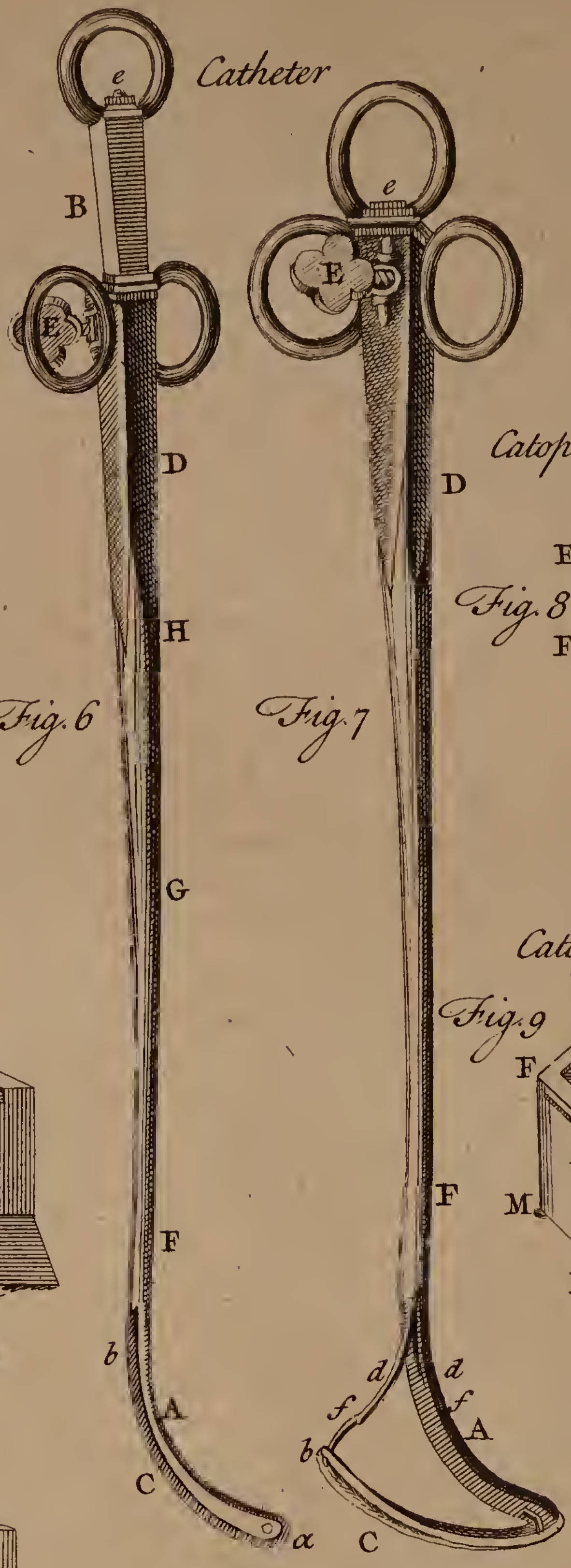


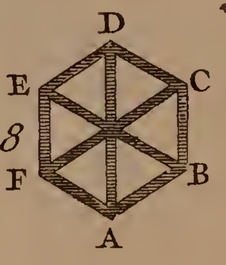
Fig. 2 Cardioid



Catheter *Fig. 6* *Fig. 7*



Catoptric Cistula *Fig. 8*



Catoptric Cistula *Fig. 9*

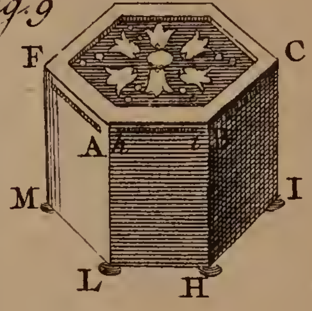


Fig. 3 Catapulta

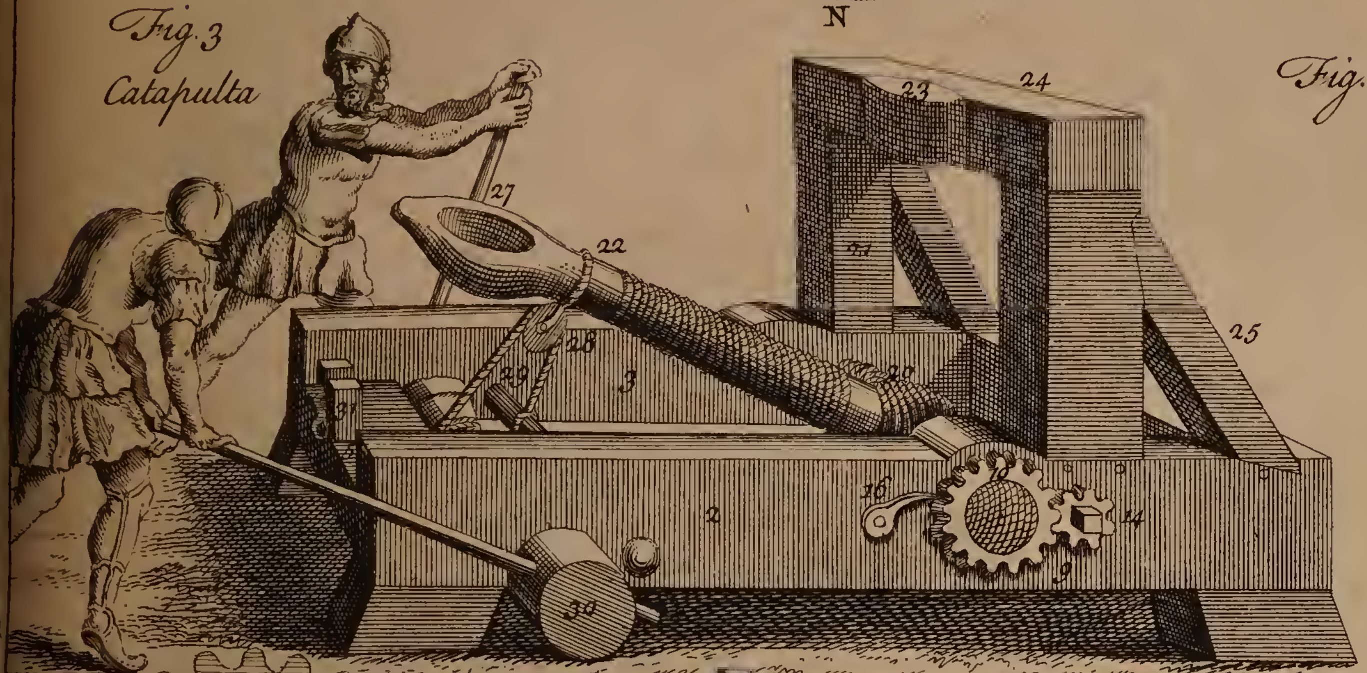


Fig. 4

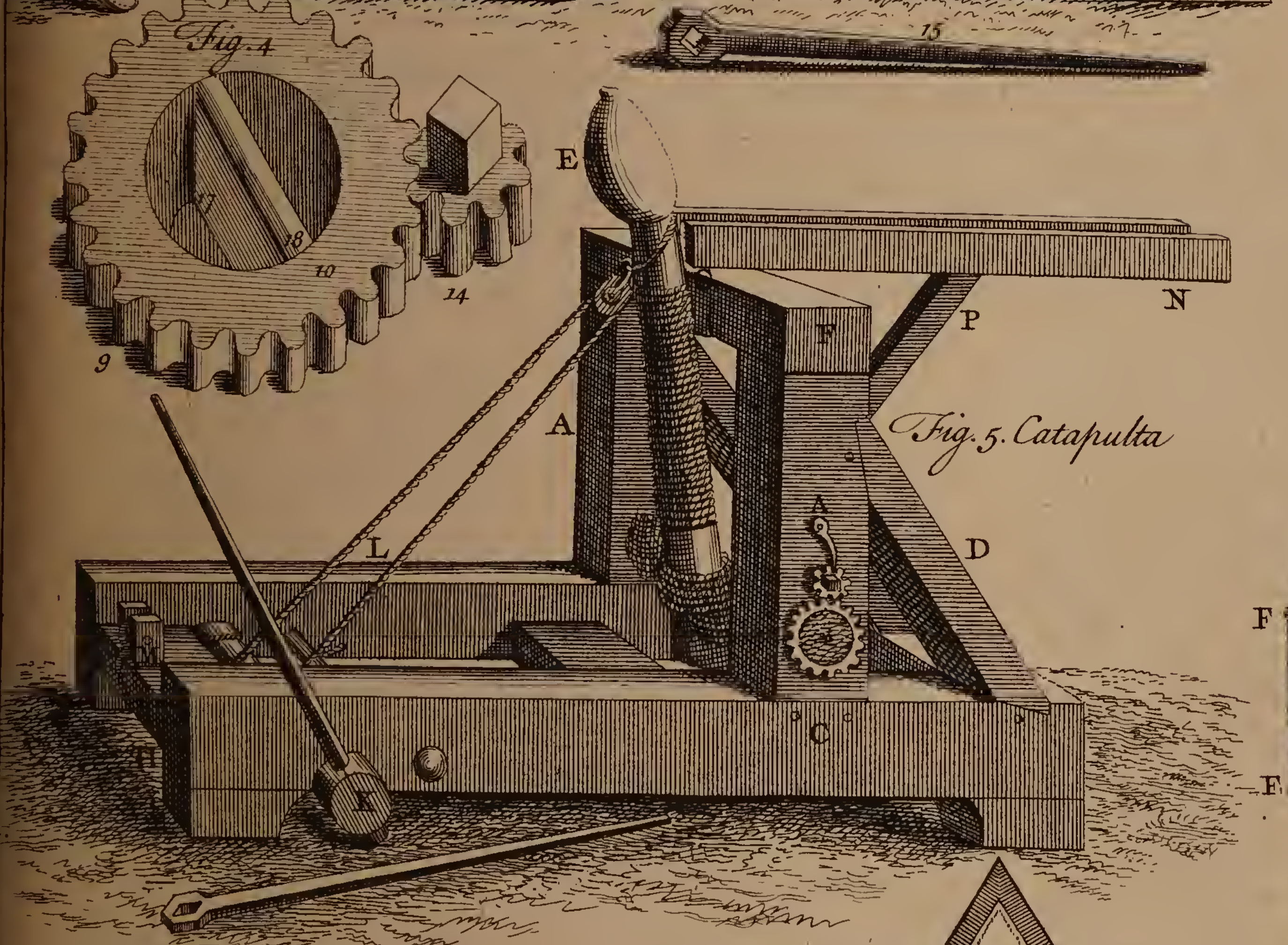


Fig. 5. Catapulta

Cavaliers *Fig. 10* *Fig. 11* *Fig. 12*

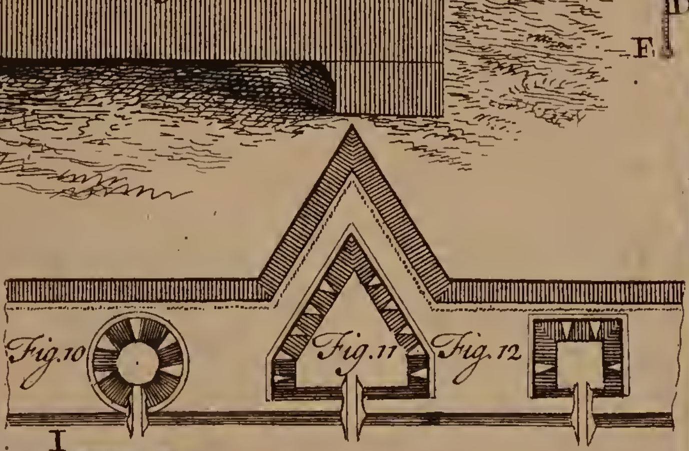


Fig. 13. Costar's Engine

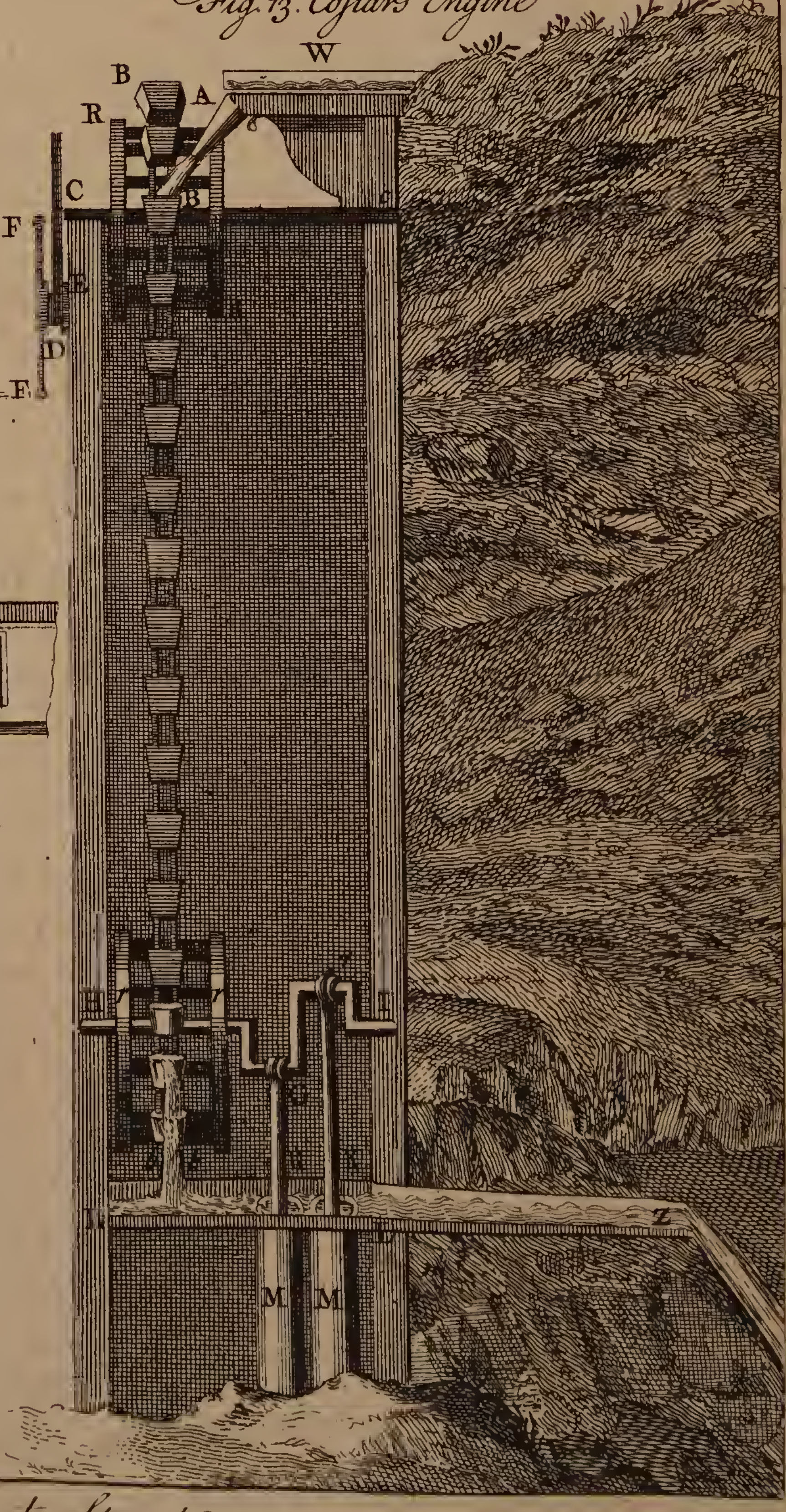
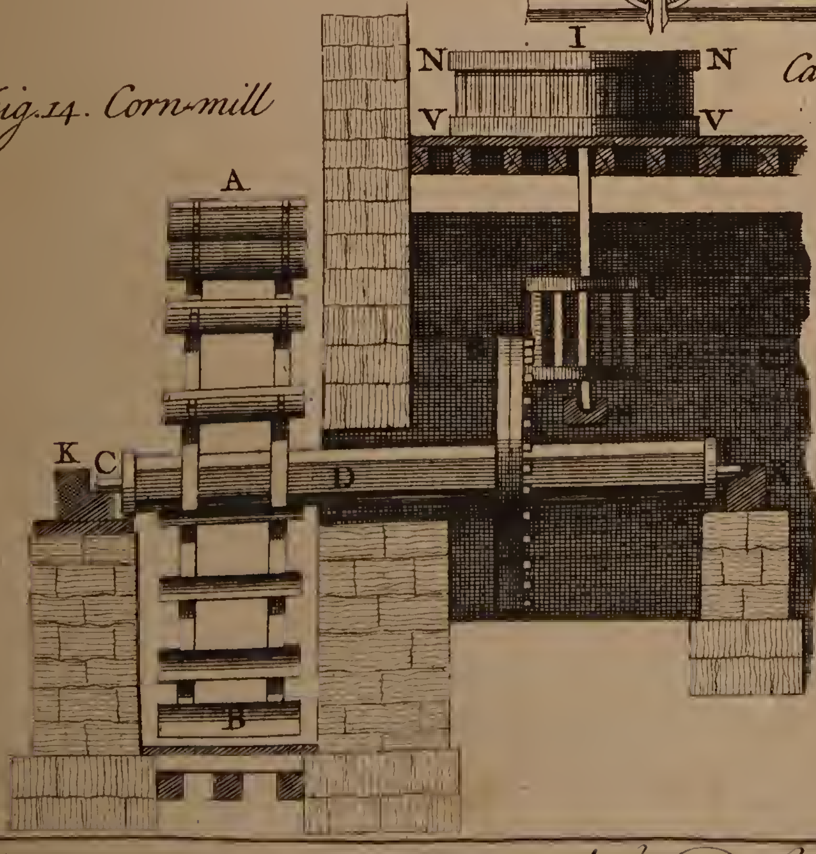


Fig. 14. Corn-mill



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be ſomewhat abated from relaxing before the tree reached the croſs beam. The height of the upright beam 21 is ſeven diameters and an half, and three inches, each propped behind with very ſtrong props, fixed at bottom in the extremities of the baſe 2, 3. The croſs beam 24 muſt be propped in the ſame manner in the center. The upright and croſs beams, props, &c. in this part of the machine, ſhould be ſtrengthened, eſpecially in the joints, with double ſquares of iron of four inches broad, and a quarter of an inch thick, pinned with ſtrong pins, keyed at the end of them to keep them firm. Care muſt be taken to place the cuſhion or ſtomacher in the center, as has been ſaid. It ſhould be covered with tanned ox-hide, and ſtuffed with hair, the arm ſtriking againſt it with inconceivable force.

When the Catapulta is to batter with ſtones, the bottom of the arm muſt be placed exactly in the center of the ſkain or cordage. This is the more important, becauſe, if it be not exactly in the middle, the tenſion will be unequal; and, whatever ſhould be more on the one than the other ſide, will infallibly break in ſtraining, which is worth nothing. To prevent miſtakes in ſo important a circumſtance, a piece of wood, of the ſame bigneſs with the end of the tree or arm, might be fixed in the ſkain of cordage when formed. The ſame piece of wood might ſerve to mark the center of the cords, in carrying them backwards or forwards through the ſpaces in the capitals.

The tree, arm, or ſtylus, as Ammianus Marcellinus calls it, ſhould be of excellent aſh, the ſoundeſt that can be got. Its length is from fifteen to ſixteen diameters of the bore of the capitals. The end at bottom to be fixed in the middle of the ſkain is ten inches thick, by fourteen broad: that is to ſay, it ſhould be narrower in the firſt than the ſecond dimenſion, to make it the ſtronger, and prevent its bending: for, if the arm bends, it muſt have more breadth.

The bottom of the arm which the cords receive, muſt have theſe dimenſions, its edges being ſmoothed off; for, without that precaution, they would fret or cut the cordage, which are of Cat-gut. The reſt of the arm ſhould be made in an elliptical form, not ſo thick by an inch as the end fixed in the cords, and of the ſame breadth, to the place where it ſtrikes againſt the ſtomacher, which ought to be ſomewhat thicker, but flat, leſt the violence of the ſtroke cut it in two: in the ſame place the arm ſhould form a little curve.

To ſtrengthen the arm or tree, of which the force of being diſcharged is every thing that can be conceived of moſt violent, it ſhould be wrapped round with a cloth dipped in ſtrong glue like the tree of a ſaddle, and bound very hard with waxed thread of the-ſixth of an inch in diameter from the large end at bottom, almoſt to the top, as in the plate.

The force of this arm is entirely ſurprizing, when the trigger is ſtruck. The experiments Mr. Follard made of it in his Catapulta convinced him of this. Though his machine threw only a weight of half a pound, the working of the arm in great machines might be judged from it. The ancients who experienced the ſame every day, had no better expedient to prevent the arms of this kind of machine from breaking, than to make them of two pieces of wood of equal length. Theſe they joined together with abundance of art and care, and ſtrengthened with a ſtrong binding of wax cord.—We ſhall now proceed to the manner of working the Catapulta.

At the top of the arm, juſt under the iron hand or receiver 27, a ſtrong cord is made faſt, with two loops to it twiſted, the one within the other, for ſtrength. Into theſe two loops the hook of the pulley 28 is put; this pulley ſhould be of braſs with double wheels. Upon occaſion another may be hooked on at bottom, and to the center of the cock or trigger. The cord 29 is then put through the wheels of the two pullies, and faſtened to the roll 30, round which, in turning, it divides itſelf. The roll ought to be placed in ſuch a manner that the end of the arm at top, to which the pulley is hooked, may almoſt touch it when the hand or receiver is come to its proper place at bottom. The cock or trigger 31 which ſerves as a ſtay, is then brought to it, and made faſt by its hook to the extremity of the hand, which is either in the form of a ſpoon, as in the plate, or of an iron hand, with three branches a little curving; in this the body to be diſcharged is put. If the machine is to throw flints, they are put into an oſier baſket, that exactly fits the hand or receiver: the pulley at the neck of the arm is then unhooked, and, when the trigger is to let it off, a ſtroke muſt be given upon it with an iron bar or crow of about an inch in diameter; the arm then goes off with a force little unequal to that of a modern mortar. It is to be obſerved, that the tree or arm deſcribes an angle of ninety degrees, beginning at the cock, and ending at the ſtomacher or cuſhion; which we ſhall farther explain in deſcribing another Catapulta for throwing large darts.

My little Catapulta, ſays Mr. Follard, is only ten inches long, by thirteen broad. It throws a ball of lead of a pound weight almoſt five-hundred yards. This kind of machines carry a greater or leſs diſtance, according to the points of elevation given them, and the different degrees of the cordage which we have carried to thirty-ſix. We believe, that a Catapulta, according to the proportions here laid down, muſt carry at leaſt eight hundred yards. However, adds he, we do not pretend to advance this as a certainty, not having had opportunity to make the experiment.

Plate XIV. *fig.* 5. repreſents another battering Catapulta with its capitals affixed in its upright beams, and canal for throwing great darts, or many at a time.

A, Are the two double beams of the capitals fixed upright upon the baſe C, and ſupported by the props D, with tenons and mortiſes, which ſerve to ſtrengthen them againſt the ſtroke of the arm E upon the croſs-beam F, which ſhould have its cuſhion or ſtomacher G.

When the arm E is to be brought down to the croſs-beam H; it is done by the roller K, round which runs the cable L. The cock M is then brought to it, which ought to form a little curve. This Catapulta is ſcarce leſs ſimple than the former, and, according to Mr. Follard, might be of great uſe in beſieged places, if planted at bottom and behind the walls.

It was particularly uſed for throwing darts of an extraordinary ſize, and ſometimes ſeveral together; the other threw both ſtones and darts at once, and in very great numbers. The ſame author ſaith, that he doubted at firſt whether the Catapulta could do this or no, but was not long without diſcovering the myſtery. As there is ſomething curious in it, he gives the following explanation of it:

N, Is a canal of oak rounded withinſide in form of a gutter. Its length is ſix diameters of the capitals, and its breadth in proportion to the ſize of the large dart, or bundle of darts to be diſcharged. Theſe darts were larger and longer, and more or leſs in number, according to the ſize of the machine.

When arrows were to be ſhot in the manner of cartridges, the end of the canal or gutter was placed in a cut of the depth of two inches in the center of the croſs-beam F, which is fitted exactly. It entered about two inches into the cuſhion or ſtomacher, ſupported by the prop P, to hinder it from bending or giving way. The upper part of the arm ought to be flat at the place where it ſtrikes the great dart or cartridge, and covered with a plate of ſteel, a quarter of an inch thick.

To diſcharge a bundle of large darts, they undoubtedly made uſe of a deal box of a round form, into which the bundle of arrows were put, tied with a very ſmall twine in the middle, to keep them in a right line and parallel with each other. This box was put into the canal or gutter, and projected ſix or ſeven inches beyond the cuſhion towards the arm. It muſt have been very ſlight, looſely put together, and of little or no weight, except at the end ſtruck by the arm, which, it is ſuppoſed, might be an inch thick or upwards. Its length was according to that of the arrows, that is to ſay, it ſhould be about half as long, their length being two diameters and an half of the bore of the capitals, as in the former Catapulta. The trigger was then ſtruck, and the arm, coming flat againſt the box, drove it with the arrows to a very great diſtance. The wind took the pieces of the box, which ſoon ſeparated, and the arrows, ſcattering and ſpreading in their flight, did terrible execution in the ranks of the enemy.

My little Catapulta, ſays Mr. Follard (from whoſe Polybius moſt of theſe extracts are made) diſcharged ten arrows in this manner, to the diſtance of almoſt an hundred paces, at eight degrees of elevation. The antients no doubt made uſe of the quadrant in planting their machines, as the moderns do for their mortars.

CATARACT *of water* (*Dict.*) — In moſt rivers the deſcent of the ſtream paſſes as it were by inſenſible degrees from their fountains to their mouths, where they empty themſelves into the ſea; but there are ſome whoſe fall in certain places is much more violent and rapid than the common current of the ſtream, and theſe are termed Cataracts. The Rhine, for example, forms two, one at Bilefeld and the other near Schaffouſe. The Nile has ſeveral and two among them very remarkable, which fall down from a great height between two mountains. The river Vologda in Muſcovy has two famous Cataracts near Ladoga. The river Zaira in Congo begins with a kind of Cataract which falls from the precipice of a mountain. But the moſt famous Cataract of all is that of the river Niagara in Canada; it falls like a prodigious torrent, one hundred and fifty-ſix feet perpendicular, and is near a mile broad; the miſt or fog it makes by its deſcent may be ſeen at five leagues diſtance; it riſes to the clouds, and forms a very fine rain-bow, when the ſun ſhines. At the bottom of this Cataract the eddy of the water is ſo violent, and the whirlpools ſo terrible, that the river is not navigable for ſix miles below it. Father Charlevoix's deſcription of it is very particular, and we apprehend may not be unacceptable to our readers. My firſt care, ſays he, was to viſit the fineſt caſcade that is perhaps in nature. I perceived, at firſt view, that baron de la Hontan was ſo much deceived, as to the height and figure of it, that one could ſcarce imagine he had ever ſeen it.

It is true, if you take the menſuration of its height from the three mountains, which you paſs in your way to it, the fall is not much leſs than ſix hundred feet, as M. de l'Iſle has laid it down in his chart, no doubt on the credit of La Honton and father Hennepin. But, after I arrived at the top of the third mountain, I obſerved that, the remainder of the way to this water-fall which is about three leagues, we went ſometimes up, ſometimes down hill, which certainly theſe travellers did not attend to. As this Cataract can only be approached on the ſide, and conſequently ſeen in profile, it is not eaſy to meaſure its height with inſtruments: we therefore attempted it with a rope fixed to a long pole, and, after repeated experiments, could find no greater depth than one hundred and fifty feet, ſometimes but one hundred and twenty; the pole might poſſibly meet with ſome rock that bulged out, but, from all the obſervations I could make, I apprehend it about one hundred and forty or one hundred and fifty feet.

As to its figure, it reſembles a horſe-ſhoe, and is about four hundred paces in circumference; exactly in the middle it is divided by a narrow iſland, one eighth of a league in length, at the lower extremity of which the waters unite again.

It may be obſerved as a truth in general, that, in whatever countries the number of inhabitants is not ſufficient to form political bodies of men, the earth is uncultivated, irregular, uneven, the beds of rivers are unequal, not level, and ſubject to Cataracts. The rendering the Rhone and Loire navigable has been the work of ages. It is by confining the waters within their banks, cleaning the bottoms of rivers, and directing their courſe, that they become uſeful and ſerviceable. In all countries where there are few inhabitants nature is imperfect, or at leaſt loſes much of her beauty.

CATA'RRHAL *Fever*, a ſecondary or ſymptomatic fever, by means whereof nature endeavours to correct the vitious quality of the lymph, and expel it the body.

CATCH-*word*, among printers, denotes the firſt word of a page, which is put alſo at the bottom of the preceding page, in order to ſhew how the leaves and ſheets follow each other, and facilitate the folding and binding.

CATE', or Catea, in natural hiſtory, the name of the tree which produces the drug called caſhoo. It grows in the province of Behar, and in ſome other provinces of Indoſtan, or the Mogul's dominions. It was by a miſtake that Garcias, who was firſt phyſician to a viceroy of Goa, gave the name of that tree to the lozenges, or ſmall cakes of caſhoo, otherwiſe called catechoo, which miſtake Monſ. Lemery has followed. The ſame phyſician alſo miſtook the tree called Caté for a kind of lycion, or rather for that of the ancient Greeks and Romans; for that Indian tree does by no means anſwer the deſcription which Dioſcorides has given us of the lycion. It is preſumed that the Caté is rather a kind of acacia: the caſhoo is made of its bark. They trade in that commodity at Bengal, whither this drug is carried by the river Ganges.

CATERPI'LLAR, *eruca*, in natural hiſtory, an inſect too well known to need deſcription.

There are ſeveral kinds of this inſect, which are very pernicious to a garden; but there are two ſorts which are the moſt common, and deſtructive to young plants: one of them is that which the white butterfly breeds: it is of a yellowiſh colour, ſpotted with black; and commonly infeſts the tender leaves of cabbages, cauliflowers, and Indian creſs. Theſe eat off all the tender parts of the leaves, leaving only the fibres intire; ſo that very often we ſee, in autumn-ſeaſon, whole gardens of winter cabbages and ſavoys almoſts deſtroyed by them; eſpecially in thoſe which are crouded with trees, or are near great buildings. They always increaſe moſt in very dry ſeaſons, and, when the plants have been ſtinted by the drought, they are conſtantly attacked; whereas thoſe which are in vigour, ſeldom ſuffer much by thoſe inſects. Nor is there any other method found out to deſtroy them, that I know of, but to pick them off the plants before they are ſpread from their neſts; by which means, though perhaps many may be overlooked, yet their numbers will be greatly diminiſhed. But this work muſt be often repeated during the warm weather, when the butterflies are abroad, which are continually depoſiting their eggs, and in a few days time will be metamorphoſed to perfect Caterpillars. But as theſe, for the moſt part, feed upon the outer leaves of plants, ſo they are more eaſily taken than the other ſort, which is much larger: the ſkin is very tough, and of a dark colour; this is called, by the gardeners, a grub, and is exceeding hurtful. The eggs of this ſort of Caterpillar are, for the moſt part, depoſited in the very heart or center of the plant, (eſpecially in cabbages;) where, after it has obtained its form, it eats its way out through all the leaves thereof; and alſo the dung, being lodged between the incloſed leaves of the cabbages, gives them an ill ſcent.

This inſect alſo burrows juſt under the ſurface of the ground and makes great havock on young plants, by eating them through their tender ſhanks and drawing them into their holes. The miſchief is chiefly done in the night: whenever you obſerve this, you ſhould every morning look over your plat of plants; and, wherever you ſee any plants eaten off, ſtir the ground round about the place with your fingers an inch deep, and you will certainly find them out. This is the only method I know of deſtroying them. For the metamorphoſes of Caterpillars, ſee the article BUTTERFLY.

Caterpillar-*eaters*, a name given by ſome authors to a ſpecies of worms which are bred in the body of a Caterpillar, and eats its fleſh: theſe are owing to a certain kind of fly which lodges her eggs in this animal, and they, after their proper changes, become flies like their parents.

CATHE'TER (*Dict.*)—The learned Mr. Le Cat, in the Philoſophical Tranſact. Numb. 476, has publiſhed the following new Catheter.

The body G (*plate* XIV. *fig.* 6.) of the Catheter is almoſt intirely ſolid, leaving in its center but juſt room enough for the paſſage of the wire. Without this ſolidity, and this narrowneſs of the paſſage of the wire, the Catheter would not be firm; and the wire itſelf, liable to waver, would not run true, but would impart its weakneſs, or want of juſtneſs, to the moveable piece C, which is the guide of this operation.

This body, G, is ſoldered to the piece D at H, making it enter ſquare into the ſaid piece D, till it meet the ſlider B, which I ſuppoſe intirely within the piece D. The rings are very large and ſtrong for the conveniency of uſing it.

This Catheter is made of ſilver, from the rings incluſive to F: all the reſt, together with the wire, ought to be of the hardeſt gold; becauſe it is on this end of the Catheter that the greateſt ſtreſs is laid, and ſilver has not firmneſs enough to reſiſt the efforts that theſe pieces muſt ſuſtain. And particular care muſt be taken, that all the angles and prominences be rendered very ſmooth.

I enter into theſe details of the make of the inſtrument, becauſe I have learned, to my coſt, that the workmen do not think of them.

Fig. 7. ſhews the whole mechaniſm of this Catheter, by repreſenting it open, and ſuch as it is in the bladder, while the inciſion is making.

The piece B of *fig.* 6. is here ſunk in its ſheath D; whereby the ſmall ſtyle or wire is thruſt towards the crooked end of the Catheter, and, at the ſame time, puſhes the end *b* of the ſmall moveable piece C towards the ſame part. The Catheter being thus open in the bladder, when the operator draws the inſtrument towards him, it is ſtopped by the neck of this organ, at the place marked *d d*, and then the angle *b* projects about a finger's breadth from the orifice of the bladder. Yet there are ſome ſubjects, in whom this orifice, being very wide or relaxed, gives greater way to the efforts made by the widening, *d d*, of the anterior angle of the Catheter; whereby it happens, that, inſtead of ſtopping this angle at *d d*, it lets it paſs through to *f f*, which brings the inciſion ſo much nearer the neck of the bladder: nay, I have ſeen in ſome dead bodies, in which the relaxation is ſtill greater, that the proſtate was ſomewhat concerned in the inciſion; which is no great misfortune. But even this may be eaſily avoided, by taking care, in the firſt inciſions, to diſengage the part that anſwers to the projecting angle from every thing that may hide from us the proſtate and bladder; and then, the foregoing caſe becoming viſible, it is eaſy to guard againſt it, by cauſing the projecting angle of the Catheter to be puſhed, or by puſhing it one's ſelf farther into the bladder.

This projecting part of the Catheter is not ſeen; but it is very perceiveable to the touch, through the integuments, and ſtill more ſo, after they are cut through.

I muſt not omit obſerving here, that, notwithſtanding all the care I have taken to inſtruct the inſtrument-maker in the conſtruction of this Catheter, and eſpecially of the moveable piece *b* C, in order to make it ſolid, yet it has often proved too weak to bear the effort of thruſting the part forward, which we are obliged to do on one ſide; ſo that it bent, and remained in the middle, whilſt the reſt of the Catheter was to the left ſide.

In caſe of this accident, it came into my thought to turn the Catheter up-ſide-down, ſo that the angle of the moveable piece might anſwer to the upper part of the neck of the bladder, and ſtop there, while the concave and immoveable part of the Catheter anſwered to the inciſion, and that the very end of the Catheter projected at the place where I was to open the body of the bladder. And, upon ſeveral trials, I found that this place was the very ſame which had before been pointed out by the angle of the moveable piece; therefore, when I have one of theſe Catheters, on which I cannot depend, I make uſe of it in this laſt manner, and it intirely anſwers my expectation; becauſe the fixed piece of theſe Catheters is always very ſolid, and that the angle of the moveable piece does its duty as well on the upper as on the under ſide of the neck of the bladder. It has even ſeemed to me, that the end of the inſtrument makes the greater protruſion forward. In fine, this Catheter, being almoſt ſtraight, eaſily aſſumes in the bladder every ſituation which one finds neceſſary to give it.

CATO'PTRIC *Ciſtula* (*Dict.*) — To make a Catoptric Ciſtula is to repreſent ſeveral different ſcenes of objects, when looked in at different foramina, or holes.

Provide a polygonous ciſtula, or cheſt, of the figure of the multilateral priſm A B C D E F, (*plate* XIV. *fig.* 8.) and divide its cavity by diagonal planes E B, F C, D A, interſecting each other in the center, into as many triangular locules, or cells, as the cheſt has ſides. Line the diagonal planes with plain mirrors: in the lateral planes make round holes, through which the eye may peep within the locules of the cheſt. The holes are to be covered with plain glaſſes, ground within-ſide, but not poliſhed, to prevent the objects in the locules from appearing too diſtinctly. In each locule are to be placed the different objects, whoſe images are to be exhibited; then, covering up the top of the cheſt with a thin tranſparent membrane or parchment to admit the light, the machine is compleat. For, from the laws of reflection, it follows, that the images of objects, placed within the angles of mirrors, are multiplied, and appear ſome more remote than others; whence the objects in one locule will appear to take up more room than is contained in the whole cheſt. By looking, therefore, through one hole only, the objects in one locule will be ſeen, but thoſe multiplied, and diffuſed through a ſpace much larger than the whole cheſt: thus every new hole will afford a new ſcene: according to the different angles the mirrors make with each other, the repreſentations will be different; if they be at an angle greater than a right one, the images will be monſtrous, &c. The parchment that covers the machine, may be made pellucid, by waſhing it ſeveral times in a very clear lye, then in fair water, and bracing it tight, and expoſing it to the air to dry. If it be deſired to throw any colour on the objects, it may be done by colouring the parchment. Zahnius recommends verdigreaſe ground in vinegar, for green; decoction of Braſil-wood for red, &c. He adds, that it ought to be varniſhed, to make it more pellucid.

To make a Catoptric ciſtula to repreſent the objects within it prodigiouſly multiplied, and diffuſed through a vaſt ſpace.

Make a polygonous ciſtula or cheſt, as before, but without dividing the inner cavity into any apartments or locules; (*plate* XIV. *fig.* 9.) line the lateral planes C B H I, B H L A, A L M F, &c. with plane mirrors, and, at the foramina or apertures, pare off the tin and quickſilver, that the eye may ſee through; place any objects in the bottom M I, *e. gr.* a bird in a cage, &c. Here the eye, looking through the aperture *h i*, will ſee each object, placed at bottom, vaſtly multiplied, and the images removed at equal diſtances from one another. Hence, were a large multangular room, in a prince's palace, lined with large mirrors, over which were plain pellucid glaſſes to admit the light; it is evident the effects would be very ſurprizing and magnificent.

CA′TUS *Pardus*, in zoology, the name of a beaſt of prey, called alſo by ſome Catus montanus, and by us the cat of mountain. It is of the ſize of a maſtiff dog, but it reſembles, in all reſpects, the common domeſtic cat in ſhape, except that the tail is, in proportion to the creature's ſize, conſiderably ſhorter. It is alſo, if any thing, ſhorter, in proportion to its length, than our cat, and is of the common colour of that animal, only that it is variegated with black ſpots. Its throat is white, and its ſpots are long upon the back, and round upon the ſides and legs; the beard or whiſkers are plainly the ſame as in the cat; it is leſs fierce againſt the human ſpecies than many of the other beaſts of prey, and may even be tamed. It naturally grows very fat. *Ray. Syn. Quad.*

CAVALIE′RS, *in fortification*, (*Dict.*)—Cavaliers are of various ſhapes, ſuch as ſquare (*plate* XIV. *fig.* 12.) or round, (*fig.* 10.) or like a horſeſhoe, or a plain line; but when they are conſtructed in flankers, as is uſually the caſe, (*fig.* 11.) they are of a like figure to that flanker; leaving a ſpace of about eight or ten yards, or more, between the parapet of the flanker and the outline of the Cavalier.

They ſhould be faced with earth, or plank, or brick; but not with ſtone, becauſe the ſplinters, knocked off by the enemy's cannon, would greatly annoy the troops that may be poſted in the line below the Cavalier.

Any other particulars will be ſufficiently known from the figures; obſerving, in the plans, to repreſent their outſide limits by a double line, to expreſs the ſloping of the earth, and to put a ramp in the gorge.

CAU′DA *Ceti*, a fixed ſtar of the ſecond magnitude, called alſo by the Arabs dineb kaetos. Its longitude in the year 1700, according to Hevelius, was 28° 22′ 14″ of Piſces, and its latitude ſouthward 2° 44′ 35″.

CAUDA *Cygni*, a fixed ſtar of the ſecond magnitude in the Swan's tail, called by the Arabs dinebadigege, or eldegiagick. Its longitude, according to Hevelius, in the year 1700, was 1° 16′ 45″ of Piſces, and its latitude northward 59° 57′ 33″

CAUDA *Delphini*, a fixed ſtar of the third magnitude, in the tail of the Dolphin. Its longitude, according to Hevelius, in the year 1700, was 9° 55′ 17″ of Aquarius, and its latitude northward 29° 9′ 20″.

CAUDA *Leonis*, a fixed ſtar of the firſt magnitude, in the Lion's tail, called alſo by the Arabs dine beleced. Its longitude, according to Hevelius, in the year 1700, was 17° 27′ 46″ of Virgo, and its latitude northern 12° 18′ 55″.

CAUDA *Urſæ majoris*, a fixed ſtar of the ſecond magnitude, in the extreme part of the tail of the great Bear, called alſo by the Arabs alalioth and benenah. Its longitude, according to Hevelius, in the year 1700, was 22° 39′ 24″ of Virgo, and its latitude northward 59° 25′ 7″.

CAUDA *Urſæ minoris*, a fixed ſtar of the ſecond magnitude, in the extreme part of the tail of the leſſer Bear, called alſo the polar ſtar, and by the Arabs abrukabah.

CA′VEATING, in fencing, the act of diſengaging, or ſhifting the ſword from one ſide of the adverſary's ſword to the other.

Caveating is a motion whereby a man brings in an inſtant his ſword which was preſented on any ſide of his adverſary's, generally beneath its hilt, to the oppoſite ſide; either from within, to without, or vice verſa; or from having its point high, to below, or the reverſe; and either on the ſame ſide it is preſented in, or the oppoſite ſide.

CAUK, or *Cawk*, is uſed by the miners in the Peak to denote a worſe ſort of ſparr; being a ponderous white ſtone found in the lead mines, and which will draw a white line like chalk, or the galactites.

It is of a much more denſe and compact nature than galactites, and reſembles cryſtals, except that it wants tranſparence. There is a ſingular proceſs mentioned by Dr. Liſter, which is that of vitrifying antimony by its means. This is done with great readineſs and ſpeed by it, and the glaſs, thus made, will produce ſome effect on other metals, which no other glaſs will, nor indeed any other preparation of antimony. The method of preparing it is this: take a pound of antimony; flux it clear; have in readineſs an ounce or two of Cauk in a lamp red-hot, put it into the crucible to the melted antimony, and continue it in fuſion; then caſt it into a clean mortar not greaſed, decanting the clear liquor from the lump of Cauk. This proceſs gives more than fifteen ounces of glaſs of antimony, like poliſhed ſteel, and bright as the moſt refined quickſilver. The Cauk, in the mean time, is found to be diminiſhed, not increaſed in its weight, and will never flux with the antimony, though ever ſo ſtrong fire be given it. This is a very odd mineral, and this learned author ſuppoſes it to be allied to thoſe white, milky, and mineral juices which are found in mines. The effect of both is evidently the ſame; for the milky juice of lead mines vitrifies the whole body of antimony, in the ſame manner that the Cauk does in this experiment. *Phil. Tranſ.* Numb. 110.

CA′ULIFLOWERS, are the produce of a kind of cabbage, and have of late years been ſo far improved in England, as to exceed, in ſize and goodneſs, any that are raiſed in the reſt of Europe; they are in ſeaſon in the months of May, June, and July, but the ſkill of the gardener can continue them much longer. The manner of propagating them is this:

Having procured ſome good ſeed, you muſt ſow it before the middle of Auguſt, upon an old cucumber or melon bed, ſifting earth over the ſeeds to a quarter of an inch in thickneſs: if the weather prove very hot and dry, the beds muſt be ſhaded with matts, and be lightly watered at times. In about a week's time the ſeeds will appear above ground, and they muſt be uncovered by degrees, but not expoſed to too much ſun at firſt. In a about a month more they ſhould be pricked out on another old bed, at three inches diſtance, and ſhaded and watered, when firſt tranſplanted; but after this they muſt not be much watered, nor be ſuffered to have too much rain, which will make them black-ſhanked, or rotten in the ſtalks. In this bed they are to remain to the middle of October, when they are to be planted out for the winter ſeaſon: they are then to be planted out in rich beds, and thoſe which are to be early ripe, are to be ſhaded with bell glaſſes, two under each glaſs, and in February to be planted out again: the reſt are to be at firſt ſet at a greater diſtance, and to ſtand.

When the Cauliflowers begin to fruit, they muſt be carefully watched, and ſome of the inner leaves muſt be bent down over the flower, to ſhade it from the ſun, which would otherwiſe turn it yellow. The very fineſt of the Cauliflowers, which are not looſe and frothy about the edges, and very firm, ſhould be ſaved for ſeed; and the flower ſtems, as they ſhoot out, ſupported with ſticks till the ſeeds are ripened, which muſt then be carefully gathered, and dried for uſe. *Mill. Gard. Dict.*

CA′USALTY, in metallurgy, the lighter parts of ſulphureous and earthy ores of metals carried off in the water uſed in waſhing them, and ſubſiding afterwards from it. *Boerhaave's Chem.*

CAU′STICA (*Dict.*)—The celebrated Heiſter, in his Surgery, gives directions for making an excellent cauſtic ſtone, in the following manner:

Take of pot-aſh, and the ſtrongeſt quick-lime, equal quantities of each, for inſtance, ſix ounces; or of pot-aſh, one pound, and of quick-lime, ſix ounces; which, when pounded ſeparately, are to be mixed. Then, putting them in a large glaſs or pot, a large quantity of water is to be poured upon them; and they are to ſtand for an hour or two, till they are ſufficiently incorporated with each other: then what is colliquated is to be ſeparated from the ſubſiding maſs, ſtrained through a linen cloth, and condenſed in an iron veſſel over the fire. After which this conſiſtent maſs, being put into a crucible, is to be fuſed over a briſk fire, till it aſſumes the conſiſtence of oil. Then it is to be poured into a veſſel or mortar; and, before it is entirely cold, it is either to be cut to pieces, or broken, and kept for uſe, in a cloſe-ſtopped glaſs, in a dry place.

From this glaſs we take what is ſufficient for opening an abſceſs, and apply it either whole, or groſly pounded in a mortar, ſecuring it on the part affected. If any moiſt ſubſtance is laid upon the Cauſtic, it generally operates, and corrodes the ſubjacent parts ſooner, in the ſpace of an hour or two, for inſtance; but, when it becomes old, it generally loſes its corroſive quality.

Boerhaave's method of preparing the lapis ſepticus, or potential cautery, is as follows:

Take lime made of burnt ſtones, that is quite freſh, very dry, ſolid, not affected by any moiſture, nor as yet cleft aſunder; of this put one part into a clean iron pot, and lay upon it two parts of the pureſt pot-aſh, in ſuch a manner, that the lime may be covered all over with this alcali. Let theſe be then left together in the pot, with a cloth flung over them, till the lime begins to crack and ſplit aſunder: when you obſerve this, add four times their weight of water, and boil them for the ſpace of one or two hours. When the fæces are ſubſided, pour off the liquor, and let it be ſtrained through Hippocrates's ſleeve, made of thick linen cloth, till it at laſt paſſes through as limpid as pure water. Put this lixivium into a large iron ladle over the fire, and, taking care that it do not boil over, evaporate it till it becomes perfectly dry. Then increaſe your fire till the ladle grows red-hot, and, as ſoon as ever the ſalt has done ſmoaking, it will melt. When it is in this ſtate, pour it out upon a hot braſs plate; and, whilſt the matter continues very ſoft, make it ſmooth, and cut it into ſuch pieces as are fit for chirurgical uſes. Let theſe be put into a very dry, hot, ſtrong glaſs-bottle, by the fire-ſide, and inſtantly ſtop it with a choice dry cork: let the mouth of the bottle be then dipped in melted pitch, and be very accurately ſecured, that no moiſture may poſſibly get through it, which is attracted by the alcali, prepared in this manner, with an incredible power, even through corks and bladders: but, if you obſerve theſe cautions, it may be kept for years. When you want to take a bit out for uſe, it muſt be done in a hot dry air, or near a good fire, and then the bottle muſt be immediately ſtopped again, as before.

Remarks.

1. This ſalt, from the truly igneous virtue of the lime attracted into the fixed igneous alcali, acquires a moſt acute and quick corroding power, which was neither in the alcali nor in the lime, when they were ſeparate. The acrimony of it exceeds that of all other ſalts hitherto known; for, if you cut a round hole in a ſticking plaiſter, and apply this to a human body, and then put a bit of this ſalt upon the ſkin in the vacuity, and cover it over with another plaiſter, that it may not fall off, it will, in a very ſhort time, conſume the ſkin, and the membrana adipoſa; and hence it is valued by the ſurgeons, for what they call their potential cautery, above all others.

2. If almoſt any parts of animals are thrown into a freſh lixivium of this ſalt, whilſt it is boiling, they will, in a ſhort time, be converted into a liquid matter; at will likewiſe moſt vegetable ſubſtances, and the ſulphurs of foſſils. A poor man, unfortunately falling into a boiling copper of ſuch a lixivium, had his cloths, and all the ſoft parts of his body, conſumed, ſo that there was found nothing of him left, but his bones: hence this lixivium is of incomparable ſervice, where the parts are gangrenous to a great depth, and almoſt ſphacelated, at it diſpoſes them to a happy ſeparation; but it requires the prudent application of a ſkilful ſurgeon.

3. This ſalt melts with a pretty moderate fire, and then it runs like wax. By this eaſy fuſion, therefore, it is capable, without the aſſiſtance of an intenſe fire, of diſſolving a great many bodies, which, otherwiſe, are not diſſolved without difficulty, as myrrh, gum ſandarach, and others. The antient chymiſts wrote a great deal about the art of making alcali's melt in the fire like wax; and hence they called the operation *inceration*. Might they not mean the proceſs we have juſt now deſcribed? Certainly the ſalt produced by it has this property.

4. If lime is firſt ſlaked, or extinguiſhed, either in the air, or with water, as almoſt all old lime is, or is converted into a powder; then, if it is thus managed with a fixed alcali, it will not produce this acrid kind of ſalt. This ſalt, when it is once melted in the air, or is kept a good while, not carefully ſtopped, loſes this ſingular virtue; and then it depoſits a large quantity of inactive ſtony fæces, which did not appear before: hence, therefore, we learn, that fire communicates to inert ſtone, and ſhells of fiſh, an acrimony, that is not eaſily procurable in any other manner: when a native vegetable ſalt, therefore, from a natural, ſoft, ſaponacious one, is converted into a fixed alcali, does it not require this acrimony from the fire?

5. The ſalt, thus prepared, obtains this ſingular property, that it becomes vaſtly diſpoſed to a union with the expreſſed and diſtilled oils, both of vegetables and animals, and thus to form a ſoap. And this ſeems to ariſe from its being rendered ſo exceedingly penetrating, that it becomes capable of intimately dividing theſe oils, and uniting with them, which, without the aſſiſtance of this ſharp lime, can ſcarcely be effected conveniently: nor, without the lime, would the alcali run ſo eaſily in the fire; for that melts with a great deal of difficulty.

Lunar CAUSTIC, called alſo lapis cauſticus, is a preparation of ſilver, ſometimes of copper, uſually made by diſſolving the metal with ſpirit of nitre, evaporating two thirds of the fluid, and boiling the reſt to an oily conſiſtence, which, when cold, grows hard.

CAU'STICUM *antimonial*, the name given in the late London Diſpenſatory to what was before called butter of antimony.

CAU'TIONARY *Towns*, places of ſtrength, which one prince or power puts in the poſſeſſion of another, as a ſecurity either for the payment of a debt, or performance of ſome other matter ſtipulated between them. Rochelle, Saumur, and ſome other cities in France, were allowed to the reformed, for their ſtrength and ſecurity.

CA'XOU, in metallurgy, a word uſed to expreſs a cheſt of ores of ſilver, or any other metal, that has been burnt, ground, and waſhed, and is ready to be refined.

CA'ZIMI, among the Arabian aſtronomers, denotes the center or middle of the ſun. A planet is ſaid to be in Cazimi, when it is not diſtant from the ſun either in longitude or latitude above 17′, or the aggregate of the ſemi-diameter of the ſun's diſk and that of the planet.

CE'DAR, in botany, a large tree which puſhes out branches at the diſtance of ten or twelve feet from the ground. They are large, and at a diſtance from each other. Its leaves are pretty much like thoſe of roſemary. It is an ever-green, and lives very long, but dies as ſoon as its top is cut off. The leaves ſtand upright, and the fruit hangs down; that fruit is a ſmall one, like that of the pine-tree, except that its rind is thinner, ſmoother, and more open. The ſeed is like that of the cypreſs-tree.

There are ſtill ſome Cedars on mount Libanus, but in ſmall number, above and to the eaſt of Biblos and Tripoli. There are none to be ſeen any where elſe on thoſe mountains. But it is very probable that there were a great many more formerly, ſince their timber was uſed in ſo many conſiderable works. There are ſome Cedars alſo growing in ſome parts of Africa, in the iſle of Cyprus, and in that of Crete or Candia. Joſephus, the Jewiſh hiſtorian, aſſerts, that Solomon planted ſo large a quantity of Cedars in Judea, that they were as numerous as the ſycomore-trees, which are very common in that country.

They uſed that timber not only for beams, and for the boards which covered the buildings, and made up the cielings of the apartments, but they put it likewiſe into the body of the walls, ſo that there were, for inſtance, three rows of ſtone and one of Cedar-wood. They alſo made ſtatues of it, when they would have them laſt a long time. It is uſed to make fine turners and inlaid work, and in ſome floors and cielings of royal palaces, and other ſtately edifices; but, in thoſe places where it grows, it is employed in land and ſea buildings, like common timber.

During the hotteſt ſeaſon of the year, there runs naturally, and without any inciſion, from the trunk and large branches of this tree, a white, clear, and tranſparent reſin, which is called Cedar-gum, or maſticine-manna, which hardens and forms itſelf into grains like maſtic. The largeſt trees hardly yield ſix ounces of it a day.

When the gum has done running of itſelf, they make inciſions into the tree, from whence iſſues afterwards an unctuous liquor, which dries, as it runs along the trunk of the tree. This is the reſin of Cedar, which is ſold at the druggiſts ſhops; it is of a fine yellow colour, friable, lucid, tranſparent, and of a good ſmell.

Laſtly, the Cedar furniſhes alſo a third ſort of drug, called turpentine, or reſin of Cedar; it is a liquor clear, like water; of a ſtrong penetrating ſcent, contained in ſmall bladders or veſicles, which the exceſſive heat of the ſun cauſes to riſe on the trunk of the tree. Theſe gums and reſins of Cedar are to be met with in France.

Mr. Miller obſerves, that what we meet in the ſcripture of the lofty Cedars, can be no ways applicable to the ſtature of this tree; ſince, by the experience of thoſe we have now growing in England, as alſo from the teſtimony of ſeveral travellers, who have viſited thoſe few remaining trees on mount Libanus, they are not inclined to grow very lofty, but, on the contrary, extend their branches very far: to which the alluſion made by the Pſalmiſt agrees very well, when he is deſcribing the flouriſhing ſtate of a nation: they ſhall ſpread their branches like the Cedar-trees.

The wood of this famous tree is accounted proof againſt all putrefaction of animal bodies. The ſaw-duſt is thought to be one of the ſecrets uſed by thoſe mountebanks, who pretend to have the embalming myſtery. This wood is alſo ſaid to yield an oil, which is famous for preſerving books and writings; and the wood is thought, by lord Bacon, to continue above a thouſand years ſound. It is likewiſe recorded, that, in the temple of Apollo at Utica, there was found timber of near two thouſand years old. And the ſtatue of the goddeſs, in the famous Epheſian temple, was ſaid to be of this material alſo, as was moſt of the timber work of that glorious ſtructure.

This ſort of timber is very dry, and ſubject to ſplit; nor does it well endure to be faſtened with nails; therefore pins of the ſame wood are much preferable.

The Cedar brought from Barbadoes and Jamaica is a ſpurious ſort, of ſo porous a nature, that the wine will leak through it. That produced in New England is a lofty grower, and makes excellent planks, and flooring that is everlaſting. They ſhingle their houſes with it, and uſe it in all their buildings.

ings. This is the oxycedrus of Lycia, which Vitruvius deſcribes as having its leaves reſembling thoſe of cypreſs.

The Cedar of Greece and Aſia was no other than a ſmaller kind of juniper, which, having prickly leaves, was by ſome called oxycedrus; and the common juniper was at that time called alſo by the name of Cedar. The Lycian Cedar of the Greeks was this juniper kind; but the cedrium and cedrelæum, which were a kind of pitch and an oil ſeparated from it by melting, were not prepared from this Cedar, but from the Syrian Cedar; which was a larger ſhrub, and reſembled the cypreſs, and therefore was confounded with that tree, being called by ſome the wild cypreſs. The cedrium was always made from this ſpecies, but the oleum de coda, or code oil, was made from the fruit of the oxycedrus, or prickly-leaved juniper, called Cedar by the Greeks, and growing in their own country.

The ſhittim and the almug, mentioned in ſcripture, are uſually ſuppoſed to have been kinds of Cedar.

Johnſton, in his Dendrographia, is of opinion, that pitch was anciently made of Cedar, as well as of the pine and fir, grown old and oily.

CE'GINUS, in aſtronomy, a fixed ſtar of the third magnitude, in the left ſhoulder of Bootes. Its longitude, according to Hevelius, for the year 1700, was 13° 26′ 4″, and its latitude northern 49° 35′ 47″.

Some alſo give this denomination to the ſtar otherwiſe called Cepheu.

CEI'BA, in botany, the Indian name of the ſilk cotton tree. Dr. Linnæus calls it xylon, which is the old name applied to the common cotton; and he has given to that genus the modern title of goſſypium. The characters are: it hath a roſaceous flower, conſiſting of ſeveral leaves placed in a circular order: from whoſe calyx ariſes the pointal, which afterwards becomes a fruit ſhaped like a bottle, divided into five parts from the top to the bottom; in which are contained ſeveral round ſeeds wrapped up in a ſoft down, and faſtened to the five-cornered pyramidal placenta.

Theſe trees grow very plentifully both in the Eaſt and Weſt-Indies, where they arrive to a prodigious magnitude: the Weſt-Indians hollow the trunks of thoſe trees for making their canoes, for which they are chiefly valued.

It is reported, that in the iſland of Cuba, in Columbus's firſt voyage, was ſeen a canoe made of an hollowed trunk of one of thoſe trees, which was ninety-five palms long, and capable of containing one hundred and fifty men.

And ſome modern writers have affirmed, that there are trees now growing in the Weſt-Indies, ſo large as ſcarcely to be fathomed by ſixteen men, and ſo high, that an arrow can ſcarcely be ſhot to their tops.

The wool of theſe trees is of a dark colour, and too ſhort to ſpin; ſo that it is little valued: but ſometimes the inhabitants ſtuff beds and pillows with it, though it is accounted unwholeſome to lie upon. The inhabitants of the Weſt-Indies call this ſilk-cotton; but, the ancient American name for this plant being Ceiba, father Plumier hath continued it under that name, and conſtituted a genus of it.

Theſe plants are preſerved in ſome curious gardens in Europe, where they thrive very well, if they are placed in a bark-ſtove; but, as they are trees of a large growth, it can hardly be expected to ſee either fruit or flowers from them in England; ſince they grow to a great magnitude before they produce either in their own country.

CE'LERI, a name given by our gardeners to ſome ſpecies of apium.

We have two ſorts of this plant cultivated in our gardens, the Italian Celeri, and the celeriac.

The ſeeds of this plant ſhould be ſown at two different ſeaſons, the better to continue it for uſe, through the whole ſeaſon, without its running up to ſeed. The firſt ſowing ſhould be in the beginning of March, in an open ſpot of light earth; but the ſecond ſowing ſhould be in April, in a moiſter ſoil. In about a month's time after ſowing, the plants will come up; they muſt be kept clear of weeds, and, if the ſeaſon is dry, they muſt be watered. When they have been a month or five weeks above ground, they will be fit to tranſplant. They muſt now be ſet at three inches diſtance, in beds of moiſt rich earth. In the middle of June ſome of the plants of the firſt ſowing will be fit to tranſplant for branching; the ſoil in which it is now planted muſt be moiſt, rich, and light.

The manner of planting it at this time is this: you muſt dig a trench of ten inches wide, and eight or nine inches deep, looſening the earth at the bottom, and laying it level; and the earth which comes out of the trench, is to be equally laid on each ſide of the trench, to be ready to draw in again to earth the Celeri, as it advances in height. The trenches ſhould be made at three feet aſunder, and the plants ſet in them at ſix inches diſtance. The tops of their leaves, and ends of their roots, are to be cut off when planted; and they are to be watered, to fix the earth to their roots: after this, they require little care but the drawing up the earth to them, as they advance in height; it muſt be carefully obſerved, in doing this, never to bury the heart of the plant, nor ever to perform it but in dry weather; for, if done in wet, the plants will rot. The earth between the trenches is to be uſed, when that which was thrown out in the digging of them is all employed; and, ſoon after midſummer, ſome of the firſt ſowing will be ready to cut, and the ſucceeding ones, if rightly managed, will continue it till April or May. Many plantations are indeed alſo made out of one ſowing, by pulling up the ſtrongeſt plants firſt, then ſome time after the ſtrongeſt of the remaining, and, finally, the leaſt of all, which will be got to a proper growth by that time. *Miller's Gardener's Dict.*

CE'LTIC *Philoſophy.*—Under this denomination we are to comprehend not only the philoſophers of Gaul, but all thoſe who formerly flouriſhed in Europe, either in the Britannic iſlands, among the Germans and Iberians, or in Italy. Burnet tells us, it is very probable that the Germans and Britons had their druids, who, if they were not ſo learned as thoſe among the Gauls, and held in leſs eſteem, yet profeſſed the ſame principles and taught the ſame doctrine. It is not ſurprizing any account of their philoſophy ſhould be ſo obſcure as it is, conſidering the interval of time wherein it flouriſhed between us and even the ancient Romans. No writings or monuments are left to clear up the point; it is moſt probable they concealed their opinions from all who were not initiated in their myſteries, never wrote down, but conveyed their arcana by oral tradition. The fables of Solinus, Pliny, Pomponius Mela, Aul. Gellius, Herodotus, and Strabo, ſhew abundantly the weakneſs and ignorance of the Latin and Greek writers on this ſubject. Cæſar himſelf, the conqueror of the Gauls, though ſo nice an obſerver of the manners and cuſtoms of thoſe he vanquiſhed, ſays little of the Celtæ, and what he ſays is involved in a cloud of fables. What farther contributes to the obſcurity of this hiſtory, is, the many different people who went by the general name of Celtæ; from hence an amazing variety of principles and cuſtoms muſt neceſſarily have been introduced. As, for example, in the time of Cæſar and Tacitus, the Gauls differed from the Germans very much, though they were of the ſame origin; the Germans were much heavier than the Gauls, who, according to Juſtin, had refined their manners by an intercourſe with the Greeks, who had ſettled at Marſeilles; and that the Gauls, from them, had contracted a politeneſs natural to their nation. The Greeks and Romans are both ignorant of the antiquity of the Celtæ in all reſpects.

The Celtæ were more addicted to war than ſtudy; they followed the chace in their vaſt foreſts with more ardour than they purſued metaphyſical ſubtilties. But their moral philoſophy was far more excellent than that of the Greeks and Romans, who had a dangerous way of rendering truth obſcure by argumentation. But, notwithſtanding the contempt they entertained for the polite ſciences, they had among them ſages and philoſophers who kept their philoſophy a ſecret, though in a different manner from that among the Greeks and Romans. Theſe ſages were called druids, a name famous in antiquity, though very obſcure as to its original. The moſt probable opinion is, that they derive their name from the oak, becauſe, by an invariable tradition, they are ſaid to have aſſembled in groves of oaks, and held the oak ſacred. The conformity of their doctrines with thoſe of the Magi, among the Perſians and Chaldeans of Babylon, argues them not unacquainted with thoſe philoſophers.

The druids had a great influence over the ſtate; they in ſhort left the prince only a power of commanding in time of war. The tyranny of theſe prieſts was no doubt deſtructive of the royal authority; for, if a prince pretended to take the reins of government into his own hands without conſulting them, they at once interdicted him from being preſent at ſacrifices, and at once launched out all the anathemas of religion againſt him, and, being followed with blind obedience by their diſciples, ſubverted the government; they were, in ſhort, impoſtors who ſubjected a weak people under the yoke of ſhameful ignorance. According to ancient writers, the druids wore collars of gold, dreſſed magnificently, and the pomp in which they lived, created the eſteem and authority they had among the Gauls.

The druids were divided into ſeveral claſſes; according to Ammianus Marcellinus, there were among their body, bards, eubages, and thoſe ſtrictly called druids. The employment of the bards was to celebrate the actions of heroes in verſe. The eubages applied themſelves to the contemplation of nature, and diſcovering her ſecrets. Thoſe which were called druids, by way of eminence, joined to the ſtudy of phyſics that of ethics and politics. They had two ſorts of doctrine, one for the people, which was therefore public; another for their diſciples, which they had kept ſo inviolably ſecret, that no part of it has tranſpired, except that of the immortality of the ſoul, which, Pomponius Mela ſays, they divulged with a deſign to animate the courage of their countrymen, and inſpire them with a contempt of death.

The Celtæ, like other nations, ſunk into idolatry. Their prieſts the druids, who certainly had clearer notions of the Deity than the people, encouraged them in this fooliſh ſuperſtition. This reproach may too juſtly be objected to all legiſlators. The gods they worſhipped, were Theutates, Heſus, and Taranes; the Romans make Theutates Mercury, Heſus Mars, and Taranes Jupiter; but this is doubted by men of learning among the moderns. It is however certain by the concurring teſtimony of antiquity, that they ſhed human blood on their altars, and the druids were the prieſts who ſlew the unhappy victims.

After the Gauls were conquered by the Romans, they, who before looked on God as the ſoul of the world, and worſhipped him every-where, and in all places, though ſome were in a particular manner dedicated to him; followed the example of their maſters, built temples and conſecrated altars. The druids inſenſibly loſt their credit, and were at laſt baniſhed by a decree of the ſenate, either becauſe it was apprehended they carried on ſome dangerous deſigns againſt the ſtate, or continued human ſacrifices.

The druids both among the Gauls and Germans preſerved their authority by divination. But, what is more remarkable, theſe divinations were generally delivered by women, from whence grew the prodigious reſpect they had for them, which was ſometimes carried to the pitch of adoration; for Tacitus tells us Velleda and Aurinia were reckoned among the goddeſſes.

We ſhall conclude this article by obſerving that the Celtæ, from a firm perſuaſion of the immortality of the ſoul and a future ſtate, poſſeſſed true courage, had a juſt contempt of death, deſpiſed luxury, and refuſed to meet no danger, when virtue and honour called. It is indeed a pity ſuch a nation had druids for their prieſts.

CE'MENT (*Dict.*)—We have various receipts for making Cement to mend broken china or glaſſes; one of the fineſt, and, at the ſame time, ſtrongeſt Cements for this purpoſe is, the juice of garlick ſtamped in a ſtone mortar; this will leave little or no mark, if done with care.

Another Cement for broken glaſſes, china, and earthen ware, may be prepared by beating the white of an egg very clear, and mixing with it fine powdered quick-lime; or iſinglaſs, powdered chalk, and a little lime may be mixed together, and diſſolved in fair water, with which the glaſſes, &c. are to be cemented, and then ſet in the ſhade to dry; a precaution that ſhould always be obſerved, which ever of the above Cements are uſed.

For the manner of preparing a Cement to bind together the various embelliſhments of grottoes. See the article GROTTO.

CEME'NTATORY *Water*, *aqua cementatoria.*—Thoſe ſprings produce the water which paſſes under this name, that are ſtrongly impregnated with vitriol of copper, which are met with at the bottom of ſeveral copper-mines, but eſpecially in Hungary, near Neuvol, at the bottom of the Krapack mountains. The property of turning iron into copper is generally attributed to them; but, notwithſtanding the knowledge of chemiſtry be ſo imperfect, it is eaſy to ſee there is no tranſmutation, but a ſimple precipitation, cauſed by the iron ſteeped in this water. This is the manner of the proceſs to make this pretended tranſmutation:

The Cementatory water is very clear and limpid at the ſpring-head; reſervoirs are made to catch it in conſiderable quantities. The water collected in theſe reſervoirs is put into wooden troughs, about a foot wide, and of the ſame depth; as to their length, it is not determined; they are ſometimes 100, ſometimes 150 feet long. Theſe troughs are filled with old iron as full as they can hold, then the Cementatory water is let in which covers the iron, diſſolves and deſtroys it, and puts in its ſtead the copper with which it is impregnated. It has the ſame form as the iron, and in three months, or thereabouts, according to the ſtrength of the vitriolic water, all the iron is conſumed and deſtroyed, and the copper is entirely precipitated. The reaſon why the precipitated copper takes the ſame ſhape as the iron had before, is, becauſe the vitriolic acid, having more affinity with the iron, leaves the copper which it held in a ſtate of diſſolution, to cleave to the iron: from whence it follows, that the quantity of copper which precipitates is exactly equal to the quantity of iron which diſſolves.

By this method it is ſaid a large quantity of copper is obtained, without much expence or trouble; and this copper, they tell you, is more ductile and malleable than what is procured from the mine after ſeveral meltings. This copper is ſoft, and like clay while under water, but it aſſumes a conſiſtence and acquires a hardneſs on being brought into the air.

The two moſt famous ſprings of Cementatory water in Hungary, are thoſe of Smolnitz and Heregrund: the firſt of theſe is ſaid to furniſh 600 quintals of ſuch copper as we have deſcribed, ſuch is the abundance of its water, and ſo ſtrongly is it impregnated with vitriol of copper. Beſides, it is remarkable that iron ſteeped in this water diſſolves in three weeks entirely, and the copper ſucceeds in its place; whereas other ſprings take three months, ſometimes a year, before the operation is completed.

Several other ſprings of the ſame quality are found in Hungary, Germany, Sweden, &c. Henekel, in his Pyritologia, page 764, explains the cauſe of theſe phænomena in this manner. The waters of theſe ſprings, ſays he, paſſing over the copper pyrites which are diſſolved in the bowels of the earth, take off the vitriolic particles which are formed on the pyrites, and carry them along with them.

CE'NSUS, among the Romans, was an authentic declaration, made by the ſeveral ſubjects of the empire, of their reſpective names and places of abode, before proper magiſtrates, in the city of Rome, called cenſors; and in the provinces cenſitors, by whom the ſame were regiſtered.

This declaration was accompanied with a catalogue, or enumeration in writing, of all the eſtates, lands, and inheritances they poſſeſſed; their quantity, quality, place, wives, children, tenants, domeſtics, ſlaves, &c.

The Cenſus was inſtituted by king Servius, and was held every five years. It went through all the ranks of people, though under different names: that of the common people was called Cenſus, or luſtrum; that of the knights Cenſus, recenſio, recognitio; that of the ſenators, lectio, relectio.

Hence, alſo, Cenſus came to ſignify a perſon who had made ſuch a declaration: in which ſenſe it was oppoſed to incenſus, a perſon who had not given in his eſtate or name to be regiſtered.

The Cenſus among the old Romans was held, as is commonly thought, every five years; but this muſt not be taken to be preciſely true: on the contrary, Dr. Middleton has ſhewn, that both the Cenſus and luſtrum were, for the moſt part, held irregularly and uncertainly, at very different and various intervals of time.

The Cenſus was an excellent expedient for diſcovering the ſtrength of the ſtate: by it they learnt the number of the citizens, how many were fit for war, and who for offices of other kinds; how much each was able to pay of taxes towards the charge of the war.

The Cenſus, according to Salmaſius, was peculiar to the city of Rome. That in the provinces was properly called profeſſio; but this diſtinction is not every-where obſerved by the ancients themſelves.

CENT, ſignifies properly a hundred, being an abridgment of the word centum; but it is often uſed, in commerce, to expreſs the profit or loſs ariſing from the ſale of any commodity: ſo that, when we ſay there is 10 per Cent. profit, or 10 per Cent. loſs, upon any merchandize that has been ſold, it is to be underſtood that the ſeller has either gained or loſt ten pounds on every hundred pounds of the price at which he bought that merchandize, which is $\frac{1}{10}$ of profit, or $\frac{1}{10}$ of loſs, upon the total of the ſale.

To gain 100 per Cent. (or Cent. per Cent.) in trade, is the doubling of one's capital: to loſe 50 per Cent. is to loſe one half of it.

Cent, is alſo uſed in the trade of money, and ſignifies the benefit, profit, or intereſt of any ſum of money, which is laid out for improvement.

Thus we ſay, money is worth 4 or 5 per Cent. upon exchange; that is to ſay, it brings 4 or 5 pounds profit for every hundred pounds laid or lent out.

Cent, is alſo uſed with regard to the draughts, or remittances of money, made from one place to another. Thus we ſay, it will coſt 2 $\frac{1}{2}$ per Cent. to remit money to ſuch a city.

When we ſay that a broker, or exchange-agent, takes one-eighth per Cent. fee or perquiſite, for the contracts or bargains that are made by his means and interpoſition, it is to be underſtood, that there is to be paid to him the eighth part brokerage of a pound, which is 2 s. 6 d. for every hundred pounds he cauſed to be negociated. The one eighth per Cent. is commonly paid by both the contracting parties; that is to ſay, by him who gives, and by him who receives, the money; ſo that the brokers have $\frac{2}{8}$ or $\frac{1}{4}$ per Cent. for every bargain, which amount to 5 s. or $\frac{1}{4}$ of a pound for every 100 l. and 2 l. 10 s. for every 1000 l.

CE'NTAURS, in mythology, a kind of fabulous monſters, half men, half horſes.

The poets feign that the Centaurs were the ſons of Ixion and a cloud. The reaſon of this fancy is, that the caſtle to which they retired was called νεφελη, which ſignifies a cloud. This fable is differently interpreted: ſome will have the Centaurs to have been a body of ſhepherds and herdſmen, rich in cattle, who inhabited the mountains of Arcadia, and to whom is attributed the invention of bucolic poetry.

The Centaurs in reality were a tribe of Lapithæ, who inhabited the city Pelethronium, adjoining to mount Pelion, and firſt invented the art of breaking horſes, as is intimated by Virgil.

CENTENI'NUM *Ovum*, among naturaliſts, denotes a ſort of hen's egg, much ſmaller than ordinary, vulgarly called a cock's egg; from which it has been fabulouſly held that the cockatrice or baſiliſk was produced. *Brown, Vulg. Err.*

The name is taken from an opinion, that theſe are the laſt eggs which hens lay, having laid an hundred before; whence Centeninum, q. d. the hundredth egg.

M. La Peyronie has carried the hiſtory of the ova Centenina to a greater length, as well as certainty; a hen was brought to him which for a conſiderable time laid no other eggs: the ſame hen was alſo obſerved to crow like a cock, and to render by the cloaca a thin yellow matter, much like the yolk of an egg diluted in water. Upon opening her, ſhe was found hydropical; a bladder as big as the fiſt, full of water, was found contiguous to the oviduct, which it preſſed and crowded ed in ſuch a manner, as not to leave the cavity thereof above five lines in diameter; ſo that a common egg, ſuch as it is when it falls from the ovary into the tube, could not paſs without burſting, by which the yolk was let out, and diſcharged another way. *Mem. Acad. Scienc. An.* 1710.

CE'NTER (*Dict.*)— CENTER *of the equant*, in the old aſtronomy, a point in the line of the aphelion; being ſo far diſtant from the center of the excentric, towards the aphelion, as the ſun is from the excentric towards the perihelion.

CE'NTERING *of an optic glaſs*, the grinding it ſo as that the thickeſt part is exactly in the middle.

Method of CENTERING *an object-glaſs.*— A circular object-glaſs is ſaid to be truly centered, when the center of its circumference is ſituated in the axis of the glaſs; and to be ill centered, when the center of its circumference lies beſides the axis. Thus let *d* (*Plate* XV. *fig.* 1.) be the center of the circumference of an object-glaſs *a b c*, and ſuppoſe *e* to be the point where its axis cuts its upper ſurface. If the points *d* and *e* do not coincide, the glaſs is ill centered. Let *a f g* be the greateſt circle that can be deſcribed about the center *e*, and, by grinding away all the margin without this circle, the glaſs will become truly centered. Now, the center *e* which lies in the axis of the glaſs, may be found by ſeveral methods, but I prefer this that follows:

Let a couple of ſhort cylindrical tubes be turned in wood or braſs, and let the convexity of the narrower be ſo exactly fitted to the concavity of the wider as juſt to turn round in it with eaſe, but without waddling; and let the planes of the baſes of the tubes be exactly perpendicular to their ſides. Place the baſe of the narrower tube upon a ſmooth braſs plate, or a wooden board of an equal thickneſs, and, with any ſharp-pointed tool, deſcribe a true circle upon the board round the outward circumference of the baſe: and upon the center of this circle, to be found when the tube is removed, deſcribe a larger circle upon the board. Theſe two circles ſhould be ſo proportioned, that the one may be ſomewhat greater, and the other ſomewhat ſmaller, than any of the glaſſes intended to be centered by them. Then, having cleared out all the wood within the inner circle, put the end of the tube into this hole, and there faſten it with glew, ſo that the baſe of the tube may lie in the ſurface of the board: then having fixed the wider tube very firmly in a hole made in the window-ſhutter, and having darkened the room, lay the glaſs to be centered upon the board fixed to the narrower tube; and having placed the center of it, as near as you can gueſs, over the center of the hole, fix it to the board with two or three lumps of pitch, or ſoft cement, placed at its circumference. Then put the narrower tube into the wider as far as it can go, and fix up a ſmooth ſcreen of white paper to receive the pictures of objects that lie before the window, and, when they appear diſtinct upon the ſcreen, let the inner tube be turned round upon its axis, and, if the center of the glaſs happens to be in this axis, the picture will be perfectly at reſt upon the ſcreen; if not, every point of it will deſcribe a circle. With a pencil mark the higheſt and loweſt places of any one circle, deſcribed by ſome remarkable point in that part of the picture which appears moſt diſtinct; and, when this point of the picture is brought to the higheſt mark, ſtop the circular motion of the tube, and, keeping it in that poſition, depreſs the object-glaſs, till the point aforeſaid falls exactly in the middle between the two marks. Then turn the tube round again, and the point of the picture will either reſt there or will deſcribe a much ſmaller circle than before, which muſt be reduced to a quieſcent point by repeating the ſame operation. Then, I ſay, the center (of refraction) of the glaſs will lie in the axis of the tube, and, by conſequence, will be equidiſtant from the circumference of the large circle deſcribed upon the board fixed to it. Now, to deſcribe a circle upon the glaſs *f g h* (*fig.* 2.) about its center of refraction, let a long ſlender braſs plate *a c b* be bent ſquare at each end, as repreſented in the figure, leaving a piece in the middle equal in length to the diameter of the large circle *a d b e* that was deſcribed upon the board; and let the ſquare ends of the plate be filed away, ſo as to leave a little round pin in the middle of each. Then having laid it over the glaſs, along any diameter of the large circle *a d b e*, make two holes in the board to receive the pins *a b*, and find the center of this circle upon the long plate; and with this center *c* deſcribe as large a circle as you can, upon the glaſs underneath, with a diamond-pointed compaſs; and grind away all the margin as far as this circle *f i k*, in a deep tool for grinding eye-glaſſes; and then the glaſs will be truly centered. If the pitch or cement be too ſoft to keep the glaſs from ſlipping, while the circle is deſcribing, it may be fixed firmer with wax or harder cement.

To ſhew the reaſon of this practice, (*fig.* 3.) repreſents a ſection of the object-glaſs *k l m*, of the board *a b*, and of the tubes *c d* and *h i*, and of the window-ſhutter *n o*. Imagine the plane of this ſection, or of the ſcheme, to paſs through *e*, a point in the glaſs, which keeps its place, while the reſt are turning round it, by the motion of the tube; let it alſo paſs through *l* the center of refraction in the glaſs, and cut an object in the line P Q R; then let a pencil of rays flowing from any Q be collected to the focus *q*, upon the ſcreen S T; and the points Q, *l*, *q*, will be in a ſtraight line deſcribed by the axis, or principal ray, of the pencil. Draw Q *e f*, cutting the ſcreen in *f*; and, while the tube is turning round, the line Q *l q* will deſcribe a conical ſurface, whoſe axis is the fixed line Q *e f*; and, therefore, the focus *q*, or image of the point Q, will deſcribe a circle *q g x* about *f*, to be found upon the ſcreen by biſecting the interval *q x* between the higheſt and loweſt points of the circle. Now, as *f* is the center of this circle, ſo *e* is the center of another circle deſcribed by *l*; and, therefore, by depreſſing the glaſs *k l* along the ſurface of the board *a b*, till the image *q* falls upon the mark *f*, the point *l* will be depreſſed to *e* the center of motion, and then it will be in the axis of the tube, and conſequently equidiſtant from the circumference of the circle deſcribed upon the board *a b*; and here it is plain that the image *q* will be at reſt in the point *f*.

It is not neceſſary to the accuracy of the practice, that the point Q ſhould be in the axis of the glaſs. For if the glaſs *k l m* be turned about its axis Q L *q*, the image *f* of any collateral point Q will remain at reſt; becauſe the points Q *l* are at reſt, and the axis Q *e f* of the oblique pencil is a ſtraight line.

The chief advantage of having a glaſs well centered is this, that the rays coming through any given hole or aperture, whoſe center coincides with the axis of the glaſs, will form a diſtincter image, than if that center lay beſide the axis; becauſe the aberrations of the rays from the geometrical focus of the pencil are as the diſtances of their points of incidence from the center of refractions in the glaſs.

If the picture be received upon the unpoliſhed ſide of a piece of plane glaſs, inſtead of the paper S T, its motions may be diſcerned more accurately by viewing it from behind through a convex eye-glaſs; as in a teleſcope where croſs-hairs are uſually ſtrained over a hole put into the place of the rough glaſs. Therefore, as object-glaſſes are commonly included in cells that ſkrew upon the end of the tube, one may examine whether they be pretty well centered, by fixing the tube, and by obſerving, while the cell is unſkrewed, whether the hairs keep fixed upon the ſame lines of an object.

CENTRI'FUGAL *Wheel.* See *Centrifugal* WHEEL.

CE'NTRO-BARYC *Method* (*Dict.*)— The doctrine is compriſed in the following theorem, with its corollaries.

Every figure, whether ſuperficial or ſolid, generated by the motion of a line or a figure, is equal to the factum of the generating magnitude into the way of its center of gravity, or the line which its center of gravity deſcribes.

Demonſt. For ſuppoſe the weight of the whole generating magnitude collected in the center of gravity; the whole weight, produced by its motion, will be equal to the factum of the weight moved, into the center of gravity. But, when lines and figures are conſidered like homogeneous heavy bodies, their weights are as their bulks: and, therefore, the weight moved is the generating magnitude; and the weight produced, that generated. The figure generated, therefore, is equal to the factum of the magnitude, into the way of its center of gravity. Q. E. D.

Corol. 1. Since a parallelogram A B C D (*Plate* XV. *fig.* 7.) is deſcribed, if the right line A B proceed according to the direction of another A C, with a motion ſtill parallel to itſelf; and the way of the center of gravity E is equal to the right line E F, perpendicular to C D, that is, to the altitude of the parallelogram: its area is equal to the factum of the baſe C D, or the deſcribent line, into the altitude E F. See PARALLELOGRAM in the Dict.

Corol. 2. In the ſame manner it appears, that the ſolidity of all bodies, deſcribed by a plane deſcending according to the direction of any right line A C, is had by multiplying the deſcribing plane by the altitude. See PRISM, and CYLINDER in the Dict.

Corol. 3. Since a circle is deſcribed, if the radius C L (*fig.* 5.) revolve round a center C, and the center of gravity of the radius C L be in the middle F; the way of the center of gravity is a periphery of a circle X, deſcribed by a ſubduple radius: conſequently the area of the circle is equal to the factum of the radius C L, into the periphery deſcribed by the ſubduple radius C F.

Corol. 4. If a rectangle A B C D (*fig.* 5.) revolve about its axis A D, the rectangle will deſcribe a cylinder, and the ſide B C the ſuperficies of a cylinder. But the center of gravity of the right line B C is in the middle F; and the center of gravity of the generating plane in the middle G, of the right line E F. The way of this latter, therefore, is the periphery of a circle deſcribed by the radius E G; that of the former, the periphery of a circle deſcribed by the radius E F. Wherefore, the ſuperficies of the cylinder is the factum of the altitude B C, into the periphery of a circle deſcribed by the radius E F, or the baſe. And the ſolidity of the cylinder is the factum of the generating rectangle A B C D, into the periphery of a circle deſcribed by the radius E G, which is ſubduple of E F, or of the ſemidiameter of the cylinder.

Suppoſe *v. gr.* the altitude of the deſcribing plane, and therefore of the cylinder B C = *a*; the ſemidiameter of the baſe D C $= r$; then will E G $= \frac{1}{2} r$; and, ſuppoſing the ratio of the ſemidiameter to the periphery $= 1 : m$, the periphery deſcribed by the radius $\frac{1}{2} r = \frac{1}{2} m a r$. Therefore, multiplying $\frac{1}{2} m r$ by the area of the rectangle A C $= a r$; the ſolidity of the cylinder will be $= \frac{1}{2} m a r$. But $\frac{1}{2} m a r = \frac{1}{2} r . m r . a$ the area of the circle deſcribed by the radius D G. It is evident, therefore, the cylinder is equal to the factum of the baſe into the altitude.

Corol. 5. In like manner, ſince the center of gravity of the right line A B (*fig.* 8.) is in the middle M, and the ſurface of a cone is deſcribed, if the triangle A B C revolve about its axis; if P M $= \frac{1}{2}$ C; the ſuperficies of the cone will be equal to the factum of its ſide A B, into the periphery deſcribed by the radius P M, on the ſubduple of the ſemidiameter of the baſe B C.

Suppoſe, *v. gr.* B C $= r$, A B $= a$; the ratio of the radius to the periphery $1 : m$; then will P M $= \frac{1}{2} r$, and the periphery deſcribed by this radius $= \frac{1}{2} m r$. Therefore, multiplying $\frac{1}{2} m r$ into the ſide of the cone A B, the product is the ſuperficies of $\frac{1}{2} a m r$. But $\frac{1}{2} a m r$ is alſo the factum of $\frac{1}{2} a$ and $m r$: therefore, the ſurface of the cone is the product of the periphery, into half the ſide.

Corol. 6. If the triangle A C B (*fig.* 6.) revolve about an axis, it deſcribes a cone; but if C B be biſected in D, and the right line A D be drawn, and A O $= \frac{2}{3}$ A D; the center of gravity will be in O. The ſolidity of the cone, therefore, is equal to the factum of the triangle C A B, into the periphery deſcribed by the radius P O; but A D : A O :: B D : O P; and A O $= \frac{2}{3}$ A D, and D B $= \frac{1}{2}$ C B. Therefore, O P $= \frac{2}{3}$ D B $= \frac{1}{3}$ C B.

Suppoſe, *v. gr.* C B $= r$, A B $= a$; the ratio of the radius to the periphery $= 1 : m$. Then will O P $= \frac{1}{3} r$ the periphery deſcribed by this radius $\frac{1}{3} m r$; the triangle A C B $= \frac{1}{2} r$; and, therefore, the ſolidity of the cone $\frac{1}{3} m r \, \frac{1}{2} a r = \frac{1}{6} a m r^2$. But $\frac{1}{6} a m r^2 = \frac{1}{2} r . m r \, \frac{1}{3} a$. Or, the factum of the baſe of the cone into the third part of the altitude.

This elegant theorem, which may be ranked among the chief inventions in geometry of the laſt age, was taken notice of long ago by Pappus; but the jeſuit Guldinus was the firſt who ſet it in its full light, and exhibited its uſe in a variety of examples. Several other geometers, after Guldinus and Pappus, alſo uſed it in meaſuring ſolids, and ſurfaces generated by a rotation round a fixed axis, eſpecially before the late invention of the integral calculus: and it may ſtill take place in ſome caſes, where the integral calculus would be more difficult. M. Leibnitz has obſerved, that the method will hold, though the axis or center be continually changed during the generative motion.

CE′PITES, in natural hiſtory, a name uſed by the ancients to expreſs a gem, which gave the repreſentation of ſeveral cluſters of plants and flowers in the beds of a garden, with naked veins, expreſſing the walks between.

CERA′STES, *the horned ſnake*, in zoology, the name of a ſpecies of ſerpent, which has on its forehead two protuberances, looking like ſhells, but of a more ſolid texture, and, from their reſemblance of horns, have given it its name: theſe are often no larger than grains of barley: its teeth are like thoſe of the viper, and are placed in the ſame order: it is of the number of viviparous ſerpents, and is remarkable among the ſerpent claſs for its long enduring thirſt. It is found in Lybia and Arabia, particularly about the town of Suez.

CERA′SUS, *the cherry-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, or compoſed of ſeveral petals arranged in a circular form: the piſtil ariſes from the cup, and finally becomes a roundiſh or heart-faſhioned fleſhy fruit, containing a ſtone of the ſame ſhape with its kernel.

The ſeveral ſorts of cherry-trees are propagated by binding, or grafting the ſeveral kinds into ſtocks of the black or wild red cherries, which are ſtrong ſhooters, and of a longer duration than any of the garden kinds. The ſtones of theſe two kinds are ſown in a bed of light ſandy earth in autumn, and the young ſtocks produced from them are to remain where they riſe till the ſecond autumn after their ſowing, when, in October they ſhould be planted out into a rich earth, at three feet diſtance from row to row, and at about ten inches diſtance in the rows. The ſecond year after the planting-out, they will be fit to bud, if they are intended for dwarfs; but, if they are intended for ſtandards, they will not be tall enough till the fourth year, for they ſhould be budded or grafted near ſix feet from the ground. The grafting is uſually performed in ſummer, and the head of the ſtock is to be cut off in the beginning of the March following, about ſix inches above the bud; and if the bud has ſhot well, and there is any fear of its being diſplaced by the winds, it muſt be gently tied up to the part of the ſtock left above it. The autumn afterwards, theſe trees will be fit to remove, and be ſet where they are to remain; or they may be left two years. Many, when they plant theſe trees in their places, lop off a great part of their heads, but this is an injury that often kills them; and, when they eſcape, they ſeldom get well over it for four or five years. If the trees are intended for walls, it is adviſeable to plant dwarfs between the ſtandards, that theſe may cover the lower part of the wall, while the others ſpread over the upper part; and, when the dwarfs riſe to fill the whole walls, the ſtandards ſhould be taken entirely away. When theſe trees are taken up from the nurſery, the dead fibres of the roots muſt be carefully taken off, and the upper part of the ſtock which is above the bud, muſt be cut off cloſe down to the back part of it: the bud muſt be placed directly from the wall. Cherry-trees thrive beſt on a dry hazley loam, and in a gravelly ſoil are very ſubject to blights, and ſeldom ſtand long good. They ſhould be placed at fourteen feet aſunder, with a ſtandard tree between each two. In pruning theſe trees, their ſhoots ſhould never be ſhortened, for they moſtly produce their fruit from their extreme part. All the foreright ſhoots are to be diſplaced, and the others trained horizontally; and, where there is a vacancy in the wall, the branches, being ſhortened, will throw up a ſhoot or two to fill it. *Miller's Gard. Dict.*

CERATO′NIA, *the carob-tree*, commonly called St. John's bread, in botany, a genus of plants whoſe characters are: it hath male and female flowers on diſtinct plants: the male flowers have an empalement of one leaf, which is cut into five parts: the female flowers conſiſt of one leaf, having a ſingle ſtyle, which afterwards turns to a fleſhy hard pod, including kidney-ſhaped ſeeds; each being divided by an iſthmus, in the pod.

We have but one ſpecies of this plant; viz. 1. Ceratonia. H. L. The carob-tree or St. John's bread.

This tree is very common in Spain, and in ſome parts of Italy, as alſo in the Levant, where it grows in the hedges, and produces a great quantity of long flat brown-coloured pods, which are thick, mealy, and of a ſweetiſh taſte. Theſe pods are many times eaten by the poorer ſort of inhabitants, when they have a ſcarcity of other food: but they are apt to looſen the belly, and cauſe gripings of the bowels. Theſe pods are directed by the College of Phyſicians to enter ſome medicinal preparations; for which purpoſe they are often brought from abroad.

In England the tree is preſerved by ſuch as delight in exotic plants, as a curioſity: the leaves always continue green; and, being different in ſhape from moſt other plants, afford an agreeable variety, when intermixed with oranges, myrtles, &c. in the green-houſe.

Theſe plants are propagated from ſeeds, which, when brought over freſh in the pods, will grow very well, if they are ſown in the ſpring upon a moderate hot-bed; and, when the plants are come up, they ſhould be carefully tranſplanted, each into a ſeparate ſmall pot filled with light rich earth, and plunged into another moderate hot-bed; obſerving to water and ſhade them until they have taken root; after which you muſt let them have air in proportion to the heat of the weather. In June you muſt inure them to the open air by degrees, and in July they ſhould be removed out of the hot-bed, and placed in a warm ſituation, where they may remain until the beginning of October, when they ſhould be removed into the green-houſe, placing them where they may have free air in mild weather: for they are pretty hardy, and require only to be ſheltered from hard froſts. When the plants have remained in the pots three or four years, and have gotten ſtrength, ſome of them may be turned out of the pots in the ſpring, and planted into the full ground, in a warm ſituation, where they will endure the cold of our ordinary winters very well, but muſt have ſome ſhelter in very hard weather.

CERA′TUM *epuloticum*, a name given in the late London Diſpenſatory to the compoſition commonly called Turner's cerate, and there ordered to be made in this manner: take oil of olive, a pound; yellow wax and prepared calamy, of each half a pound; melt the wax in the oil, and, when the mixture begins to congeal again, ſprinkle in the powder, and continue ſtirring it till the whole is cold. *Pemberton's Lond. Diſpenſ.*

CERATUM *mercuriale*, a form of medicine preſcribed in the late London Pharmacopœia, and ordered to be made in the following manner: take yellow wax and purified hogs lard, of each half a pound; quickſilver, three ounces; ſimple balſam of ſulphur, a drachm: melt the wax and lard, and then add to them gradually the quickſilver, firſt well divided by the balſam of ſulphur. *Pemberton's Lond. Diſpenſ.*

CERAU′NIA, CERAUNIAS, or CERAUNIUS *lapis*, in natural hiſtory, a ſort of flinty figured ſtone, of no certain colour, but of a pyramidal or wedge-like figure; popularly ſuppoſed to fall from the clouds in thunder ſtorms, and to be poſſeſſed of divers notable virtues, as of promoting ſleep, preſerving from lightning, &c.

The generality of naturaliſts take the Ceraunia for a native ſtone, formed among pyrites, of a ſaline, concrete, mineral juice. Mercatus and Dr. Woodward aſſert it to be artificial, and to have been faſhioned thus by tools.

CE′RUSE (*Dict.*)— The manner of preparing Ceruſe in quantities at Venice is deſcribed by Sir Philip Vernatti. The plates for this purpoſe are large, and about the thickneſs of a knife's back, and rolled up, but ſo as that the ſurfaces no where touch. Each roll is put into a ſeveral pot, wherein it is upheld by a little bar from the bottom, that it may not touch the vinegar, which is alſo put into the pot, to effect the converſion. The pots are then covered with a plate of lead, as cloſe as may be, and over this with a board; after which they are let down into a bed of horſe-dung, big enough to contain four hundred pots. After three weeks continuance, the pots are taken up, the plates unrolled, laid on a board, and beaten with battledores, till all the flakes come off, which, when they prove good, are hard, thick, and weighty; when otherwiſe, porous and light, and ſometimes black, or burned, if the dung proves not well ordered: ſometimes alſo there will be no flakes, or Ceruſe at all. From the beating-table it is carried to the mill, ground with water between two ſtones, to an almoſt impalpable fineneſs. Laſtly, it is molded into ſmall parcels, and expoſed to the ſun to dry, and harden for uſe. *Vernatti in Phil. Tranſ. N.* 138.

CERUSE, *in the manufacture of China.* The Chineſe make Ceruſe of this preparation of lead, which it is eaſier to ſee the advantages of, than to comprehend the manner in which they are brought about. The China veſſels, when they have been baked, and finiſhed, as to the matter, and even covered with their varniſh, will yet receive, into their very ſubſtance, the colours which thoſe people mix up, with an addition of Ceruſe, and, as ſome of the old accounts ſay, of copperas and ſaltpetre; but, though theſe latter ingredients had uſed to be added, the Ceruſe alone ſupplies their place at this time, at leaſt in very many things. It would be worth while to try an admixture of Ceruſe with the colours uſed in painting on glaſs; and this, after a ſecond baking, might, perhaps, be found to incorporate itſelf in the ſame manner that it does into China-ware, and to recover the long loſt ſecret of letting in the ſtrongeſt colours, without hurting the tranſparence. *Obſerv. ſur les coutum. de l' Aſie.*

CERUSE *of antimony*, a preparation of the regulus of that mineral, powdered, mixed with ſpirit of nitre, and diſtilled in a retort, till no more fumes will riſe. What remains at the bottom, being pulverized, and waſhed ſweet, makes the Ceruſa antimonii, a medicine preſcribed as a diuretic, and by ſome reckoned equal to the mineral bezoar. Some prepare the Ceruſe by fuſing and fulminating the regulus with nitre in ſubſtance; the produce of which is a fixed powder, called the Ceruſe of antimony.

CE'RVUS *volans*, in natural hiſtory, a name given by authors to the ſtag-fly, or ſtag-horned beetle, a very large ſpecies of beetle with horns ſloped, and ſomewhat like thoſe of a ſtag.

CE'SARE, *in logic*, a mode of ſyllogiſms in the ſecond figure, wherein the major propoſition, and concluſion, are univerſal negatives, and the minor an univerſal affirmative. Such is, CE, No man who betrays his country, deſerves praiſe. SA, Every virtuous man merits praiſe. RE. Therefore, no man who betrays his country is virtuous. *Walch. Lex. Phil.*

CETA'CEOUS, in a proper ſenſe, denotes only thoſe large fiſh which are viviparous, or breed their young within their own bodies, and have no gills, but lungs, with which they breathe, like quadrupeds, having but one pair of fins, and giving ſuck to their young.

Theſe ſcarce differ in any thing from quadrupeds, except the want of feet. They have no air-bladder, but are enabled, by the air they receive into the lungs in reſpiration, to render their bodies equiponderant to water.

CETACEOUS, in the ordinary uſe, is alſo extended to all larger fiſh, called by the Latins belluæ marinæ, or ſea-beaſts.

In which view, Cetaceous fiſhes are divided into greater, including the whole kind properly ſo called; and leſſer, to which belong the porpoiſe, ſhark, dog-fiſh, &c.

CE'TUS, *the whale*, in zoology. See the article WHALE.

CHAFERCONNEE'S, printed linens, manufactured in the grand Mogul's dominions. They are imported by the way of Surat. They are of the number of thoſe linens, the trade of which is prohibited in France.

CHA'FERY, in the iron works, the name of one of the two principal forges. The other is called the finery. When the iron has been wrought at the finery, into what is called an ancony, or ſquare maſs, hammered into a bar in its middle, but with its two ends rough, the buſineſs to be done at the Chafery is the reducing the whole to the ſame ſhape, by hammering down theſe rough ends to the ſhape of the middle part. *Ray's Engliſh Words.*

CHAIN, in mechanic arts, a ſeries of ſeveral rings, or links, fitted into one another.

CHAIN alſo denotes a kind of ſtring, of twiſted wire, ſerving to hang watches, tweezer-caſes, and other valuable toys, worn by the ladies, upon.

The invention of this piece of curious work is owing to the Engliſh; whence, in foreign countries, it is denominated the Engliſh Chain. It is but of very late years that foreigners have undertook to imitate them, and hitherto with no extraordinary ſucceſs: thoſe of Paris have come neareſt. Theſe Chains are uſually either of ſilver or gold, ſome of gilt copper; the thread, or wire, of each kind to be very fine.

For the fabric, or making of theſe CHAINS.—A part of the wire is folded into little links of an oval form; the longeſt diameter about three inches; the ſhorteſt one. Theſe, after they have been exactly ſoldered, are again folded into two; and then bound together, or interwove, by means of ſeveral other little threads of the ſame thickneſs; ſome whereof, which paſs from one end to the other, imitate the warp of a ſtuff; and the others, which paſs tranſverſe, the woof. There are at leaſt four thouſand little links in a Chain of four pendants; which are, by this means, bound ſo equally, and withal ſo firmly together, that the eye is deceived, and takes the whole to conſiſt of one entire piece.

CHAIN-*pump*. See PUMP.

CHAIN-*ſhot*, in war, two bullets, or rather half-bullets, linked together by a Chain: their uſe at ſea is to ſhoot down yards, or maſts; or to cut the ſhrouds, or any other rigging of a ſhip.

CHAIN-*walls*, in a ſhip, are the broad timbers which are made jetting out of her ſides, to which, with Chains, the ſhrouds are faſtened, and by them ſpread out, the better to ſecure the maſts.

CHALCE'DONY. See CALCEDONY, in the Dictionary.

CHALDE'AN *philoſophy*. It is no eaſy matter to give a juſt idea of the Chaldean philoſophy; the monuments which remain of it are much leſs ancient than the ſect itſelf: what we can gather from the Greeks ſeems but of ſmall authority, and will give us but little inſight; for the Greeks had a turn of genius quite different from the Orientals. They altered every thing they received from other nations, whom, with an air of contempt, they called barbarous. Another reaſon which ſhould make us doubtful in determining what were the real opinions of the Chaldeans, is this, that they kept the dogmas of their ſect a ſecret among themſelves; none were admitted to the knowledge of them, but privileged diſciples; they never publiſhed them but under the veil of allegories, or ſymbols. Thus we can only form conjectures from what the Greeks and Arabians have tranſmitted to us. Hence that diverſity of opinions among the learned on this head, who, inſtead of explaining, have rendered it more obſcure and myſterious. Witneſs a ſect of philoſophers which appeared in Aſia much about the time of our Saviour's birth. Theſe men, to give weight to their dreams and idle doctrines, reſolved to colour them with the air of great antiquity, and made them paſs under the name of Chaldean and Perſian, the precious remains of the doctrines of thoſe philoſophers. In conſequence of which, they forged a great number of works in the name of the famous Zoroaſter, who was then looked on in Aſia as the chief and maſter of all the Magi in Perſia and Chaldea. Many men of eminent learning, both ancient and modern, have taken a great deal of pains to diſcover who this Zoroaſter was, ſo much boaſted of in the Eaſt, but, after all their diſquiſitions, have been forced to acknowledge themſelves in the dark.

Other philoſophers, not leſs ignorant of the ſacred myſteries in the ancient doctrine of the Chaldeans, choſe to ſhare the honour of ſetting up a ſeparate ſect with the former. Theſe therefore reſolved to give Ægypt the honour of Zoroaſter's birth, and were as bold as their antagoniſts, in forging works which they attributed to Zoroaſter. As Pythagoras and Plato went into Ægypt to ſtudy the ſciences, which this nation was ſaid to have carried to a very great perfection, they imagined the ſyſtems of theſe two Greek philoſophers a faithful extract of the doctrine of Zoroaſter. This boldneſs of forging books on both ſides ſufficiently ſhews what credit we ought to give to theſe two ſects of philoſophers. The Chaldeans were in great reputation among the Babylonians. They were the prieſts of the nation, and diſcharged the ſame offices as the Magi among the Perſians, as to inſtructing the people in all religious matters, ceremonies, and ſacrifices: from whence the Greek hiſtorians have often confounded one with the other; and this is a mark of their little nicety, in not diſtinguiſhing as they ought between the ſtate of philoſophy among the ancient Babylonians, and the ſtate of philoſophy after the Babylonians became ſubject to the Perſians.

It may not be amiſs juſt to remark, that among all ancient nations, namely, the Aſſyrians, Perſians, Ægyptians, Æthiopians, Gauls, Britons, Germans, Scythians, Hetrurians, the prieſts were always looked upon as ſages and philoſophers. They were, in general, men of addreſs and cunning, who made religion ſerve the political views and intereſts of princes. The Chaldeans acknowledged a ſupreme Being, author of all things, who eſtabliſhed that beautiful harmony which connects the univerſe. Though they thought matter eternal and pre-exiſtent to the operation of God, yet they did not ſuppoſe the world eternal; for their coſmogony repreſents our earth as an opaque chaos, wherein all the elements were confuſedly blended together, before it received that order and arrangement which rendered it habitable. They ſuppoſed, that monſtrous animals, of various forms, were born in the womb of this rude chaos, and were ſubject to a woman named Omerca. That the God Belus cut her in two; of one half he made the heavens, of the other the earth, and that the death of this woman deſtroyed all the monſtrous animals before-mentioned; that Belus, after having formed the world, and produced the living creatures in it, cauſed his own head to be cut off; that men and animals were produced out of the earth; that other Gods dipped men in the blood which flowed from the wound of the God Belus; and that this was the reaſon why men were endowed with intellectual faculties, becauſe they had received a part of the deity.

The fragments of Beroſus, preſerved by Syncellus, obſerve, that this coſmogony is nothing but a myſterious allegory, by which the Chaldeans expreſſed the creation of the world. This allegory indicates, that man owes his creation and birth immediately to God, and that the ſupreme Being made uſe of another God, for the creation of the world. This opinion was univerſally received all over the Eaſt. They thought it beneath the majeſty of the ſupreme God to preſide immediately over the world; that all-perfect, as he was, he confined his contemplations to his own perfections, not concerning himſelf about poor mortals, but left the care to inferior local and tutelary deities. In honour of theſe only, incenſe ſmoaked, and the blood of victims flowed upon the altars. But beſides the good genii, who delighted in doing good to mankind, they admitted alſo of evil genii; theſe laſt they ſuppoſed to be formed of groſſer matter than the firſt, and that a continual war ſubſiſted between them; the firſt proceeded from the good principle, the latter from the bad. Hence it appears, that the doctrine of the two principles firſt roſe in Chaldea, from whence it was propagated to the Perſians, and prevailed univerſally, almoſt, among the Orientals. This doctrine ſeems to owe its riſe to the ſacred hiſtory of the fall of the firſt man; for, according to them, theſe dæmons aſſumed all ſhapes, at pleaſure, to delude thoſe who liſtened to them. Such were the myſteries in which the Chaldeans initiated a ſmall number of adepts, who were to ſucceed them, and hand the tradition down from one age to another.

The doctrine they taught in public, according to Herodotus and Diodorus Siculus, was, that the ſun, moon, and ſtars, eſpecially the planets, were deities which muſt be adored. The ſtars, principally in veneration among them, were the ſigns of the zodiac, without taking any thing from the dignity of the ſun and moon, which they looked on as primary deities. They called the ſun Belus, the moon Nebo, or Nergal. The common people, born to be dupes to thoſe who have wit enough to gain the aſcendant over them, thought a deity reſided in every ſtar, and, conſequently, that ſo many Gods deſerved their adoration. As to the ſages and philoſophers of the country, they contented themſelves with placing their genii, or deities of a lower claſs, in them, as directors of their different motions.

This principle once eſtabliſhed, it was not difficult for them to perſuade the people, that the ſtars had a great influence on the happineſs or miſery of mankind; and hence ſprung judicial aſtrology, in which the Chaldeans had the reputation of excelling, inſomuch that all eminent in this ſcience were called Chaldeans. Theſe quacks, like our fortune-tellers, pretended to read in the ſtars human deſtinies and future events: but the reality of this ſcience depended upon the credulity of the people; for what connection can there be between the regular motion of the ſtars and the free events of the will? The eager curioſity of prying into futurity is a diſtemper as ancient as the world, but has exerciſed its dominion moſt among the Orientals, who are conſtitutionally of a warm imagination. It is incredible to what extravagance this has prevailed, by the cunning artifices of the prieſts: judicial aſtrology was the ſtrongeſt rein by which they always ruled the people of the Eaſt. Sextus Empiricus declaims, with much ſtrength and eloquence, againſt this trifling art, ſo baneful to the happineſs of mankind, by the evils it neceſſarily produces. The Chaldeans, in ſhort, ruled the people with a rod of iron, which their own ſuperſtition impoſed on themſelves; for nothing could be done without conſulting the augures and aſtrologers. Notwithſtanding the credulity of the people, the impoſture of judicial aſtrology was too groſs not to betray itſelf. Under the conſulate of M. Popilius and Cneius Calpurnius, it was decreed, by an edict of the Prætor Cor. Hiſpallus, that the Chaldeans ſhould depart from Rome, and all Italy, within the ſpace of ten days; and the reaſon aſſigned by the edict was, that they abuſed weak and credulous minds, by their pretended knowledge of the ſtars. Alexander himſelf, who was at firſt very much prejudiced in favour of the Chaldeans, deſpiſed them after Anaxarchus ſhewed him the vanity of judicial aſtrology.

Though aſtronomy was in very great eſteem among the Chaldeans, and they cultivated it very much, yet they do not ſeem to have made any conſiderable progreſs in it. What aſtronomers muſt they have been, to ſuppoſe the eclipſes of the moon to have proceeded from her turning her opaque ſide towards the earth; and that the other was always luminous of itſelf, independent of the ſun? Where had they learned that the terreſtrial globe ſhould be conſumed by fire, on a conjunction in the ſign Cancer, and be drowned on a conjunction in the ſign Capricorn? Yet the Chaldeans have paſſed for great aſtronomers. Pretences to antiquity have been the foible of all nations, and a thouſand abſurdities are owing to it. The Chaldeans, in the time of Alexander the Great, pretended, that aſtronomy had flouriſhed in Chaldea four hundred and ſeventy thouſand years; but this is not probable, and only exiſted in the warm imaginations of the Chaldeans: Calliſthenes, who accompanied Alexander in his military expeditions, ſent the account of the obſervations he had found at Babylon to Ariſtotle: theſe obſervations went no farther back than one thouſand nine hundred and three years; which, if they are ſuppoſed to begin at the four thouſand three hundred and eighty-third year of the Julian period, when Babylon was taken, will go no higher than the two thouſand four hundred and eightieth year of the ſame period. This falls very ſhort of the chronological ſyſtem of Moſes, according to the verſion of the Septuagint, carried back no farther than the flood. If the Chaldeans had made more ancient obſervations, how came Ptolemy, who was ſo exact an aſtronomer, not to mention them, and ſpeak of none till the firſt year of Merodach, king of Babylon, which falls on the twenty-ſeventh year of the æra of Nabonaſſar? The pretended antiquity of the Chaldean obſervations no more deſerve our credit, therefore, than Porphyrius, who builds upon them. Epigenius affirms the aſtronomical obſervations, found on the baked bricks at Babylon, go no farther back than ſeven hundred and twenty years; and, as even this is too long a ſpace of time to be juſtified by hiſtory, Beroſus and Critodemus have ſhortened it to four hundred and eighty years.

After this, who would not laugh to ſee the Chaldeans gravely preſenting us with their aſtronomical obſervations, in ſupport of their antiquity, when their own authors give them the lye? They certainly, as Lactantius ſays, thought, by going ſo far back as four hundred and ſeventy thouſand years, to give a ſort of ſanction to their antiquity, which make it leſs ſuſpected; but, in this, they were miſtaken; for all chronology, not ſupported by facts, is not hiſtorical, and, conſequently, proves nothing in favour of the antiquity of a nation. When we once know the courſe of the ſtars, we can foreſee, from their regular motion, the conjunctions, oppoſitions, &c. which ſhall happen at any future time, and may, conſequently, by calculation, find out theſe phænomena, in any time paſt, of the ſame date; but theſe calculations, and a ſyſtem of ſuch obſervations, purely arbitrary in point of time, no more prove the world to have exiſted from eternity, than that it ſhall laſt to eternity. Such is the caſe of the ancient Chaldeans, with regard to their obſervations of four hundred and ſeventy thouſand years: if a ſucceſſion of hiſtorical facts were annexed to theſe obſervations, credit ought to be given to them; but, as no ſuch appear, they are only to be looked on as the dreams of a calculator.

CHALK, *(Dict.)*—The hard, dry, and fine Chalk is much the propereſt for burning into lime; but the ſoft, unctuous Chalk is greatly the beſt for lands; becauſe it diſſolves with froſt and rain, in the manner of marl. This ſort of Chalk, uſed inſtead of marl, by way of a manure, is a very fine improvement for ſome ſorts of land, eſpecially the firſt time it is laid on. It changes the very nature of the ſoil, and makes it rich, for a time; but it ſoon exhauſts itſelf, and requires dunging, to keep it in heart afterwards. A ſecond chalking will prove of very little benefit to thoſe lands, which ſucceeded ever ſo well with the firſt, unleſs they have lain a long time to recover themſelves after it. It is from hence, that the farmers have their trite ſaying, that "Chalk makes a rich tenant, but a poor landlord."

The beſt method, therefore, of uſing Chalk, is to mix one load of it with two loads of dung, or mud; this will make it not only a temporary, but a laſting advantage to the ground. It is the beſt improvement for ſowre and cold lands, and is obſerved always to do moſt good to thoſe lands that lie fartheſt off from any natural beds of it; the ground near Chalk-beds partaking of their nature, though there is no Chalk diſtinguiſhable by the eye. The common method of chalking lands is to lay twelve or ſourteen loads of Chalk upon every acre, and this will ſometimes make the land bring very rich crops, for fourteen or fifteen years together.

It is beſt to carry the Chalk upon a lay a year or two before it is plowed up; by this means it will ſweeten the ſurface of the earth, and will not work ſo much downwards, as it will, if plowed up at firſt. It makes corn yield well; and, when laid upon graſs ground, it makes the graſs ſweet and rich, and cattle that feed upon it grow fat ſoon. The cows alſo that feed in theſe paſtures, are obſerved to give better milk than ordinary.

They have a very eaſy way of digging Chalk in Kent. It lies on hills, and the workmen undermine it as far as they think proper; then digging a trench at the top, as far diſtant from the edge as the undermining goes at bottom, they fill this with water, and that ſoaks through in the ſpace of one night, and the whole flake falls down at once.

In other parts of the kingdom, Chalk generally lies deeper, and they are often ſorced to dig for it conſiderable depths, and draw it up in baſkets; yet, in theſe places, it ſells cheap enough at the mouth of the pit to be worth buying, even to carry a great way, for manure. *Mortimer's Huſbandry.*

Black CHALK, a name given by the painters to a ſpecies of ochreous earth, with which they draw on blue paper, and other ſubſtances. It is very improperly called Chalk, being more of the nature of the Cologn earth, than any other known ſubſtance, but containing much leſs vegetable matter than that.

Red CHALK, an earth much uſed by painters and artificers, and common in the colour-ſhops of London, and elſewhere. It is properly an indurated clayey ochre, and is dug in Germany, Italy, Spain, and France, but, in the greateſt quantity, in Flanders. Its characters, by which it is diſtinguiſhed from other earth, are theſe: it is of a fine, even, and firm texture; very heavy, and very hard; of a pale red on the outſide, but, when broken, of a deep duſky chocolate colour within. It adheres firmly to the tongue, is perfectly inſipid to the taſte, and makes no efferveſcence with acids. *Hill's Hiſt. of Foſſ.*

CHALK-*land.* Barley and wheat will ſucceed very well on the better ſort of chalky land, and oats generally do very well on any kind of it.

The natural produce of this ſort of land, in weeds, is that ſort of ſmall vetch, called the tine-tare, with poppies, may-weed, &c. Saintfoin and hop-clover will generally ſucceed tolerably well on theſe lands; and, where they are of the better ſort, the great clover will do. The beſt manure for theſe lands is dung, old rags, and the ſheep-dung left after folding them upon it. If rain happens to fall on theſe lands, juſt after ſowing, the earth will bind ſo hard after it, that the ſhoots from the ſeed cannot pierce through it, and the greater part of the crop will be, by this means, loſt. In Hertfordſhire they manure their Chalk-lands with pigeons dung, aſhes, and ſoot, and with ſome horſe-dung: and, in Oxfordſhire, they uſe no other manure, than half-rotten dung, with which they mix ſand; and this, they ſay, prevents the earth from binding. They generally ſow theſe lands there with wheat, meſlin, and barley, only, after wheat, they ſow peaſe and vetches; in the ſowing of theſe, they are particularly forced to wait for fair weather, becauſe of the land's binding. *Mortimer's Huſbandry.*

CHALK-*ſtones*, in medicine, are uſed for the concretions of calcarious matter in the hands and feet of people violently afflicted with the gout.

CHA'MA, in natural hiſtory, the name of a large genus of bivalve ſhells, the characters of which are theſe: it is uſually ſmooth, though in ſome places a little rugoſe, and has in ſome few a number of ſpines. The valves of the ſhell are equal, elate, and convex, and the mouth gaping, not cloſing faſt, and even in all parts, as in the oiſter.

The fiſh, contained in this genus of ſhells, have all a hot taſte, like that of pepper, and inflame the mouth in a troubleſome manner. The French have hence called them flames and flammets, and, in ſome parts of the ſame nation, they are called lavignons and pelourdes.

CHAMÆME'LUM, *camomile*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind; the diſk is compoſed of floſcules, and the outer edge of ſemi-floſcules, all ſtanding upon embryo ſeeds, and all incloſed in one common ſquamoſe cup. The embryos finally ripen into ſeeds, and are affixed to the thalamus of the flower. To this it is to be added, that the leaves are finely divided, and the whole face and appearance of the plant has ſomething peculiar, which readily diſtinguiſhes it from the other plants with radiated flowers.

M. Tournefort has enumerated nineteen ſpecies of Chamæmelum.

The common camomile is digeſtive, laxative, and emollient; it mitigates pain, and promotes the menſes and urine; the leaves dried are ſaid to anſwer theſe purpoſes better than any other part of the plant; for all others, the flowers are uſed. Theſe are given in infuſion, as a gentle emetic, very large quantities of the infuſion being drank warm. They are alſo uſed in emollient decoctions, and are a general ingredient in clyſters. The people who furniſh the apothecaries with them, uſually ſell the double flowers, but the ſingle ones have greatly more virtue. It is very remarkable of the flowers of this plant, that, like thoſe of the common yarrow, they yield by diſtillation a fine ſky-blue oil.

CHAMÆPI'TYS, *ground-pine*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the one-lipped kind; this lip is divided into three ſegments; the middle of theſe is bifid, and there are ſmall jags, ſupplying, in ſome ſort, the place of an upper lip. The piſtil ariſes from the bottom of the flower, and is ſurrounded by four embryos, which finally become four oblong ſeeds, and are contained in an open capſule, which was the cup of the flower. To this alſo it is to be added, that the flowers of the ground-pines grow ſcatteredly in the alæ of the leaves, and are not placed verticulately.

The ſpecies of ground-pine, enumerated by M. Tournefort, are five.

Champæpitys, or ground-pine, though highly extolled as an aperient, cephalic, and nervous medicine, is, however, little uſed, except as an ingredient of the theriaca, and ſome other officinal compoſitions.

CHAME'LEON. (*Dict.*)—The ſtructure and motion of this creature's eyes are very ſurpriſing; they are very large, and ſet in large cavities, appearing to be large ſpheres, of which one half ſtands out of the head, and is covered with a thin ſkin, perforated with a ſmall hole at the top, through which is ſeen a very vivid and bright pupil, ſurrounded with a yellow iris; the whole is properly a longitudinal ſlit, which the creature opens more or leſs wide at pleaſure; and the eye ſeems fixed to this eye-lid, ſo as to follow all its motions, not turning round within it, as in other creatures. The motion of the eyes of this creature is not leſs ſingular than their ſtructure, ſince it can turn them ſo as to ſee what paſſes either far backward, on either ſide, or directly behind it, without at all moving the head, which is fixed to the ſhoulders; and the creature can give one eye all theſe motions, while the other is perfectly ſtill. The trunk of the body is properly all breaſt, for the creature has no belly, its ribs being continued to the ilia; the feet have all five toes, two behind, and three before, the hind-ones being as large as the others. This creature moves as ſlow as the tortoiſe, which appears very ſingular; its legs are ſufficiently long, and it has no great weight of body to carry; but it is ſaid, that on trees, in its wild ſtate, it moves very nimbly. Its tail, when inflated, is round as that of a rat or ſnake; when empty, it is very lank, and has three longitudinal ridges running along it, which are owing to the apophyſes of the ſpine. This tail is a great ſafety to the creature on trees, as it twiſts it round the branches, when in any danger of falling. The account given by the ancients, and later writers, of the long hollow tongue of the Chameleon, which it can dart with ſuch celerity to take flies, by means of a ſpongy nodule at the end, is found, on experience of thoſe who have kept the creature alive, to be true. Thoſe among the former, therefore, who ſuppoſed the Chameleon lived on the air only, were greatly miſtaken; ſome, of late, have alſo favoured this opinion, becauſe of the long time the creature will live without food; but this is the caſe with all the ſerpent kind alſo, which yet we know will eat ſolid food, when they can get at it. *Ray's Syn. Quad.*

CHA'MOS, or CHAMOSH, the idol or god of the Moabites. The name of Chamos comes from a root, which, in Arabic, ſignifies to make haſte, for which reaſon many believe Chamos to be the ſun, whoſe precipitate courſe might well procure it the name of ſwift or ſpeedy. Others have confounded Chamos with the god Hammon, adored not only in Lybia and Egypt, but alſo in Arabia, Ethiopia, and the Indies. *Lucan. Pharſal.*

CHA'OS (*Dict.*)—The ancient philoſophers underſtood by this term a confuſed mixture of particles of every kind without form or regularity, to which they ſuppoſed motion eſſential, and conſequently attributed the formation of the univerſe to it. This ſyſtem among them is the corollary of an excellent axiom in itſelf, Ex nihilo nihil fit: but this they generalize too much; inſtead of reſtraining this principle to effects, they extend it to the efficient cauſe, and look on the creation as a chimerical and contradictory notion.

The philoſophers, poets, and prieſts of antiquity, among the Heathens, embraced this opinion. Chaos, according to them, was the moſt ancient of all beings: the eternal Being, the firſt principle and cradle of the univerſe. The Barbarians, Ægyptians, and Perſians, agree in this notion: Ariſtophanes, Euripides, &c. the Ionic and Platonic philoſophers, even the Stoics, ſet out with a Chaos, and look on the ſucceſſive periods and reſolutions of this Chaos, to have continued according to the laws of motion, till, by different combinations, it at laſt formed the univerſe in that order we at preſent ſee it.

Among the Romans Ennius, Varro, Ovid, Lucretius, Statius, &c. held the ſame opinion. This took its riſe among the Barbarians by whom it was tranſmitted to the Greeks, from them deſcended to the Romans, and was propagated to other nations: ſo that it ſeems doubtful to determine whether this doctrine be more ancient than univerſal.

Though the firſt notion of a Chaos be very ancient, it is very difficult to determine, whom we ought to aſcribe its origin to. Moſes, the moſt ancient of all writers, in his hiſtory of the creation, deſcribes the world before to have been an undigeſted heap, wherein all the elements were confuſed: and from hence, probably, the Barbarian and Greek philoſophers borrowed the notion of their Chaos. Moſes tells us, this maſs was covered with water; and ſeveral of the ancient philoſophers have aſſerted the Chaos was a maſs of water, not elementary water nor ocean, but a kind of mud, the fermentation of which, in time, produced this world.

Cudworth, Grotius, Schmid, Dickinſon, and others, confirm this aſſertion, by inſiſting on the analogy there is between what Moſes relates of the Spirit of God moving upon the face of the waters, and the fondneſs of the mythologiſts to ſeparate the Chaos: they add farther in ſupport of this, that a very ancient opinion prevailed, both among the philoſophers and mythologiſts, that there is a ſpirit in the waters, aqua per ſpiritum movetur: from whence they conclude, that the ancient philoſophers originally had their opinion and notion of a Chaos from the works of Moſes, which they afterwards altered to their own convenience or pleaſure.

Whatever was the opinion of the ancients, concerning the Chaos and its origin, it is certain, Moſes included all things in the womb of his Chaos: and that their ſeparation, conducted by an Almighty hand, ſoon brought forth all this variety of creatures which embelliſh the univerſe. To imagine, after the example of ſome ſyſtem-writers, that God at firſt produced only a vague and undetermined matter, out of which motion, by inteſtine fermentations and attractions, formed a ſun, an earth, and all the ornaments of the univerſe: to ſuppoſe with Whiſton, that the ancient Chaos was the atmoſphere of a comet; that there is a conformity between the earth and comets, which demonſtrates that a planet is nothing but a comet, which has acquired and aſſumed a regular and durable form, has placed itſelf at a proper diſtance from the ſun, and turns round it in an orbit nearly circular; and that a comet is nothing but a planet which begins to deſtroy or form itſelf again, that is, a Chaos, which in its primordial ſtate moves in an orbit very excentric: to ſupport theſe and many other extravagancies which have been advanced, the enumeration of them would take up time impertinently, and be ſubſtituting opinions that want veriſimilitude, in the room of thoſe truths, which God has atteſted by the mouth of Moſes. According to the ſacred account, water was already made; then he tells us the Spirit of God moved upon the face of the waters, the ſtars of the heaven as well as our earth were already made, becauſe the heaven which contains them was already created. This philoſophy of Moſes, which repreſents eternal wiſdom regulating nature, by an expreſs will and command, proceeds on certain uniform and general laws, is undoubtedly more rational than any whimſical ſyſtems that have been propoſed by the ancient materialiſts, who form the world from a fortuitous concourſe of atoms; or ſome modern philoſophers who would account for the exiſtence of all beings, on the principle of homogeneous particles aſſembling themſelves together. Thoſe latter ſeem not to reflect, that by attributing the formation of all particular beings, the harmony, connection, and dependence apparent between them, to the impetus of a blind motion, they rob the Almighty of his greateſt glory, the fabric of the univerſe, in favour of a cauſe they are ignorant of, both with regard to itſelf, and the manner of its operation. This doctrine borders cloſely on the errors and abſurdities of Strato and Spinoza.

From what we have ſaid, the little certainty of philoſophy both in its principles and progreſs is obvious: it has aſſerted at one time that motion and matter only were neceſſary beings; if it has perſiſted in maintaining matter to be uncreated, yet it has ſubmitted that matter to the direction of an intelligent being, to make it aſſume a thouſand different forms, and diſpoſe its parts in that fitneſs and order which was neceſſary to produce the univerſe. The preſent opinion is, that matter was created, and that God gave it motion; that this motion, firſt impreſſed by the hand of God, is ſufficient of itſelf to produce all the phænomena we obſerve in the viſible world. A philoſopher who ſhould be hardy enough to explain the mechaniſm, and even the firſt formation of things, barely by the laws of motion, and ſay, Give me matter and motion, and I will make a world, ought firſt to demonſtrate, that exiſtence and motion are not eſſential to matter; for, without this precaution, this philoſopher, ſeeing nothing in the wonderful works which nature has produced, but what motion only might have effected, will be apt to fall into atheiſm.

Let us open our eyes then on the dangerous enthuſiaſm of forming ſyſtems, and believe with Moſes, that, when God created matter, the heaven and the earth out of nothing, he determined, by ſo many particular acts of his will, all the different materials, which, in the courſe of the following operations, ſerved for the formation of the world. In the laſt five days of the creation, God only diſpoſed every being in the place he had diſtined for it, to form the ſplendid picture of the univerſe. That before the fiat was a confuſed maſs, and the ſcene of the world opened, as the almighty voice of its Creator ranged the different beings in that wonderful order which conſtitutes its preſent beauty.

Far from being of opinion, that this notion of a Chaos was particular to Moſes, all nations, barbarous or civilized, ſeem to have preſerved one common tradition of a ſtate of darkneſs and confuſion prior to the creation of the world; and it is probable they imbibed this notion from the ſame common ſource, notwithſtanding the ignorance of the people, and the fictions of the poets, have ſo much diſguiſed it.

CHA'PPE, in heraldry, the partition of an eſcutcheon, by lines drawn from the center of the upper edge to the three angles below, as repreſented in *plate* XXV. *fig.* 6. in the Dictionary.

CHARGE (*Dict.*)—The common allowance for the charge of powder of a piece of ordnance is half the weight of the ball. In the Britiſh navy, the allowance for thirty-two pounders is but ſeven ſixteenths of the weight of the bullet. But a late author is of opinion, that, if the powder in all ſhip cannon whatever was reduced to one third of the weight of the ball, or even leſs, it would be of conſiderable advantage, not only by ſaving ammunition, but by keeping the guns cooler and quieter, and at the ſame time more effectually injuring the veſſels of the enemy. With the preſent allowance of powder, the guns are heated, and their tackle and furniture ſtrained, and this only to render the bullets leſs efficacious. For a bullet which can but juſt paſs through a piece of timber, and loſes almoſt all its motion thereby, has a much better chance of rending and fracturing it, than, if it paſſes through with a much greater velocity. Vid. *Robins*, *Propoſ. for Increaſing the Strength of the Britiſh Navy.*

CHA'RLOCK, *rapiſtrum*, in huſbandry, a very troubleſome weed among corn, being more frequent than almoſt any other. There are two principal kinds of it; the one with a yellow flower, the other with a white. Some fields are particularly ſubject to be over-run with it, eſpecially thoſe which have been manured with cow-dung alone, that being a manure very favourable to the growth of it. The farmers in ſome places are ſo ſenſible of this, that they always mix horſe-dung with their cow-dung, when they uſe it for arable land.

When barley, as is often the caſe, is infeſted with this weed to ſuch a degree as to endanger the crop, it is a very good method to mow down the Charlock in May, when it is in flower, cutting it ſo low as juſt to take off the tops of the leaves of the barley with it: by this means the barley will get up above the weed; and people have got four quarters of grain from an acre of ſuch land, as would have yielded them ſcarce any thing without this expedient. Where any land is particularly ſubject to this weed, the beſt method is to ſow it with graſs ſeed, and make a paſture of it; for then this plant will not be troubleſome, it never growing where there is a coat of graſs upon the ground. *Mortimer's Huſbandry.*

CHA'RRE, an Engliſh name for a fiſh of the truttaceous kind, of which there are two ſpecies, diſtinguiſhed by the red Charre, and the gilt Charre; the former of which is called by the ichthyographiſts umbla minor, and the latter, the carpio lacus Benaci.

Red CHARRE, called by the Welſh torgoch, is a large fiſh, longer and ſlenderer in its general ſhape than the trout. The back is of a duſky yellow colour, and is ſpotted with obſcurely white ſpots: the belly is not carried to an edge, but is about a finger broad: this, in moſt of theſe fiſhes, is of an elegant red, ſometimes deeper, and ſometimes paler; but in ſome, particularly in the female, it is white. The ſcales are very ſmall, and the ſide lines running from the gills to the tail are perfectly ſtraight; the belly fins are red: the opening of the mouth is wide, and the jaws are nearly of the ſame length, the lower being only a very little longer than the other and more pointed: the teeth are ſmall and ſharp. It is caught in the lakes of Wales, and eſteemed a very fine fiſh; but its fleſh does not boil ſo red as that of the trout. *Willoughby*, *Hiſt. Piſc.*

Gilt CHARRE, is ſomething like the trout in figure, but it is broader, and its belly is prominent, eſpecially when the fiſh is large: the uſual ſize is about a foot in length, which it rarely exceeds. The ſcales are very ſmall, and the back is variegated with black ſpots. Its belly and the lower parts of its ſides are of a fine bright ſilver colour: the ſkull is pellucid, and the noſe bluiſh. This is very common in ſome of the lakes of Italy, but is not peculiar to that kingdom, as has by ſome been imagined, being frequent in ſome foreign, and in ſome of the northern lakes; and there is no doubt, but that the fiſh there caught, and called the gilt Charre, and the carpio lacus Benaci, are intirely the ſame fiſh. It is a very finely-flavoured fiſh, and much valued at great tables. *Willoughby*, *Hiſt. Piſc.*

CHA'TELET *of Paris*, the ſupreme court of judicature in Paris, the metropolis of France. Cauſes tried there are final, unleſs in ſome caſes where an appeal may be made to the parliament.

Juſtice is adminiſtered in this court by a provoſt (whoſe office in the Chatelet is of much more authority than in any other part of the kingdom) in whoſe name all acts of this court are diſpatched, two deputies for civil and criminal cauſes, two private deputies, fifty-ſix counſellors, one king's advocate and ſollicitor.

CHEEKS, a general name, among mechanics, for almoſt all thoſe pieces of their machines and inſtruments, that are double and perfectly alike.

The CHEEKS *of a printing-preſs*, are its two principal pieces: they are placed perpendicular, and parallel to each other; ſerving to ſuſtain the three ſommers, viz. the head, ſhelves, and winter, which bear the ſpindle, and other parts of the machine.

The CHEEKS *of a lathe*, are two long pieces of wood, between which are placed the puppets, which are either pointed, or otherwiſe; ſerving to ſupport the work, and the mandrils of the workman. Theſe two pieces are placed parallel to the horizon, ſeparated from one another by the thickneſs of the tail of the puppets, and joined with tenons to two other pieces of wood, placed perpendicularly, called the legs of the lathe. See LATHE.

CHEEKS *of the glaſier's vice*, are two pieces of iron, joined parallel at top and bottom; in which are the ais, or ſpindles, little wheel, cuſhions, &c. whereof the machine is compoſed.

CHEEKS, in ſhip-building, are two pieces of timber, fitted on each ſide of the maſt, at the top, ſerving to ſtrengthen the maſts there. The uppermoſt bail or piece of timber in the beak of a ſhip, is called the Cheek. The knees which faſten the beak-head to the bow of the ſhip, are called Cheeks; and the ſides of any block, or the ſides of the ſhip's carriage of a gun, are called Cheeks.

CHEEKS *of a mortar*, or *brackets*, in artillery, are made of ſtrong planks of wood, bound with thick plates of iron, and are fixed to the bed by four bolts; they riſe on each ſide of the mortar, and ſerve to keep her at what elevation is given her, by the help of ſtrong bolts of iron which go through both Cheeks, both under and behind the mortar, betwixt which are driven coins of wood; theſe bolts are called the bracket bolts, and the bolts which are put one in each end of the bed, are the traverſe bolts, becauſe with hand-ſpikes the mortar is by theſe traverſed to the right or left.

CHEKA'O, in natural hiſtory, the name of an earth found in many parts of the Eaſt-Indies, and ſometimes uſed by the Chineſe in their porcelain manufactures. It is a hard and ſtony earth, and the manner of uſing it is this: they firſt calcine it in an open furnace, and then beat it to a fine powder. This powder they mix with large quantities of water, and, ſtirring the whole together, they let the coarſer part ſubſide, and pouring off the reſt, yet thick as cream, they leave it to ſettle, and uſe the matter at the bottom, which is found in form of a ſoft paſte, and will retain that humidity a long time. This ſupplies the place of the earth called hoache, in the making that elegant ſort of China ware which is all white, and has flowers which ſeem formed by a mere vapour within its ſurface. The manner of their uſing it is this: they firſt make the veſſel of the common matter of the manufacture; when this is almoſt dry, they paint upon it the flowers, or whatever other figures they pleaſe, with a pencil dipped in this preparation of the Chekao; when this is thoroughly dry, they cover the whole veſſel with the varniſh, in the common way, and bake it as uſual. The conſequence is, that the whole is white, but, the body of the veſſel, the figures, and the varniſh being three different ſubſtances, each has its own particular white, and the flowers, being painted in the fineſt white of all, are diſtinctly ſeen through the varniſh upon the veſſel, and ſeem as if traced by a fine vapour only. The hoache does this as well as the Chekao, and has beſide this the quality of ſerving for the making the porcelain ware, either alone, or in the place of the kaolin: the Chekao has not this property, nor any other ſubſtance beſides this hoache, which appears to be the ſame with our ſteatetes or ſoap-rock. *Obſervat. ſur les Coutumes de l'Aſie.*

CHELIDO'NIUM, *celandine*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of four leaves, which are diſpoſed in form of a croſs: the piſtil ariſes from the cup of the flower, and finally becomes a renicapſular pod, containing roundiſh ſeeds.

The ſpecies of celandine enumerated by M. Tournefort are four; and by Mr. Miller three.

Bocconi has very ſtrongly recommended this plant as ſpecific in the care of conſumptions: he propoſes the taking it in infuſion, or drinking its juice, and ſays enough in its praiſe to recommend it at leaſt to a fair trial, which would be eaſily made in a country where conſumptions are ſo common. *Boccon. de Plant.*

CHE'MISTRY *(Dict.)*—Rules to be obſerved in the practice of chemiſtry.

Let the firſt rule be, with care and diligence, to obſerve the proceſs uſed by nature, in the production of all thoſe things we would endeavour to imitate; for nature, as a moſt expert chemiſt, employs the very inſtruments which men alſo employ, viz. fire, water, air, and earth.

To illuſtrate this rule by an example; it appears, by numerous inſtances, that there is an acid or ſaline liquor naturally contained in the bowels of the earth; which acid, there mixing with various kinds of earthy matters, as a menſtruum, changes their natures, or makes them appear under different forms. Hence, common brimſtone, allum, the native vitriol, &c. ſeem to have their origin.

For by an exact ſcrutiny, and attentive conſideration, it appears, that, when this general acid diſſolves a certain bituminous earth, it makes brimſtone; when a chalky earth, allum; when iron or copper, vitriol, &c. And accordingly, by uſing the ſame kind of general acid (which may be procured by burning brimſtone under a glaſs-bell) in the ſame manner as nature ſeems to employ it, we can likewiſe, by art produce brimſtone, allum, or vitriol, when and where we pleaſe. And thus, if we could univerſally diſcover the proceſs and inſtruments which nature employs in the production of her effects, we ſhould have certain rules for imitating her.

Our ſecond rule is, to gain a habit of transferring, diverſifying, enlarging, and in proving an experiment, till it ends in ſome certain diſcovery, either of light to the underſtanding, or of uſe in life; one of which points all juſt experiments will end in, when duly proſecuted, and judiciouſly weighed and conſidered.

For unſucceſsful experiments are no leſs inſtructing than thoſe that ſucceed, which ought to be well remarked. The head muſt in all caſes co-operate with the hands: ſo that the mind ſhould be ever caſting about to diſcover the cauſe of failure, as well as of ſucceſs. This is a ſagacity which may be procured by uſe, and turned into a habit of invention and diſcovery: ſo that no ſingle experiment ſhall be performed, but ſome advantages will be immediately derived from it; nor no experiment be made, without ſome ſolid grounds of hope for ſucceſs.

The third rule to make this art turn to advantage, with regard to the improvement of any branch of trade that we may have in view, is, to proſecute experiments in an orderly ſeries; and to let the inquiry ſuit the genius and temper of the enquirer, ſo that it may be proſecuted by him with vigour and pleaſure. This hath been the practice of the greateſt maſters in this art.

Thus, if any one ſhould be averſe to fire and furnace, he may ſtill improve chemiſtry and arts, or perform many ſerviceable chemical operations, without much apparatus or expence, or without the utenſils and inſtruments commonly employed in that art: which may therefore be as conveniently practiſed within a ſtudy or a parlour, as in a laboratory. For there are many chemical enquiries, that may be proſecuted without the uſe of fires and furnaces: and even ſuch diſpoſitions as are more delighted with ſpeculation than practice, may greatly contribute to the improvement of chemiſtry, by ſorting, ranging, and digeſting experiments into tables; ſhewing what they prove, and how far they reach; how far they fall ſhort, and how they may be carried farther: others might, to advantage, employ themſelves upon drawing things of uſe in life, from the experiments already known and publiſhed: and, laſtly, others might, from a due conſideration of experiments, deduce new directions and rules of practice, for producing, in a ſure and conſtant manner, much greater effects than are uſually hoped for. *Shaw's Lect.*

Commercial CHEMISTRY, is uſed to denote the application both of technical and philoſophical Chemiſtry, to the eſtabliſhing, ſupporting, or improving any branch of trade or commerce. *Shaw's Lectures.*

Oeconomical CHEMISTRY, the application of philoſophical, techinical, or commercial Chemiſtry, to the ſervice and accommodation of the affairs of a family. *Shaw's Lectures.*

Philoſophical CHEMISTRY. Philoſophical Chemiſtry conſiſts of three parts, viz. invention, rationale, and experiment; whence we may define it to be a particular exerciſe of the rational and inventive faculties of the mind, leading to experiments, and thence to the diſcovery of cauſes, ſo as to form axioms that ſhall rationally account for phænomena, and diſcover rules of practice for producing uſeful effects. And thus philoſophical Chemiſtry is not only the key to all the other parts, but it diſcovers of itſelf the cauſes of many natural phænomena, as, particularly, earthquakes, volcanoes, vegetation, the growth of minerals, and the like.

This branch of Chemiſtry alſo explains the general forms and qualities of bodies, whereon their properties and effects depend; as volatility and fixedneſs, fluidity and firmneſs, colours, taſtes, odours, effervescences, fermentation, ſolution, precipitation, congelation, extraction, and the like.

To this part of Chemiſtry it alſo belongs to bring new inventions to the teſt, to diſcover their validity or inſufficiency. Thus when any hint is ſtarted for a new trade, or method invented for the improvement of an old one, before any attempt is made to ſupply it in the larger way, it ſhould be experimented in miniature; as the aſſay maſter tells the owner of an ore, whether it will be worth the erecting large works for it, or not. *Shaw's Lectures.*

Technical CHEMISTRY. By Technical Chemiſtry is meant the application of philoſophical Chemiſtry to the immediate ſervice of arts, ſo as by its means to invent, form, aſſiſt, promote, or perfect them in the large way of buſineſs. *Shaw's Lectures.*

CHE'RRY-*tree*. See CERASUS.

CHERT, in natural hiſtory, a name given by ſome of our miners to a peculiar fine kind of ſtone found in ſtrata, but of the hardneſs and ſmoothneſs of flint. It is called alſo in ſome places whern, and by ſome authors nicomia.

CHE'RVIL, *chærephyllum*, in botany, the name of a genus of umbelliferous plants, the characters of which are theſe: the flower is of the roſaceous kind, compoſed of ſeveral leaves irregular in ſize, and diſpoſed in a circular form on a cup, which afterwards becomes a fruit compoſed of two ſeeds, reſembling the beak of a bird, not ſtriated, but ſometimes rough, ſometimes ſmooth, and gibboſe on one ſide, and flat on the other.

The common garden Chervil flowers in May or June. Its leaves and ſeeds are uſed in medicine; the ſeed contains the principal virtue of the plant, and is eſteemed a great medicine in jaundices and dropſies. It is very certain that it is a very powerful diuretic, and a promoter of the menſes. It reſolves coagulated blood, and generally diſpoſes the perſon to ſleep. It is uſed alſo externally in fomentation, in cholicky pains and retention of urine.

The leaves of this plant are what the good women call ſweet fern, from which they diſtil a water, and eſteem it a very great remedy for cholicks.

CHE'SNUT-*tree*, See CASTANEA.

CHEVRE'TTE, in artillery, an engine to raiſe guns or mortars into their carriages; it is made of two pieces of wood of about four feet long, ſtanding upright upon a third, which is ſquare; they are about a foot aſunder and parallel, and are pierced with holes exactly oppoſite to one another, having a bolt of iron, which, being put through theſe holes, higher or lower at pleaſure, ſerves with a hand-ſpike, which takes its poiſe over this bolt, to raiſe any thing by force. *Guill. Gent. Dict.*

CHE'WING-*balls*, a ſort of balls contrived for horſes to chew, not ſwallow at once; not intended as a food, but as incentives to appetite, and on other medicinal occaſions very uſeful to the creature. The receipt now moſt eſteemed for theſe balls is this: take liver of antimony, and of aſſafœtida, of each one pound; wood of the bay-tree, and juniper-wood, of each half a pound; pellitory of Spain, two ounces: let all theſe be powdered together; then add as much fine grape verjuice as is neceſſary to make the whole into a paſte. This is to be formed into balls of about an ounce and an half in weight, which are to be dried in the ſun. Theſe are the Chewing-balls, and theſe are to be uſed one at a time in the following manner: the ball is to be wrapped up in a linen rag, and a thread is to be faſtened to this, in ſuch manner that it may be tied to the bit of the bridle, and kept in the mouth: when the bridle is taken off, the horſe will immediately eat, and, when one ball is conſumed, another is to be tied up, and put in its place, till the intent is anſwered.

CHIN-COUGH. In the Chin-cough, Dr. Huxham uſes the common evacuations, and propoſes to correct the lentor of the blood, and to ſtrengthen the nerves and ſtomach by mercurials, the cortex, and proper ſtomachics. *Obſ. de Aere & Morb. Epid.*

Dr. Burton declares againſt bleeding, vomiting, and purging in the Chin-cough, except in very urgent caſes; the medicine which he ſays has had great ſucceſs, is a ſcruple of fine powder of cantharides, and as much camphor, mixed with three drachms of the extract of jeſuits bark. Of this mixture he gives eight or nine grains to children every third or fourth hour, in a ſpoonful of ſome ſimple water, or ſome julep, in which a little balſam of capivi had been diſſolved. He ſays this method is not proper in ſuch Chin-coughs as proceed from thin ſharp rheum, but he believes, that, in the Chin-cough from a tough viſcid phlegm, it will ſcarce ever fail, at leaſt it has not failed yet. *Med. Eſſ. Edinb.*

CHINE'SE *Philoſophy*. The Chineſe are univerſally owned to have ſurpaſſed all other nations of India, in their antiquity, learning, politeneſs, the improvement of the ſciences, a taſte for philoſophy, and their political principles. And, according to ſome eminent authors, they may diſpute the pre-eminence, in theſe particulars, even with the politeſt nations in Europe.

If credit be given to theſe authors, the Chineſe had philoſophers in the firſt ages of the world. A plan of ſublime morality was current among them ſoon after the flood. Iſaac Voſſius, Spezelius, and a crowd of miſſionary jeſuits, who have travelled into China to propagate Chriſtianity, have given us this account of them: others, as Budæus, Thomaſius, &c. ſpeak leſs favourably of the Chineſe. The only method therefore of coming at the real truth is to take a ſhort review of the writings aſcribed to them; but unhappily it is a matter of doubt whether theſe are authentic, and the exactneſs of the tranſlation is very much diſputed.

The collection publiſhed at Paris in 1687, by the fathers Intorcetta, Hendric, Rougemont, and Couplet, preſents us with the Ta-hio or Scientia magna; a work of Confucius, publiſhed by his diſciple Cemcu. The Chineſe philoſopher in this work propoſes to teach princes the art of governing well; which he makes to conſiſt in that of knowing and acquiring all the qualities neceſſary for a ſovereign; ſuch as to command himſelf, to know how to form his council and court, and bring up his family in a proper manner.

The ſecond work in this collection is intitled Chumyum, or, de Mediocritate in rebus omnibus tenenda, the golden mean; but contains nothing more than may be met with in Seneca's Morals.

The third is a collection of dialogues and apophthegms concerning vices, virtues, moral duties, and good behaviour, intitled Lun-yu. At the concluſion of this article we ſhall give our readers the moſt ſtriking of theſe apophthegms, which are indeed the only valuable part of this book of Confucius.

The learned editors promiſed the public the works of Mencius, a Chineſe philoſopher, which Francis Noel, a miſſionary of the ſame company, performed in 1711, by publiſhing ſix Chineſe claſſics, in which are contained ſome fragments of Mencius. We ſhall not enter into the diſputes which theſe collections have raiſed among the literati, with regard to their authenticity.

The Chineſe chronology and philoſophy are not very conſiſtent. Fohi, the founder of the empire of China, reigned, according to them, in the 2954th year before Chriſt. The Chineſe cycle begins in the 2647th year before Chriſt, the eighth year of the reign of Hoangti. Hoangti's predeceſſors were Fohi who reigned 140 years, and Xinung who reigned 110 years. But, to follow the ſyſtem of Petavius, the birth of our Saviour falls in the year of the world 3889, the deluge in 1656; from whence it follows that Fohi reigned ſome ages before the flood: ſo that we muſt either give up the chronology of the ſacred writings, or that of the Chineſe. Neither a Chriſtian, nor a ſenſible European, will heſitate a moment which to prefer, when he reads in the Chineſe hiſtory, that Fohi's mother was impregnated by the rainbow, and a thouſand other ſuch extravagant ſtories, which make the epoch of his reign uncertain, notwithſtanding the unanimous teſtimony of a nation.

In whatever age Fohi reigned, he ſeems to have been rather an Orpheus or Hermes, than a great philoſopher or learned divine. For they tell us he invented the alphabet, two inſtruments of muſic, one of twenty-ſeven, the other of thirty-ſix ſtrings. They aſſert the book Ye-kim, attributed to him, contained the moſt profound ſecrets; that he taught the people, whom he had civilized, the exiſtence of a God, and the manner in which he ought to be worſhipped.

This Ye-kim is the third of the U-kim, or collection of the moſt ancient writings among the Chineſe: it is compoſed of whole lines and hemiſtichs, or rather lines ſtopped at different lengths, the combination of which exhibits ſixty-four different figures. The Chineſe looked on theſe as an emblematic hiſtory of nature, the cauſes of its phænomena, the ſecrets of divination, and of many other ſublime ſciences, till Leibnitz decyphered the ænigma, and demonſtrated that Fohi's two lines were only the elements of binary arithmetic.

The emperor Fohi tranſmitted his philoſophy to his ſucceſſors. They applied themſelves to improve what he had begun, to civilize the manners of the people, and accuſtom them to the uſeful bonds of ſociety. Xin-num went a ſtep farther; he taught agriculture, the virtues of plants, and the firſt attempts in the art of medicine. It is uncertain whether the Chineſe at that time were idolaters, atheiſts, or deiſts. Thoſe who pretend to prove they admitted the exiſtence of a God, from the ſacrifice Ching-tang made in the time of a famine, ſeem to want ſufficient grounds for the ſupport of their aſſertion.

The philoſophy of the kings of China ſeems to have been for a long time intirely political and moral, if we may form a judgment from the maxims of their kings Yao, Xum, and Yua. This collection is intitled U-kim, the firſt book of which, called Xu-kim, contains theſe maxims. The ſecond book, called Xy-kim, is a collection of moral poems and odes. The third is Fohi's lineary work already mentioned. The fourth is the Chum-cieu, or ſpring and autumn. This is an hiſtorical abridgment of the lives of ſeveral of their princes, wherein their vices are not concealed. The fifth is the Li-ki, which is a kind of ritual, to which was joined an explanation of what ought to be obſerved in ceremonies, profane and ſacred, and the duty of man in all ſtations of life, under the reign of the three imperial houſes, Hia, Xam, and Cheu. Confucius boaſted that he drew from the writings of the antient kings, Yao and Xum, the moſt ſublime ſcience and greateſt wiſdom.

The U-kim is the moſt ſacred, authentic, and moſt reſpected literary hiſtory in China. We may look on the reigns of their kings who were philoſophers, as the firſt age of the Chineſe philoſophy. The ſecond age which we are now entering upon, begins with Rooſi, or Li-lao-kiun, and ends with the death of Mencius. China had many philoſophers of note, long before the time of Confucius. Particular mention is made of Rooſi, Li-lao-kiun, or Lao-tan, who was born 346 years after Xekia, or 504 before Chriſt, at Sokoki in the province of Soo. They tell you he was an adept in the knowledge of the gods, of ſpirits, the immortality of ſouls, &c. Till this period the philoſophy of the Chineſe was only moral. But now metaphyſics, a number of ſects, and various opinions ſtarted up.

Confucius ſeems not to have greatly cultivated this philoſophy, but held that of the firſt kings in higher eſteem. He was born 451 years before Chriſt, at the village of Ceu-ye, in the kingdom of Xantung. His family was illuſtrious, and, according to the Chineſe, his birth miraculous, for they tell us that celeſtial muſic was heard round his cradle; that two dragons gave him pap; that at ſix years of age he arrived at the ſtature of manhood and gravity of old age. At the age of fifteen he applied himſelf to the ſtudy of literature and philoſophy. He was married at twenty, and his merit raiſed him to the higheſt preferment; but the luxury of a voluptuous and debauched court was diſagreeable to him, and he to the court. Being diſmiſſed from his employment, he retired into the kingdom of Sum, where he opened a ſchool of moral philoſophy, and had many diſciples, who were men of ability, and honeſt citizens. His philoſophy conſiſted more in deeds than words, in actions than expreſſions. His diſciples reverenced him when alive, regretted him when dead, and held him in ſo great veneration, that they inſtituted a kind of ſacrifices to his memory.

It is very difficult to determine whether Confucius was the Anaxagoras or Socrates of China, as the anſwer to this queſtion depends on a great knowledge of the language; but it is plain from the account we have given of his principal works, that he applied himſelf more to the ſtudy of humanity and morality than to the ſtudy of nature and its cauſes.

Mencius appeared in the next age. We ſpeak of this philoſopher next, becauſe Rooſi, among the Japaneſe, is the ſame with Li-lao-kiun among the Chineſe, whom we have mentioned before. Mencius has the reputation of having been ſuperior to Confucius in ſubtilty and eloquence; but at the ſame time is owned to be much his inferior, with regard to moral rectitude and ſimplicity of heart. All kinds of literature and philoſophy were almoſt extinguiſhed by Xi-hoam-ti who reigned about three ages after Confucius. This prince who was jealous of the glory of his predeceſſors, an enemy to men of learning, and an oppreſſor of his ſubjects, cauſed all the writings he could collect to be burned, except thoſe wrote on agriculture, medicine, and magic. Four hundred and ſixty ſages, who had retired to the mountains, with what part of their libraries they could carry along with them, were taken and expired in the flames, with the books they had preſerved: near as many who were confined in an iſland by the orders of this prince, fearing the ſame fate, choſe to throw themſelves from precipices into the ſea. The ſtudy of literature was prohibited by ſevere penalties, and the books that remained were diſregarded, and not looked into, till the princes of the race of Han ſet about the revival of learning, when it was with difficulty they recovered ſome of the works of Confucius and Mencius. They found a copy of Confucius buried in the ruins of a wall, but this copy was half rotten; and it is from this mutilated copy that his works now extant are taken.

The revival of learning may ſerve for a date of the third period of the antient Chineſe philoſophy.

The ſect of Foc then ſpread all over China, and, with it, idolatry,

dolatry, atheiſm, and ſuperſtition of all kinds; ſo that it is uncertain whether the ignorance, into which the brutality of Xi-hoam-ti had plunged theſe people, was not preferable to the falſe doctrines they were now infected with.

Three centuries after the birth of Chriſt, a ſect prevailed throughout the empire of China, who imagined themſelves more perfect by being inactive, and thought they reſembled the aerial beings more, by their inert philoſophy. Theſe, as much as in them lay, forbad the natural uſe of the ſenſes. But this ſect grew into diſrepute on the appearance of the Fan-chin. Theſe Epicureans appeared in the fifth century, and maintained that virtue, vice, providence, immortality, &c. were only arbitrary terms, without a meaning. This philoſophy is unhappily too palatable not to be received by the bulk of mankind, and is ſo much the more dangerous, as it becomes more univerſal.

The middle age of the Chineſe philoſophy commences about the tenth or eleventh century, under the two philoſophers Cheu-cu and Chim-ci. Theſe according to ſome were polytheiſts; according to others atheiſts. The ſect of literati immediately followed thoſe of Cheu-cu and Chim-ci. This ſect, under the name of Ju-kiao, divides the whole empire with the ſects Foe-kiao and Lao-kiao, which are in truth no other than three different combinations of ſuperſtition, idolatry, polytheiſm, and atheiſm.

At length the Europeans carried our ſciences into the Eaſt; and this event is the epocha of the modern philoſophy among the Chineſe. The ſingular eſteem with which they honoured the firſt Europeans who travelled into China, gives us no very high idea of their ſkill in mechanics, aſtronomy, and other parts of the mathematics. Theſe Europeans were not men of any diſtinguiſhed merit, but ſuch whom zeal carried thither, to propagate the Chriſtian religion at the hazard of their lives, in unknown regions, which indeed befel ſome of their ſucceſſors. They were well received by the Chineſe; ſuperſtition, apt to take offence and be alarmed, gave them no oppoſition; they opened ſchools, had many diſciples, and their learning was admired. The emperor Cham-hy about the end of the laſt century admitted them at court, learned our philoſophy and ſciences of them, ſtudied mathematics, anatomy, aſtronomy, mechanics, &c. but his ſon Yong-Tching baniſhed all the virtuoſi of Europe to Canton and Macao, except thoſe which reſided in Pekin, who continued there. Kien-Long the ſon of Yong-Tching was a little more indulgent to them; he however forbad the Chriſtian religion, and even perſecuted his ſoldiers who had embraced it; but permitted the jeſuits to continue their inſtructions at Pekin.

We ſhall now give ſome account of the Chineſe ethics; theſe depend, among them, on the ſtudy of what Confucius has wrote on this ſubject; we cannot therefore give a clearer idea of their morality than by exhibiting ſome of his maxims.

1ſt. Political ethics have two principal objects, the cultivation of the mind and the government of the people.

2d. The former requires the underſtanding to be adorned with all knowledge, to enable it to diſtinguiſh good from evil, truth from falſehood; to moderate the paſſions, to ſtrengthen the love of truth and virtue in our hearts, to behave ourſelves with decency and honeſty towards other men.

3d. The latter object of ethics requires the citizen to know how to conduct himſelf, govern his family, and fill his own ſtation of life properly.

4th. He merits the title of a philoſopher, who has a profound knowledge of things and books, who weighs every thing wiſely, ſubmits to reaſon, and goes on boldly in the paths of truth and juſtice.

5th. When the intellectual faculty is brought to ſuch a degree of perfection as to dive into the nature of things, the intentions and will purify themſelves, bad affections depart from the ſoul, the body is preſerved in health, domeſtic affairs are well managed, every duty of life diſcharged, private government is well adminiſtered, the empire well regulated, and enjoys peace.

6th. What has man from heaven? An intelligent nature, a conformity to which conſtitutes a rule of actions. The wiſe man exerciſes himſelf in keeping up to this rule.

7th. There is an unerring reaſon or celeſtial rectitude given to all; there is an human ſupplement to this gift, when it is loſt. The celeſtial rectitude is in poſſeſſion of the ſaint, the ſupplement is attained by the philoſopher.

8th. There is only one principle of moral conduct, which is, to behave in all things with ſincerity; to conform, with all our ſouls and all our ſtrength, to this univerſal maxim, Do as you would be done unto.

9th. A man is known by examining his actions, conſidering their end, the paſſions in which he indulges himſelf, and the things with which he contents himſelf.

10th. We ſhould immediately publiſh all things of univerſal benefit and utility; to conceal any part, to make any reſerve is to deſpiſe virtue and drive her from us.

11th. Let the diſciple learn the reaſons of things, let him examine them, meditate on them, reaſon concerning them, conſult the wiſe and learned, inform himſelf, baniſh confuſion from his thoughts, and irregularity from his conduct.

12th. Virtue is not only conſtant in external appearances.

13th. Virtue, regardleſs of the partiality on earth, has not a thought which may not be avowed in the open face of heaven.

14th. We muſt not apply ourſelves to virtue, but to be virtuous.

15th. The perfect man always keeps ſight of himſelf.

16th. There are three degrees of wiſdom, to know what virtue is, to love and to poſſeſs it.

17th. Uprightneſs of heart is the foundation of virtue.

18th. There are five rules to be obſerved for the conduct of the univerſe: juſtice between the prince and ſubject, affection between father and child, fidelity between man and wife, ſubordination among brothers, agreement between friends. There are three cardinal virtues, prudence to diſcern, univerſal benevolence which binds, and fortitude ſupports the whole. Uprightneſs of heart implies theſe.

19th. The motives of the mind are unknown to others; be wiſe therefore, and be particularly careful about thoſe things which are known to yourſelf only.

20th. Virtue is placed between two extremes; he that has paſt the middle point, has done no better than he that has never attained it.

21ſt. One thing alone is valuable, that is, virtue.

22d. A nation is more powerful by virtue, than water and fire. I have never ſeen a people periſh who have taken that for their ſupport.

23d. Example is more neceſſary than precept for the people.

24th. A wiſe man is his own moſt ſevere cenſor, his own witneſs, accuſer, and judge.

25th. To conquer ourſelves, and recover the ancient and primary ſtate of celeſtial rectitude, is to attain innocence and perfection.

26th. Slothful indolence and precipitate raſhneſs are equally enemies to ſucceſs.

27th. The upright man takes no by-path, but keeps on in the high road.

28th. The honeſt man is a citizen of the world.

29th. Charity is a certain and rational affection which ſacrifices us to mankind, as if it made but one individual with us, and aſſociated us to the adverſity and proſperity of the whole human race.

30th. The honeſt man only has a right to love and hate.

31ſt. Repay injuries with averſion, and benefits with acknowledgment; for this is juſtice.

32d. To fall and not to riſe again is properly to abandon virtue.

33d. It is a ſpecies of trouble of mind to wiſh to others what is not in our power to give them.

34th. The upright man acts according to his ſtation, and covets nothing out of his reach.

35th. He who ſtudies wiſdom has nine viſible qualities, clearneſs of eye, fineneſs of ear, ſerenity of countenance, gravity in deportment of body, veracity of intention, punctuality in performance, counſel in doubtful matters, conſideration of conſequences in vengeance and anger.

The morality of Confucius is vaſtly ſuperior to his phyſics or metaphyſics. We ſhall conclude this article with two or three remarks that may not perhaps be diſagreeable to our readers.

Though the antiquity of the Chineſe falls greatly ſhort of their pretenſions, yet the date of their empire certainly takes place ſoon after the flood; but, the greater antiquity we allow them, the more reaſon we ſhall have to reproach them with the little improvement they have made in their language and writings. It is inconceivable that a people to whom ſo much wit and ſagacity is in general attributed, ſhould have multiplied accents inſtead of words, and characters ad infinitum, inſtead of combining a ſmall number of them to form a language. We have heard of no poets or orators among them; their dramatical performances are extremely imperfect, they contain all the actions of the perſon's life repreſented from the cradle to the grave, and the performance takes up ſeveral months. It is no wonder indeed they have neither had poets nor orators; for their language is neither capable of poetry nor eloquence.

CHI'PPING, a phraſe uſed by potters and China-men to expreſs that common accident both of our own ſtone and earthen ware, and the porcelain of China, the flying off of ſmall pieces, or breaking at the edges. Our earthen wares are particularly ſubject to this, and are always ſpoiled by it, before any other flaws appear in them. Our ſtone wares eſcape it better than theſe, but leſs than the porcelain of China, which is leſs ſubject to it than any other manufacture in the world. The method by which the Chineſe defend their ware from this accident, is this: they carefully burn ſome ſmall bambou canes to a ſort of charcoal, which is very light, and very black; this they reduce to a fine powder, and then mix it into a thin paſte, with ſome of the varniſh which they uſe for their ware: they next take the veſſels, when dried, and not yet baked, to the wheel, and, turning them ſoftly round, they, with a pencil dipped in this paſte, cover the whole circumference with a thin coat of it: after this, the veſſel is again dried, and the border made with this paſte appears of a pale greyiſh colour, when it is thoroughly dry. They work on it afterwards in the common way, covering both this edge and the reſt of the veſſel with the common varniſh. When the whole is baked on, the colour given by the aſhes diſappears,

pears, and the edges are as white as any other part; only, when the baking has not been ſufficient, or the edges have not been covered with the ſecond varniſhing, we ſometimes find a duſky edge, as in ſome of the ordinary thick tea cups.

It may be a great advantage to our Engliſh manufactures to attempt ſomething of this kind. The willow is known to make a very light and black charcoal, but the elder, though a thing ſeldom uſed, greatly exceeds it. The young green ſhoots of this ſhrub, which are almoſt all pith, make the lighteſt and blackeſt of all charcoal; this eaſily mixes with any liquid, and might be eaſily uſed in the ſame way that the Chineſe uſe the bambou charcoal, which is a light hollow vegetable, more reſembling the elder ſhoots than any other Engliſh plant. It is no wonder that the fixed ſalt and oil, contained in this charcoal, ſhould be able to penetrate the yet raw edges of the ware, and to give them in the ſubſequent baking a ſomewhat different degree of vitrification from the other parts of the veſſel, which, though, if given to the whole, it might take off from the true ſemi-vitrified ſtate of that ware, yet at the edges it is not to be regarded, and only ſerves to defend them from common accidents, and to keep them entire.

The Chineſe uſe two cautions in this application; the firſt in the preparation; the ſecond in the laying it on. They prepare the bambou-cane for burning into charcoal, by peeling off the rind. This might eaſily be done with our elder ſhoots, which are ſo ſucculent, that the bark ſtrips off with a touch. The Chineſe ſay, that, if this is not done with their bambou, the edges touched with the paſte would burſt in the baking: this does not ſeem indeed very probable; but the charcoal will certainly be lighter made from the peeled ſticks, and this is a known advantage. The other caution is, never to touch the veſſel with hands that have any greaſy or fatty ſubſtance about them; for, if this is done, they always find the veſſel crack in that place. *Obſ. ſur les Cout. de l' Aſie.*

CHIRU'RGERY (*Dict.*)—Chirurgery is divided into ſpeculative and practical; the latter executes what the former directs.

The theory of Surgery, as it is commonly called, ſhould be diſtinguiſhed into general and particular. The general theory of Chirurgery is the theory or ſcience of medicine itſelf: the theory is inſeparable; one part cannot be known thoroughly, or applied without knowing both. The only difference between medicine and Chirurgery ſeems to be with regard to their different objects, and the different claſſes of maladies in which each is employed. Chirurgery comprehends every ſcience which teaches the art of healing, but applies them only in external caſes. Medicine alſo requires this ſcience equally, but has for its more immediate object internal caſes; ſo that the ſcience is the ſame; the application, not the ſcience, making the difference.

By conſidering the objects of both theſe arts, their connection is very viſible, and their theory the ſame. External diſorders, the object of Chirurgery, are eſſentially the ſame, as internal maladies, the object of medicine; they differ only in their ſituation: they are of equal importance, offer the ſame indications, and equally require a cure.

Though the theory of medicine and Chirurgery be the ſame, yet we muſt diſtinguiſh between the phyſician and ſurgeon. A man acquainted only with the general theory in theſe arts will be neither the one nor the other. A phyſician, beſides the knowledge of pharmacy, muſt have ſkill to apply the rules of his ſcience to the cure of internal diſeaſes; a ſurgeon, by practice, muſt acquire a readineſs and eaſe in performing operations, and apply the ſame rules of ſcience to the cure of external diſorders.

Bare ſcience, or knowledge alone, does not enable us to apply its rules, it only dictates them: practice only teaches to apply them properly, and that practice too under a maſter: ſtudy gives knowledge, but we cannot arrive at the art of applying that knowledge we have attained by ſtudy without experience; we gain readineſs by often ſeeing the ſame objects, and cuſtom only enables us to acquire a facility.

Anatomy, phyſiology, pathology, the doctrine ſymptoms, and the knowledge of the animal oeconomy, are in Chirurgery, as well as phyſic, the principia of univerſal knowledge. Anatomy diſplays the ſtructure of the organs which compoſe the human body. Phyſiology explains their actions, mechaniſm, and uſes. By this we know the human body in a ſtate of health. Pathology teaches the nature and cauſes of diſeaſes. The doctrine of ſymptoms acquaints us with the ſigns and complications of diſtempers, the particular indicia of which the ſurgeon ought to attend to. The knowledge of the animal oeconomy indicates a proper regimen with regard to air, diet, the paſſions of the mind, evacuation, exerciſe, reſt. Therapeutics teach the ſurgeon the different methods of cure, to know the nature and property of his medicines, and in what manner they act.

All this kind of knowledge, however neceſſary, is yet inſufficient; though it be the baſis of phyſic and Chirurgery, yet it has not an eſſential connection with them; though theſe ſtudies are the beſt preparations to initiate any one in theſe arts, ingenious men may chuſe to improve their minds with a knowledge of anatomy, without ever attaining the art of phyſic or Chirurgery.

Beſide the general præcognoſcenda we have been ſpeaking of, the ſurgeon muſt acquire the particular talent of manual operation; this can only be attained by a long courſe of practice and obſervation. He muſt firſt know what caſes require an operation, the beſt manner of performing it, the difficulties which ariſe from the ſtructure of the parts, and the proper remedies to be applied; he muſt alſo know the animal oeconomy, and attend to every motion of nature; for, without theſe precautions, a ſurgeon will make a blind operator, and be more apt to kill than cure.

To form the complete ſurgeon, ſomething more is ſtill wanted; operation which generally ſtrikes the vulgar, is but one part of the cure in diſeaſes which come within the ſphere of Chirurgery; the accidents which may attend it, the various treatment theſe accidents may require, are all eſſential objects of Chirurgery. Let us ſuppoſe, for example, a fracture accompanied with a dangerous contuſion; the reduction of the fracture, though often very difficult, is but a ſmall part in the treatment of this diſorder; the inflammation, gangrene, abſceſſes, ſuppurations, exceſſive diſcharges, fever, delirium, and convulſions, which frequently follow in ſuch caſes, require a more extenſive knowledge than is neceſſary to reduce the bone; a ſmall degree of knowledge, joined to practice and addreſs, may perform the ſimple operation, but the accidents which may attend fractures are not to be cured or prevented, without underſtanding the animal oeconomy, the nature of the fluids and juices, and how medicines are to operate upon them. This can only be acquired by experience, the beſt ſource of certain knowledge after a due ſtudy of the theory.

Royal academy of CHIRURGERY.—This academy was firſt eſtabliſhed at Paris, in the year 1731, and confirmed afterwards by letters patent, in 1748. It is under the direction of the ſecretary of the king's houſhold, like other eſtabliſhments of this kind: their meetings are held in the hall of the college of St. Come, every Thurſday. On the Thurſday after Low Sunday they annually have a public meeting, at which they declare what memoir has merited the prize left by the late M. de la Peyronie. This prize is a golden medal, value five hundred livres. The impreſſion ſtruck on this medal is the buſt of Lewis the Well-beloved.

CHORD (*Dict.*) — To find the number of vibrations made by a muſical Chord or ſtring, in a given time, its weight, length, and tenſion being given. Let N repreſent the weight of the Chord; L its length; P the tenſion, or weight equivalent to it, by which the Chord is extended; and D the length of a given pendulum; p the circumference of a circle, the diameter of which is 1; then will the number of vibrations made by the given Chord, while the pendulum vibrates once, be expreſſed by $p\sqrt{\frac{DPa}{LN}}$. If we take L for the number of inches and decimals contained in the length of the Chord, and the proportion of the tenſion to the weight of the Chord, as n to 1, then will the number of vibrations of the Chord in one ſecond be $\frac{355}{113}\sqrt{\frac{39.\,2n}{L}}$. Where $\frac{355}{113}$ denotes the proportion of the circumference to the diameter of the circle; and 39. 2 the length of a pendulum vibrating ſeconds, in inches and decimals of an inch, Engliſh meaſure. This laſt expreſſion coincides with Mr. Euler's rule, only we here expreſſed in Engliſh what he gives in Rhinland meaſure. To illuſtrate this rule by an example; ſuppoſe the length of the Chord to be 18. 7 inches, its weight 6 $\frac{1}{5}$ grains, and the tenſion or weight extending this Chord to be 8 *lb* troy, or 46080 grains. Then $a = 18.\ 7$, and $n = \frac{46080}{6.\ 2} = 7432$. The number of vibrations therefore by the rule will be $\frac{355}{113}\sqrt{\frac{39.\,2 \times 7432}{18.\ 7}} = 392$.

By logarithms, the rule may be thus expreſſed $\frac{L + W}{2} + C = V$. When L is the logarithm of the ratio of a pendulum, vibrating ſeconds, to the length of the given ſtring; W the logarithm of the ratio of the tenſion to the weight of the ſtring; C the logarithm of the ratio of the circumference of a circle to its diameter, or 0,4971500; and, laſtly, V = logarithm of the required number of vibrations in one ſecond.

In every Chord, the number of vibrations in a given time will be as $\sqrt{\frac{n}{a}}$, that is, as the ſquare root of the extending weight, divided by the weight of the Chord, and its length. If therefore Chords be of the ſame length, their vibrations in a given time will be as the ſquare roots of the extending weights, divided by the weight of the Chords. If Chords be equal in length and weight, their vibrations will be as the ſquare roots of their extending weights or tenſions; and if the tenſion be equal, and the Chords differ only in length, their vibrations will be as the ſquare roots of their lengths, multiplied by their weight: that is, reciprocally as the lengths of the Chords, becauſe the weights of the Chords will in this caſe be proportional to their length. *Euler.*

Mr. Euler informs us, that he found the Chord, making 392 vibrations in a ſecond, to beat uniſon with the key called *a* in inſtruments, that is, an octave and ſixth major above the loweſt C, being to *a* as 3 to 10, will make 118 vibrations in one ſecond. And the higheſt C, or c''', as Mr. Euler calls it, being four octaves above the loweſt *c*, will vibrate 1888 times in one ſecond of time. Mr. Euler ſuppoſes the limits of a human ear to be, with reſpect to gravity, two octaves lower than C; and, with reſpect to acuteneſs, two octaves higher than c'''.

CHORE'GRAPHY, the art of writing down dances, like tunes, in characters and demonſtrative figures.

This is an art which the ancients were ignorant of, or at leaſt has never been tranſmitted to us. No author has mentioned it that we know of, before Furetiere, who in his Dictionary tells us of a curious treatiſe, wrote by Thoinet Arbeau, printed at Langres in 1588, intitled Orcheſography. Arbeau was in all probability the firſt who thought of repreſenting dances by characters, but he carried this art to no great perfection; he has however a juſt claim to the honour of having been the inventor of it. His method was to write down the tune on ruled paper, as uſual, and over every bar to write in words what kind of ſtep and figure was to be obſerved, throughout the whole tune. He never thought of deſcribing the figure by lines, and dividing thoſe lines into equal parts, correſponding to the meaſure, the time and notes, in every kind of time; or of expreſſing every different movement by a diſtinct character, and placing theſe characters over every diviſion, correſponding to the lines of the figure, which has been done ſince with great exactneſs and perſpicuity.

CHRI'STIANS *(Dict.)*— It has been the opinion of ſeveral, that the name Chriſtian was derived originally from the Greek chreſtos, good, uſeful: and Suetonius, ſpeaking of Claudius, and of his expelling the Jews out of Rome, ſays that he baniſhed them thence, becauſe they were continually quarrelling about Chriſt: Judæos, impulſore Chreſto, aſſidue tumultuantes Româ expulit. Tertullian ſays, the name Chriſtian comes from the unction received by Jeſus Chriſt; and that of Chreſtianus, given by miſtake, ſignifies that gentleneſs and benignity, whereof the Chriſtians make profeſſion.

When Chriſtianity was firſt planted in the world, thoſe who embraced it, were known among themſelves by the names of diſciples, believers, elect, ſaints, and brethren; nor did they aſſume the name of Chriſtians, till the year of Chriſt 43, at Antioch, where St. Paul and Barnabas jointly preached the Chriſtian religion. This was the name they afterwards ſo much gloried in, that, before the face of their enemies, they would acknowledge no other title, though hated, reviled, tormented, and martyred for it. Euſebius records a memorable ſtory of one Sanctus, a deacon of the church of Vienna, who, being put to the rack, and examined by the magiſtrates, concerning his name, his country, his city, and his quality, made anſwer, I am a Chriſtian; which, he ſaid, was to him both name, and city, and kindred; nor could his perſecutors extort any other anſwer from him.

The primitive Chriſtians were known by ſeveral denominations. Epiphanius ſays, they were called Jeſſeans, either from Jeſſe, the father of David, or, which is more probable, from the name of Jeſus, whoſe diſciples they were. Euſebius ſays, they were likewiſe ſtiled Therapeutæ, i. e. worſhippers of the true God, or ſpiritual phyſicians; and St. Jerom confirms it. And, becauſe the Chriſtian life took its original from the waters of baptiſm, becauſe they were regenerated, or born again into Chriſt's religion, by water, the Chriſtians were wont to pleaſe themſelves with the name piſciculi. Sometimes the Chriſtians ſtiled themſelves Gnoſtics, i. e. men of underſtanding and knowledge; which name being afterwards abuſed by a perverſe ſort of heretics, they added the title of Chriſtian to it, and gave themſelves the title of Chriſtian Gnoſtics. Another name which frequently occurs in the writings of the ancients, is that of Theophori, i. e. temples of God, and is as old as Ignatius. We ſometimes meet with the name Chriſtopheri, uſed in the ſame ſenſe. It is very obſervable, that the Chriſtians, in all the names they choſe, had a particular regard to Chriſt and God, abhorring all party names, and human appellations; inſomuch that Epiphanius ſays, "The church was never called ſo much as by the name of any apoſtle: we never heard of Petrians, or Paulians, or Bartholomæans, but only Chriſtians, from Chriſt." The Chriſtians likewiſe took the name of catholic. The heathens uſed to confound the names of Jews and Chriſtians together, often giving the name of Jews to Chriſtians. Thus Dio, in the Life of Domitian, ſpeaking of Acilius Glabrio, a man of conſular dignity, ſays, he was accuſed of atheiſm, and put to death for turning to the Jews religion; which, as Baronius and others obſerve, muſt mean the Chriſtian religion, becauſe he was a martyr to it. The Chriſtians had alſo many names of reproach caſt upon them by their enemies; ſuch as Nazarenes, Galileans, Greeks, Impoſtors, Atheiſts, &c. which laſt name was common, upon account of their deriding the worſhip of the heathen gods. The reaſon why they called them Greeks was this; becauſe many of the Chriſtian philoſophers wore the Grecian pallium, or cloak; and the Romans, taking offence to ſee them quit the Roman gown for that habit, took occaſion from thence to deride them with the name of Greeks. The heathens alſo declaimed againſt the Chriſtians, as magicians and ſorcerers, becauſe Chriſt and his diſciples worked many miracles. St. Auſtin ſays, it was generally believed among the heathens, that our Saviour wrote ſome books of magic, which he delivered to Peter and Paul, for the uſe of his diſciples. The new, the wicked, and unreaſonable ſuperſtition, the barbarous, the new, and ſtrange religion, were other names of reproach they caſt upon the Chriſtian religion. Theſe, with many other ſuchlike, may ſhew the inveteracy and malice of the heathens againſt the Chriſtians.

The Jews were the firſt and moſt inveterate enemies the Chriſtians had. They put them to death as often as they had it in their power; and, when they revolted againſt the Romans, in the time of the emperor Adrian, the moſt rigorous puniſhments were employed againſt them, to compel them to blaſpheme and renounce Jeſus Chriſt. And we find, that, even in the third century, they endeavoured to get into their hands Chriſtian women, in order to ſcourge and ſtone them in their ſynagogues; where they curſed them ſolemnly, three times a day; and their rabbins would not ſuffer them to converſe with Chriſtians, upon any occaſion: nor were they contented to hate and deteſt them, but they diſpatched emiſſaries all over the world, to defame the Chriſtians, and ſpread all ſorts of calumnies againſt them. They accuſed them, among other things, of worſhipping the ſun, and the head of an aſs. They reproached them with idleneſs, and being an uſeleſs race of people. They charged them with treaſon, and endeavouring to erect a new monarchy againſt that of the Romans. They affirmed, that, in celebrating their myſteries, they uſed to kill a child, and eat its fleſh. They accuſed them of the moſt ſhocking inceſts, of impudence, avarice, and ſometimes of prodigality, and of intemperance in their feaſts of charity. But the lives and conduct of the firſt Chriſtians were ſufficient to refute all that was ſaid againſt them, and evidently demonſtrated, that theſe calumnies were merely the effect of the moſt inveterate hatred and malice.

We will now take a ſhort view of the ten grand perſecutions of the Chriſtians.

The firſt who raiſed a general perſecution againſt the Chriſtians, was the emperor Nero, of whom Tertullian tells the Gentiles, and, for the confirmation thereof, appeals to their public records: "We glory, ſays he, in ſuch an author of our perſecution: any body who knows him, may underſtand, that nothing but what is eminently good, could be condemned by Nero." He was a prince of ſuch brutiſh and extravagant manners, that their own writers ſcruple not to call him a brute in human ſhape; the very monſter of mankind. He wanted, ſays Euſebius, this to be added to his other titles, to be called the firſt emperor who perſecuted the Chriſtian religion. He publiſhed laws for ſuppreſſing it, and put to death thoſe who profeſſed it; as appears by an inſcription found in Spain, for he ſeems to have carried his perſecution even to that country. This perſecution continued a full year, even that after the burning of Rome, A. D. 66.

The ſecond perſecution was began by Domitian, a man eat up with pride and inſolence; nay, ſo wickedly ambitious was he, as to affect divinity in all his public edicts, aſſuming to himſelf, and requiring others to give him the titles of Lord and God. This perſecution began in the ninety-ſecond year of the Chriſtian æra, 26 years after that by Nero; and continued to Domitian's death, which happened about 3 years after.

The third perſecution commenced under Trajan, a prince of excellent virtues, but ſullied by his ſevere proceedings againſt the Chriſtians. He looked upon the religion of the empire as undermined by this new way of worſhip; that the number of Chriſtians grew formidable, and might endanger the tranquillity of the Roman ſtate; and that there was no better way to ſecure himſelf the favour of the Gods, eſpecially in the wars, than to vindicate himſelf againſt the Chriſtians. Accordingly he iſſued out orders to proceed againſt them as illegal ſocieties, erected and acting contrary to the laws. This perſecution is placed by Euſebius, and by many after him, in the tenth year of Trajan, and the one hundred and eighth of the Chriſtian æra; though Spanhemius thinks it began five years ſooner.

The fourth perſecution was ſet on foot by Hadrian, ſucceſſor of Trajan. We do not find, indeed, that this emperor made any laws againſt the Chriſtians, but only continued thoſe of his predeceſſors. As to the duration of this perſecution, Spanhemius reckons it commenced in the ſecond year of Hadrian's reign, and was ſtopped in the tenth, which is A. D. vulg. 126.

The fifth perſecution was in the reign of M. Aurelius Antoninus Philoſophus. He aſcribed the Chriſtians' reſolute undergoing death to mere ſtubbornneſs and obſtinacy; and accordingly made new laws and edicts againſt them, expoſing them to all the malice of their enemies. The perſecution commenced in the eaſtern parts, about the ſeventh year of his reign, A. D. 167, and continued for ſeveral years. It ſpread into the weſt, eſpecially France, where it raged with great ſeverity; and many received the crown of martyrdom. But the emperor at length greatly mitigated this ſeverity, on account of a wonderful deliverance from his enemies, procured by the prayers of the Chriſtians.

The ſixth perſecution was raiſed by Septimus Severus, who began to reign A. D. 195. The edicts which this prince gave out againſt the Chriſtians, were executed with ſo much rigour and inhumanity, that they verily believed the time of antichriſt was then come.

The ſeventh perſecution was began by Maximinus, a man of baſe and obſcure original, and of a mean and ſordid education; having been firſt a ſhepherd, then a highwayman, and laſtly a ſoldier. This perſecution is placed A. D. 237.

The eighth perſecution was raiſed by Decius, who was an implacable enemy to the Chriſtians. This perſecution was began A. D. 250; and, though it did not laſt two years, yet proved the hotteſt of any that had hitherto oppreſſed the church. The Chriſtians were every-where driven from their houſes, ſpoiled of their eſtates, and tormented in their bodies. Whips and priſons, fire and wild beaſts, ſcalding pitch and melted wax, ſharp ſtakes and burning pincers, were but ſome of the methods of their treatment; when the old ones were run over, new ones were daily invented. The laws of nature and humanity were broken down; friend betrayed friend, and the ſon his own father: every one was ambitious to promote the imperial edicts, and thought it meritorious to bring a Chriſtian to the ſtake.

The ninth perſecution commenced in the reign of Valerian, A. D. 257, and continued three years and a half: but, notwithſtanding all the ſeverity hitherto uſed, above one half of the vaſt Roman empire was become Chriſtian.

The tenth perſecution was begun, about the year 303, by Diocleſian. When he reſigned the crown, Galerius Maximian carried on the perſecution. It is, indeed, impoſſible to conceive, much more to expreſs, the cruelties of that time. Euſebius, who was an eye-witneſs of them, tells us, that they were innumerable, and exceeded all relation. Monſieur Godeau reckons, that, in this perſecution, there were no leſs than nine thouſand martyrs killed in one month's time; and he obſerves, that, during the continuance of it, there were, in the bare province of Egypt, no leſs than one hundred and forty-four thouſand perſons maſſacred, and ſeven hundred thouſand, who died through the fatigues of baniſhment, or of the public works to which they were condemned. This perſecution ſeems to have been the firſt of the ten that affected the iſland of Great Britain. It laſted no leſs than ten years. The emperors thought they had finiſhed their work, and told the world, as in ſome ancient inſcriptions found in Spain, "That they had utterly deſtroyed the name and ſuperſtition of the Chriſtians, and had reſtored and propagated the worſhip of the Gods." It ſeems they grant, that Paganiſm was at a low ebb before they attempted to reſtore it, and deſtroy Chriſtianity: but they were far deceived in their vain boaſting aſſertion; Chriſtianity was not deſtroyed, but farther propagated; and, where they had done their utmoſt to ruin it, even there it had a glorious reſurrection out of its grave, and Paganiſm haſtened to its ruin.

Thus the Chriſtian religion, in a moſt miraculous manner, expanded herſelf, growing up like a palm-tree, under the heavy weight of perſecution; for, as we have ſhewn, no religion had more powerful oppoſitions, by various kinds of puniſhments, oppreſſions, and tortures, which have been ſaid to have decked her with rubies, in her very cradle. Now, as the Chriſtian religion hath the pureſt and moſt abſtracted, the nobleſt and higheſt ſpiritual notions, ſo has it been moſt ſubject to differences of opinions, and diſtractions of conſcience: the purer the wheat is, the more ſubject to tares, and the moſt precious gems to flaws. The ſeveral ſects of the Chriſtian religion are taken notice of in their proper places.

If we conſider the Chriſtian religion, with regard to its principles, it cannot be denied, but that they are very obſcure and difficult to be underſtood; and that its myſteries are above the reach of human comprehenſion. The obſcurity of them, no doubt, is owing in a great meaſure to the ſubtilties introduced by ſeveral philoſophers, who became proſelytes to Chriſtianity in the firſt ages of the Church; and who, afterwards becoming doctors, endeavoured to explain the myſteries of the Chriſtian religion, by arguments borrowed from the Platonic, and other Pagan ſyſtems of philoſophy. Their ſucceſſors likewiſe, by their laboured explanations, added new obſcurities to thoſe which they found before; and, the human paſſions inſenſibly blending with theſe ſymptoms, nothing more was wanting to render the Chriſtian religion an impenetrable myſtery. To this, no doubt, is owing that infinite number of ſects and hereſies, which have ſprung up in the Church; each of which lays claim to a primitive purity of doctrine, the characteriſtic of divine inſpiration, a right of ſuperiority, and a perfect knowledge of the way to heaven; and there is not one which, indirectly at leaſt, can forbear damning the reſt who deſiſt from it.

The exellency of its morals is a demonſtration of the divine original of the Chriſtian religion. It conſiſts not in idle philoſophical ſpeculations, or perpetual grimace and affectation, but in a ſteady practice of the duties it requires, without the leaſt view of recompence from men: it neither ſeeks their admiration, nor attempts to dazzle their eyes, and deceive them; and this practice, being grounded on God's poſitive commands, is entirely conformable to the conduct which its divine founder obſerved, whilſt upon earth. There is no religion which excites men more to the love and practice of virtue, and hatred of vice; or that preſcribes greater rewards for the one, and puniſhments for the other.

The Chriſtian religion, in regard to the practice of it, conſiſts in the moſt exact imitation, that poſſibly can be conceived, of the infinite perfections of the ſupreme Being. From hence we may derive that ſolid virtue, that power which it gives us to ſubdue our paſſions, and that ſatisfaction which we receive from the obſervance of thoſe laws, to the utmoſt of our abilities, which God has preſcribed mankind. The characters of Chriſtianity are perfectly conformable to the attributes of the divine Majeſty: the moral part never indulges men's paſſions; it has no other view than the preſervation and happineſs of mankind; nor have the moſt inveterate enemies of the Chriſtian faith ever invented any thing but what was very much inferior to it, both in practice and ſpeculation.

CHRONO'LOGY *(Dict.)*—The farther we go back into antiquity, the greater is the uncertainty of the æra's, or epocha's; wherefore, men of learning have applied themſelves principally to the Chronology of the earlieſt times. M. Fontenelle, in his Panegyric on M. Bianchini, compares the firſt times to a vaſt ruinated palace, the materials of which lie all together in confuſion, and a great part of them deſtroyed. The more theſe materials are deficient, ſo much the more room is there to form different plans, which have no correſpondence, out of thoſe which remain. Such is the ſtate of ancient hiſtory. Beſides, materials are not only wanting on account of the vaſt number of books which have been loſt, but thoſe which remain frequently contradict each other.

We muſt therefore either reconcile theſe, or reſolve to make a choice of what we think probable; which, however, muſt always be ſuſpected of being arbitrary. All the chronological enquiries, hitherto made, are more or leſs ſucceſsful combinations of theſe indigeſted materials; and who can be aſſured the number of the combinations is exhauſted? Are not new ſyſtems of Chronology publiſhed every day? Moreri, in his Dictionary, tells us, there are ſeventy different opinions concerning the Chronology from the beginning of the world to our Saviour: we ſhall content ourſelves with mentioning the moſt celebrated authors. Julius Africanus, Dionyſius the younger, Euſebius, St. Cyril, Bede, Scaliger, Petavius, Uſher, Marſham, Voſſius, Pagi, Pezron, M. Deſvignoles, Mr. Freret, and Sir Iſaac Newton: illuſtrious names! How difficult is the ancient Chronology, ſince, after the labours of ſo many eminent men, we ſeem rather to have ſeen, than cleared up, the obſcurity of it. It is a kind of immenſe perſpective, and out of ſight; the bottom being interſperſed with thick clouds, through the intervals of which ſome glimmerings of light appear.

If it only related to ſome particular events, we ſhould not be ſurprized at the diſagreement between theſe great men; but the points in queſtion are concerning the moſt remarkable events in hiſtory, both ſacred and profane; namely, the number of years ſince the creation; the diſtinction between the ſacred and civil years among the Jews; the ſojourning of the Iſraelites in Ægypt; the Chronology of the judges and kings of Juda and Iſrael; the beginning of the years of the captivity, and of Daniel's ſeventy weeks; the hiſtory of Judith and Eſther; the birth, miſſion, and death of the Meſſiah, &c. the origin of the Chineſe empire; the dynaſties of Ægypt; the epocha of the reign of Seſoſtris; the beginning and end of the Aſſyrian empire; the Chronology of the kings of Babylon and Media; of the ſucceſſors of Alexander, &c. not to mention the fabulous and heroic ages, wherein the difficulties are ſtill more numerous, as the Abbé Artigni has well obſerved, in his Memoir concerning Literature and Hiſtory. From whence the judicious author, laſt quoted, concludes it needleſs to ſet about reconciling the old ſyſtems, or deviſing new; it is ſufficient, ſays he, to pitch upon one, and ſtick to it; and this opinion ſeems to coincide with that of other learned men, whom we have conſulted on this occaſion. As, for example, take Uſher's ſyſtem, which is at preſent in great repute, or that of Petavius, in his Rationarium Temporum. In writing ancient hiſtory, we are to mention whoſe Chronology we follow, for fear of leading our readers into an error; for, according to ſome authors, there are, from the beginning of the world to the Chriſtian æra, but 3740 years; according to others, 6934; which makes a difference of 3194 years.

It ſeems a matter of no great importance to mention, at large, the various ſentiments of chronologers, or enumerate the proofs they bring in ſupport of their different opinions; the reader may apply to their different works. Beſides, we deſign below to give an extenſive view of the ſacred Chronology, which is of the greateſt moment. The following are the moſt famous opinions concerning the age of the world, from the creation to the birth of our Saviour.

According to the Vulgate,

	Years.
Uſher	4004
Scaliger	3950
Petavius	3984
Riccioli	4184.

According to the Septuagint,

	Years.
Euſebius	5200
The Alphonſine Tables	6934
Riccioli	5634.

The birth of Chriſt is very much diſputed: authors vary, even in this point, ſeven or eight years. But, ſince that time, Chronology begins to be much more certain, by the number of monuments we have left, and the differences we meet with in authors being much leſs conſiderable.

According to Sir Iſaac Newton, the world is not ſo old by five hundred years as other chronologers have made it: the proofs he produces are of two kinds.

The firſt turn on the valuation of generations. The Ægyptians reckoned three hundred and forty-one generations from Menes to Sethos, and accounted three generations one hundred years. The ancient Greeks reckoned forty years a generation. In which Sir Iſaac thinks them both miſtaken. It is true, three ordinary generations may be computed at about one hundred and twenty years, but generations are longer than reigns; becauſe it is evident, that men in general live longer than kings reign. According to Sir Iſaac, every reign, one with another, is about twenty years: this he proves from conſidering the reigns of the kings of England, from William the Conqueror to George the Firſt; from the reigns of the firſt twenty-four, the ſecond twenty-four, and fifteen following kings of France; and from the whole ſixty-three taken together. The ancients, therefore, erred in their calculation, by computing a generation at forty years.

The other kind of his arguments is yet more ſingular, and drawn from aſtronomy; which the reader will find in the Dictionary, under this article.

Upon the ſtrength of theſe two arguments, taken together, Sir Iſaac concludes, that the expedition of the Argonauts ought to be placed 909 years before Chriſt, and not 1400; which leſſens the age of the world almoſt 500 years.

M. Freret, by comparing and conſidering the hiſtory of known times, apprehends Sir Iſaac to lie under a miſtake, in computing every generation of kings at twenty years. He finds, on the contrary, by different calculations, that they ought to be reckoned at leaſt at thirty years, or, rather, between thirty and forty. He proves his aſſertion by the 24 generations, from Hugh Capet to Lewis XV. which make 770 years, or 32 years to a generation. It is very ſingular, that the calculations of Sir Iſaac and M. Freret ſhould both be right, and yet the reſult be different. The difference ariſes from hence, Sir Iſaac counts by reigns; M. Freret by generations. As, for example, from Hugh Capet to Lewis XV. there are only 24 generations, but 32 reigns; and by allowing about twenty years for every reign, and above thirty for every generation, it follows, that, if Sir Iſaac's calculation be too little, M. Freret's is too much. Reigns in general muſt not only be ſhorter than generations, but the generations of kings muſt be ſhorter than thoſe of private perſons, becauſe kings are married younger.

With regard to the aſtronomical proofs, M. Freret obſerves, that the poſition of the ſtars and points of the equinox is by no means exact, in the writings of the ancients; that authors of the ſame age differ very much on this head. It is very probable, according to this learned chronologiſt, that Meton, by placing the ſummer ſolſtice in the eighth degree of Cancer, rather conformed to the received opinion of his age, than the truth; it being the common cuſtom among us to place the vernal equinox in the firſt degree of Aries, though its ſituation has long been far from it. M. Freret corroborates this conjecture, by many arguments, the principal of which are theſe: Achilles Tatius tells us, that ſeveral aſtronomers placed the ſummer ſolſtice in the firſt degree of Cancer, others the 8th, others the 15th; Euctemon made an obſervation of the ſolſtice with Meton, and Euctemon placed the autumnal equinox in the firſt degree of Libra; which is a proof, ſays M. Freret, that Meton, when he fixed the ſummer ſolſtice in the 8th degree of Cancer, ſubſcribed to the popular acceptation, not to truth. To follow the laws of the preceſſion of the equinoctial points, the equinox muſt have been in the 8th degree of Aries 964 years before the Chriſtian æra; and this is much about the time, that the calendar followed by Meton muſt have been publiſhed. Hipparchus places the equinoctial points at fifteen degrees diſtance from that of Eudoxus; from whence there would follow the difference of an interval of 1080 years between Hipparchus and Eudoxus, which is by no means to be maintained. M. Freret to theſe proofs adds ſeveral others, but too long for us to inſert: and the reader would do well to read Sir Iſaac's ſhort anſwer to theſe remarks of M. Freret, publiſhed in 1726; in which are ſome articles that merit the greateſt attention.

Chronology is not confined to paſt times, and fixing ancient epocha's; it extends itſelf to other uſes, particularly in the church. By the help of this, we fix the moveable feaſts; and, among others, that of Eaſter; and, by the means of the epacts, periods, and cycles, &c. we form the calendar. So that there are properly two kinds of Chronology; one purely hiſtorical, founded on facts tranſmitted to us by antiquity; the other mathematical and aſtronomical, which ſettles the different epocha's by calculations and obſervations, and ſerves to regulate the ſeaſons of celebrating the feaſts in the church.

Sacred Chronology. By the Chronology of the firſt ages, is underſtood, in general, that order, in which all the events that preceded the flood, and immediately followed it, ought to be placed, with regard to time. But what courſe ſhall we take in ſettling this order? Shall we, with ſome of the ancients, look upon the world as eternal, and ſay, that the ſucceſſion of beings was without beginning, and will be without end? Or, with ſome authors, admitting of a creation in time, ſhall we think its date to be carried ſo far back, that no thread of hiſtory or tradition remains to guide us in tracing up its high original? Or, rejecting the abſurdity of theſe ſyſtems, and applying ourſelves to the hiſtorical accounts given by ſome nations, ſhall we prefer thoſe of the inhabitants of Bethica in Spain, who produce annals of 6000 years? Or, ſhall we reckon, with the Indians, 6461 years from Bacchus to Alexander the Great: or yet, more fond of antiquity, ſhall we ſubſcribe to the Chronology of the Egyptians, who boaſt an hiſtory of twelve or fifteen thouſand years, and, with them, aſcribing to the reigns of gods and heroes 18,000 years more, make the world 30,000 years old? Or, aſſerting with the Chaldeans, that they had made aſtronomical obſervations above 400,000 years before Alexander's march into Aſia, ſhall we grant them ten kings before the flood, from the beginning of their monarchy? Shall we reckon theſe reigns to have ſubſiſted 120 ſares? and, according to Euſebius, allowing 3600 years for the time of every ſare, admit there were 432,000 years from their firſt king to the flood? Or, denying the truth of Euſebius's eſtimation of the ſare, and willing to allow the Chaldeans all the antiquity they pretend to, ſhall we reſtore them the 410,000 years they ſeem to have loſt by this calculation, and grant them the 473000 years in which they pretend to have made aſtronomical obſervations before Alexander's march, according to Diodorus Siculus?

Or, looking on all theſe Chronologies as fabulous, or reducible, by ſome light received from antiquity, to the Chronology of the ſacred writings, abide by that? Both reaſon and religion direct us to embrace the latter opinion. Our firſt buſineſs is, therefore, to ſhew that theſe extravagant calculations of the Chaldeans and others may be reduced to ſome one of the ſyſtems of our authors in ſacred Chronology; ſecondly, as theſe ſyſtems differ conſiderably, to reconcile them in order to fix ſome of the principal epocha's.

The Babylonian, Egyptian, or Chaldean annals reduced to our Chronology. We are obliged to M. Gibert for our information in this important and difficult ſubject, in a letter he publiſhed at Amſterdam, in 1743, which the reader may conſult. The ancients meant, by a year, the revolution of any planet in the heavens: ſee what Macrobius, Eudoxus, Varro, Diodorus Siculus, Pliny, Plutarch, St. Auguſtin, &c. have wrote on this ſubject. Thus the year conſiſted of two, three, four, ſix, or twelve months; and, according to Palæphatus and Suidas, ſometimes of one day only. What ſort of revolutions did the Chaldeans mean, by pretending to have made obſervations 473,000 years? Thoſe of the ſolar day, anſwers M. Gibert; the ſolar day was their aſtronomical year; from whence it follows on this ſuppoſition, that the 473,000 years of the Chaldeans are reducible to ſo many days, or about 1297 years nine months of our ſolar annual revolutions. Now, this is exactly the number of years Euſebius reckons, from the firſt diſcoveries of Atlas in aſtronomy to Alexander's march into Aſia: and he places theſe diſcoveries at the 384th year of Abraham: but the march of Alexander was in the year 1682; the interval, therefore, between the one and the other is exactly 1298 years, nearly the ſame as before.

This diſcovery is ſo much the more ſtriking, as Atlas is accounted the inventor of aſtrology, and, conſequently, his obſervations are thoſe of the greateſt antiquity. Hiſtory furniſhes ſufficient conjectures to perſuade us that the obſervations of Atlas and the Chaldeans were the ſame. But let us conſider the conſequence of this hypotheſis of M. Gibert.

Beroſus added 17,000 years to the obſervations of the Chaldeans. This author's hiſtory, dedicated to Antiochus, was, in all probability, brought down to the laſt years of Seleucus Nicanor, the predeceſſor of this Antiochus. This was much about the time that Babylon loſt its name, and its inhabitants went into the new city built by Seleucus, that is, in the 293d year before Chriſt, or rather the 289th; for Euſebius tells us, that Seleucus then peopled the city he had built. Now, the 17,000 years of Beroſus, according to the computation of M. Gibert, make 46 years and 6 or 7 months, or the exact interval between the march of Alexander and the firſt year of the 123d olympiad, that is, to the very time Beroſus had carried his hiſtory.

The 720,000 years which Epigenius attributes to the obſervations preſerved at Babylon, no longer make any difficulty; for, being reduced to Julian years, they make about 1971 years three months, which come very near to the 1903 years which Calliſthenes allowed to theſe obſervations; the 68 years difference proceeds from this, that Calliſthenes ends his calculation at the taking of Babylon by Alexander, as he ought; and Epigenius carried on his to the time of Ptolemy Philadelphus.

Another proof of the truth of M. Gibert's hypotheſis and calculations may be deduced from what Alexander Polyhiſtor

hiſtor ſays, after Beroſus, that hiſtorical records of events were preſerved at Babylon for the ſpace of 150,000 years; but every one accuſes Beroſus of impoſture, who recollects that Nabonaſſar deſtroyed all hiſtorical monuments of preceding ages, and that Nabonaſſar lived only 410 or 411 years before Alexander: however, if we reduce this 150,000 years into days, the product is 410 years, 8 months, and 3 days, which time correſponds exactly to the interval between the 26th of February of the 747th year before Chriſt, when the æra of Nabonaſſar begins, to the firſt of November of the 337th year, that is, to the year and month from whence the Babylonians dated the reign of Alexander, after the death of his father. This computation carries us to the true epocha's; the 30,000 years which the Egyptians attribute to the reign of the ſun, the ſame with Joſeph, are reduced to 80 years, the time of ſervitude attributed to this patriarch by holy writ; the 1300 years, and more, as ſome reckon from Menes to Nitochris, are only years of ſix months, which make 668 Julian years, the ſame ſpace of time, which the canon of the Theban kings, by Eratoſthenes, puts between the ſame two reigns. The 2936 years which Dicæarchus reckons from Seſoſtris to the firſt olympiad, are only years of three months, which are reduced to 734 years, the time between Danaus, the brother of Seſoſtris, and the olympiads. According to M. Freret, in his Eſſays, the Chineſe date the epocha of Yao, one of their firſt emperors, about the year 2145 or 7 before Chriſt, and reckon their firſt aſtronomical obſervations, and the compoſition of a famous calendar, to have preceded Yao 150 years: now, in this caſe, the firſt aſtronomical obſervations of the Chineſe and Chaldeans will coincide; which is very ſingular. The Chineſe, as well as all other people, certainly came out of the plains of Shinar: the higher we trace the origin of all nations and people, the more reaſon we find to believe they have proceeded from hence: the more ſtrictly we examine their Chronology and clear up the errors we diſcover in it, ſo much the nearer it approaches to the ſacred Chronology; this Chronology is therefore true; they are the moſt ancient people who are in poſſeſſion of it, and, conſequently, what we ought to embrace.

We have three different copies which vary, with regard to the Chronology of the firſt ages of the world; the Hebrew text, which ſhortens the time, only reckoning about 4000 years from Adam to Chriſt; the Samaritan, which is thought leſs correct, makes this interval longer; the verſion of the Septuagint, which carries back the creation of the world to 6000 years before Chriſt. The Hebrew text reckons 1656 years from Adam to the flood; the Samaritan 1307. According to Euſebius and the Septuagint, this interval is reckoned at 2242 years; according to Joſephus and the Septuagint, 2256; according to Julius Africanus, Epiphanius, Petavius, and the Septuagint, it is reckoned at 2262 years.

If chronologers are divided, both with regard to which text they ought to follow, and the interval between the creation and the flood, they are not leſs divided in their opinions concerning the times ſince the deluge, as may be ſeen by comparing the ſyſtems of Marſham and Pezron.

Marſham's Syſtem.	years
From the flood to the call of Abraham	426
From the call of Abraham to the coming out of Egypt	430
From the coming out of Egypt to the building of the temple	480
The duration of the temple	400
The captivity	70

Pezron's Syſtem.	
From the flood to the calling of Abraham	1257
From the calling of Abraham to the coming out of Egypt	430
From the coming out of Egypt to the building of the temple	873
From the building of the temple to its deſtruction	470
The captivity	70

Other ſyſtems, to which we muſt refer our readers, have more or leſs the ſame difference. The diverſities, as well between the texts themſelves, as the commentators on them, ſuggeſted an opinion to the Abbé de Prades, which we ſhall examine, becauſe it has made a great noiſe in the world.

The Abbé ſets out with aſking this queſtion, How can it be, ſays he, that Moſes ſhould have wrote a Chronology, which is ſo different in the three different texts, that it is impoſſible to know which Moſes wrote, or whether he is the author of any one of them? He obſerves this contradiction in Chronology had given birth to innumerable various ſyſtems; that the authors of theſe ſyſtems had ſtuck at nothing to deſtroy the authority of the texts which did not favour their own particular ſyſtem; that the chronologers themſelves ſeem to have had no great opinion of the certainty of this Chronology, becauſe they have made ſo many additions, alterations, and corrections in it, ad libitum; that the Chineſe annals are not conſidered in any of theſe ſyſtems, and yet thoſe annals are not to be rejected without an hiſtorical ſcepticiſm; that this had furniſhed the infidels with arguments againſt the account of Moſes, who makes all men to have deſcended from Noah, whereas the chronicles of the kings of China go farther back than the flood. The Abbé is of opinion, on the whole, that Moſes was not the author of any one of theſe three Chronologies, and that whatever pains father Tournemine and others had taken to reconcile them, were to no purpoſe: that the three ſyſtems were of a more modern invention than Moſes; that the differences between them could not have proceeded from the careleſneſs of copyiſts; for, if the errors of copyiſts are ſuppoſed to have produced different Chronologies, there would in all probability have been many more than three; that the Chronologies would only differ as three copies of the ſame Chronology; that, if the Chronology of the Hebrew text, from which the Septuagint made their verſion, had paſſed for authentic, ſo reſpectable a body of men, as thoſe tranſlators were, would not have preſumed to alter it; that it cannot be ſuppoſed the Septuagint preſerved the Hebrew Chronology. That there is an error ſome where is plain; but is it in the Hebrew text, or the verſion of the Septuagint, or both? The anſwer to this queſtion is, ſays he, that neither Chronology is true. It is ſomewhat amazing, that the ignorance of the copyiſts ſhould never have been perceived, till after the Septuagint; that the interval between Ptolemy Philadelphus and the birth of Chriſt ſhould be the only ſpace of time expoſed to this uncertainty; that profane and ſacred hiſtory abſolutely diſagree in this point; that the ſuperſtitious carefulneſs of the Jews ſhould have been ſo groſsly deceived; that, the numbers being wrote in all the texts at length, not in cyphers, an alteration muſt have been extremely difficult; but, however eaſy it might have been, yet it will by no means follow that ſuch an alteration would have introduced different ſyſtems of Chronology. We cannot, ſays he, ſuppoſe the Chronology of Moſes to lie diſperſed in all the three texts, and therefore we ought to conſult them all on every fact, and uſe that which is moſt agreeable to truth, all circumſtances conſidered.

According to this ſyſtem of the Abbé's, the objection indeed of the infidels to the account of Moſes, drawn from the diverſity of the Chronologies, falls to the ground; but does not this ſyſtem greatly weaken the authority of the ſacred writings? Does it not greatly take away from the credit of the facts related in them, which is founded on the carefulneſs of the Jews in preſerving their writings? The Abbé aſſerts that theſe Chronologies are three different ſyſtems; but he only proves that their alteration is very extraordinary: how then are we to take theſe three Chronologies for connected and correſponding ſyſtems, when we ſee every epocha inſerted throughout the whole Hebrew text, but omitted, with regard to all the patriarchs, in the text of the Septuagint? A connection of facts is preſerved, becauſe they are leſs liable to error than chronological calculations; and however groſs the errors may be in theſe, they ought not to aſtoniſh us. Nothing, therefore, hinders us from admitting the three texts, and trying to reconcile them, becauſe they collectively contain what may clear up many difficulties. But how ſhall we reconcile them? By conſidering the Chronology and the events; ſometimes the Chronology alone is ſufficient; and, by comparing both together, will very often clear up many difficulties; and with regard to thoſe parts of hiſtory, where both theſe fail, we are of opinion they will always remain obſcure.

This ſyſtem is very different from that of the Abbé de Prades, but appears preferable, becauſe the Abbé denies Moſes to have been the author of the Chronology, and thereby invalidates the authenticity of ſcripture. The variation of the Chronology, with regard to the firſt ages of the world in the ſeveral texts, creates the uncertainty; but the Chriſtian neither imitates the puſillanimity of the Jew, nor the prejudice of the Muſſulman, in conſidering thoſe books which contain the fundamentals of his faith; but ſubmits them to the trial of reaſon, without fear of incurring the cenſure of impiety.

The Hebrew and Samaritan texts, as well as the verſion of the Septuagint, have each their ſeveral pretenſions; the Hebrew ſeems to be written in the ſame language as the firſt original; the Samaritan lays claim to the ſame advantage, and pleads, beſides, in its own behalf, the preſervation of the true ancient Hebraic characters. The verſion of the Septuagint was made from the Hebrew of the ancient Jews. The Chriſtian churches adopted it, the ſynagogue acknowledged it, and Joſephus in his Hiſtory has in general conformed to it. If ſome faults have crept into the verſion, may not ſome alſo have crept into the Hebrew text, and may we not entertain the ſame ſuſpicion of the Samaritan? Are not all copies ſubject to theſe, and many other accidents? Tranſcribers are not leſs incorrect in copying from the Hebrew, than in tranſcribing from the Greek. The purity and correctneſs of the text depends upon the ability, attention, and honeſty of the copier, not the language in which it is written.

As the authority of the three texts is ſupported on pretenſions nearly equal, it ſeems our buſineſs to enquire what reaſons there may be for preferring one to the other in places where they contradict each other, without partially adhering to either. We ought, in juſtice, to think the three texts copies of one original; and conſequently ought not to be prejudiced in favour of any one, but try to reconcile them. Theſe principles being premiſed, we proceed to propoſe ſome rational conjectures concerning the Chronology of the three texts, with regard to the lives of the old patriarchs, and the time of their birth: we mean, ſince the flood, for the diſtribution of the people, the eſtabliſhment of empires, and ſucceſſion of princes, depend on that period; and in doing this we ſhall keep our eye on Joſephus, whoſe authority is conſiderable; and either follow him, or correct him, when his ſentiments or Chronology vary from that of holy writ.

As neither the texts themſelves nor this hiſtorian agree in point of Chronology, there muſt neceſſarily be a fault ſomewhere; let us therefore examine where it lies.

Firſt, the Samaritan text and verſion of the Septuagint ſeem right in giving the patriarchs 100 years more than the Hebrew text; partly, becauſe two of them agree, and partly, becauſe Joſephus ſtrengthens this opinion by his conſent. By reckoning the lives of each patriarch ſeparate, it may be objected the ſum total agrees with the Hebrew; but this is a fault in the addition. The Hebrew text, in the firſt ages after the flood, ſpeaks of wars and tributes impoſed on conquered people; this time, compared with the number of events it contains, appears very ſhort. Noah's three ſons beget an immenſe poſterity, forget their common origin, treat each other as enemies, and this in the interval of 367 years, which is all the time the Hebrew text allows from the flood to Abraham's going out of Meſopotamia; and Shem, according to the ſame text, lived 502 years after the flood. The life of man in the ages immediately ſucceeding the flood was 400 years. Noah himſelf ſurvived the flood 350 years. Thus Abraham muſt have lived in the time of Noah, Shem have ſeen Iſaac, and children of the ſame father muſt have been ignorant their father was alive; which ſeems almoſt incredible. But the objections drawn from the preceding facts are not the only reaſons for enlarging the ſpace of the ſecond age. In Geneſis we have an account of current coin as a thing common, and of ancient original, on occaſion of the tomb which Abraham bought of the ſons of Heth. Whoever reflects, muſt think that a long ſeries of time muſt have paſſed from the diſcovery of the mine to the uſe of metal for this purpoſe. It muſt be acknowledged theſe are things very hard to be accounted for; however, let us not abandon reaſon and experience, like ſome who have done no true honour to the cauſe of religion, by getting over every thing with miracles; but let us apply reaſon and experience to the diſcovery of truth. What will be the reſult? Theſe ſuggeſt, that, according to the authority of ſcripture, men after the flood lived together in one ſociety, till they grew numerous enough to ſeparate; when God ſaid to the children of Noah, People the earth and divide it, he did not order them to diſperſe themſelves ſolitarily here and there, and leave the patriarch Noah alone; when he bleſſes them to increaſe and multiply, his will was, that they ſpread themſelves over the face of the earth in proportion as they increaſed. Wherefore, thoſe who before the confuſion of languages ſend Shem into Syria or Chaldea, Cain into Egypt, and Japhet we know not whither, and from thence date the Chronology of kingdoms, give us the hiſtory of their own imaginations, not of the times. Men after the flood choſe a convenient and proper place to dwell in; this was the plain of Shinar. Here they ſettled; as they grew numerous, they extended themſelves; at laſt they became ſo numerous as to be able to divide into large colonies, and, as they ſaw themſelves under a neceſſity of ſeparation, ſaid to one another, Let us, before we part, erect a common work, which may tranſmit the memory of our union to poſterity; let us build a tower whoſe top may reach to heaven. The extravagance of the deſign was like the ſucceſs of it; ſcarce had they began their work, when God confounded their language, and forced them to forſake this monument of pride. They formed colonies, went into different countries, and by degrees overſpread the face of the earth: thus far good ſenſe, experience, and ſcripture concur to carry us. Theſe events ſeem naturally to require a longer time than the Hebrew text allows. Shall we, to leſſen the force of the objections made on account of the number of the people, the wars, arts, religions, languages, &c. as ſome have done, to account for the prodigious increaſe, reply, that the women regularly brought forth twins, a male and a female, every nine months? Or, ſhall we rather, to remove the difficulty, adhere to the Samaritan text and verſion of the Septuagint, againſt the Hebrew text, and allow 100 years more to the patriarchs? If the foregoing reaſons are not ſufficient to make us declare on this ſide the queſtion, the dynaſties of Egypt, the kings of China, and other Chronologies which are not to be looked on as fabulous, and go higher than the flood, according to the Hebrew text, leave us no room to doubt. The birth of Terah, the father of Abraham, ſhould have been placed at the 129th year of Nahor the grandfather of Abraham, though the Samaritan text places it in the 79th, the Septuagint in the 179th, the Hebrew in the 29th, and Joſephus in the 120th. This great diverſity gives us reaſon to preſume there is a fault in the whole. The Samaritan may have omitted the hundred, which fault is to be corrected by the Septuagint and Joſephus, who have retained it; as to the figures that follow the hundred, the Hebrew may be moſt exact; Joſephus comes neareſt to it; a view of them together may ſet this in a clearer light.

	years.
The Samaritan text	79
The Septuagint	179
Joſephus	120
The Hebrew text	29
A new conjecture	129

The Septuagint makes Cainan the third patriarch from Shem, or fourth from Noah; but this is a miſtake according to the Hebrew text, the Samaritan text, and Joſephus; and he is omitted in the firſt chapter of the firſt book of the Paralipomena in the Septuagint itſelf, where the ſucceſſion of the patriarchs mentioned in Geneſis is repeated. Origen had not admitted it into his Hexapla, which ſeems to prove that it was not in the beſt copies of the Septuagint. Origen, in his twentieth Homily on St. John, makes Abraham the twentieth from Adam and tenth from Noah, which agrees with the account in the Antiquities of Joſephus. Theophilus of Antioch, Julius Africanus, and Euſebius are of the ſame opinion. A paſſage of the third chapter of St. Luke's goſpel, which mentions Cainan, ſeems to make againſt this; but the paſſage is omitted in the Cambridge MS. and may have proceeded from a miſtake of the tranſcriber, both in the Septuagint and St. Luke; it is highly probable this Cainan is the ſame with him before the flood, and has by ſome miſtake been inſerted in both genealogies, exactly in the ſame rank; that is, the fourth from Adam, and the fourth from Noah.

The ſum total of the lives of the patriarchs in the Hebrew and Samaritan texts ſeems right; they only differ about Heber and Terah. The Hebrew makes Heber live 464 years, the Samaritan 60 years leſs; but this is not very material; for we want to fix the time of his birth, not the duration of his life. The Septuagint agrees with the Samaritan text, and we are inclined to think that more correct than the Hebrew, partly for this reaſon, and partly, becauſe it is obſerved, men's lives ſhortened, as they lived more diſtant from the flood; but Heber's life, according to the Hebrew text, is longer than either that of his father or his uncle; as to the difference between the Hebrew and Samaritan texts concerning the time Terah lived, as it makes a more eſſential difficulty, and relates to the birth of Abraham, we ſhall conſider it more at large.

It appears from what we have ſaid, that, of the three texts, the Samaritan is the moſt correct, with reſpect to the parts of Chronology we have conſidered; it is only defective, with reſpect to the time when Nahor begat Terah; and there the hundred has been omitted. We muſt now enquire the time of the birth of Abraham, and the death of Terah. Though Joſephus and all the texts agree to place the birth of Abraham at the 70th year of Terah, yet ſeveral chronologers fix the birth of Abraham at the 130th year of Terah.

According to the book of Geneſis, ſay they, Abraham went out of Haran at the age of 75 years; and, according to St. Stephen, in the ſeventh chapter of the Acts, he did not go out of Haran till after the death of his father. Now Terah, according to the Hebrew text and Septuagint, lived 205 years, wherefore Abraham muſt have been born when his father was 130 years old; for, if we ſubtract 75 from 205, we ſhall have 130 years remaining.

When you object to them that it is ſaid in Geneſis chap. xi. v. 26, 'Terah lived ſeventy years and begat Abraham, Nahor, and Haran', they reply, this means no more than in general, that Terah had lived ſeventy years, had three ſons at different times, and by mentioning them all together, ſay they, the author of Geneſis had plainly no deſign of determining the exact time of their birth; if Abraham is named firſt, it is out of honour, not as being the oldeſt.

Theſe conſiderations appeared ſufficient reaſons to Marſham, Pezron, and others, for fixing the nativity of Abraham at the 170th year of the age of his father Terah; but Petavius, Calviſius, and others, perſiſt in fixing the birth of Abraham at the 70th year of Terah: the latter inſiſt upon it, as contrary to all probability, that Moſes ſhould have neglected to ſet down the exact time of Abraham's nativity, who ſeems to have wrote the Chronology of the ancient patriarchs, principally with a view of coming down to the father of the faithful; and, in other reſpects, is ſo exact with regard to the years of this patriarch. They ſay it is more likely that St. Stephen was leſs exact in points of Chronology and geography, which were not important in the firſt martyr, but would be unpardonable negligences in Moſes, who wrote as an hiſtorian. The geographical error of St. Stephen they ſay is this, that God appeared unto Abraham in Meſopotamia before he dwelt in Charran, whereas Charran is in Meſopotamia; the geographical error will be rectified by a very ſmall tranſpoſition in the text, which runs thus: Deus gloriæ apparuit patri noſtro Abrahæ, cum eſſet in Meſopotamia, priuſquam moraretur in Charran, & dixit ad illum Exi, &c. only put the et, which is before dixit, before priuſquam, and the ſenſe will be that Abraham was in Meſopotamia before he dwelt at Charran; this difficulty may even be got over without correcting the text, by ſaying that St. Stephen thought Abraham dwelt in ſome other part of Meſopotamia before he dwelt in Charran. Petavius, in his Rationarium Temporum, to reconcile St. Stephen and Moſes's account, ſuppoſes a twofold going forth of Abraham from the city of

Charran; the firſt, in his 75th year, by the command of God into the land of Canaan, that he a long time afterwards returned to Charran; and carried with him thoſe of his family he had left behind and all his effects; but Moſes expreſly ſays, ſpeaking of this going out off Charran, which Petavius' acknowledges for the firſt, that Abraham took with him his wife Sarah and Lot his nephew, and all the ſubſtance that they had gathered, and all the ſouls that they had gotten in Haran. Wherefore, we muſt leave the dreams of Petavius, and reconcile Moſes with St. Stephen ſome other way. To ſolve the difficulty, we propoſe the following conjectures.

Firſt, Abraham never returned into his own country after leaving it, and departed not from Haran till after the death of his father Terah. St. Stephen expreſly ſays ſo, and Geneſis plainly inſinuates it. In the book of Geneſis we read concerning the going forth of Chaldea, that Terah carried with him Abraham, Lot, and Sarah, to go and dwell in Canaan; that they came as far as Haran, where they ſtopped, and Terah died there; which proves that the deſign of Terah was to have gone into Canaan, though he was prevented by death at Haran. Immediately after Moſes relates the departure of Abraham out of this city with Lot his nephew and all their ſubſtance.

Secondly, The authority of St. Stephen does not determinately fix the year of Abraham's nativity, but obliges us to place the death of Terah before the 75th year of Abraham's age; but, as Terah might have died long before his ſon arrived at that age, St. Stephen's ſpeech gives no light to the Chronology

Thirdly, Moſes has exactly pointed out the time of Abraham's nativity, which was the deſign and end of this Chronology: Abraham is the hero of his hiſtory, and he begins from him to diſtinguiſh the Hebrews from all other nations.

Fourthly, We might conjecture that Terah did not beget children till he was 170 years old, and that the 100 years which are reckoned in the lives of all his anceſtors, are omitted in his; but this conjecture is weak, for it is ſaid of Sarah, even before ſhe went out of Chaldea, that ſhe was barren, though ſhe could not then be above twenty-five years old, and Abraham at moſt five and thirty; it is ſaid alſo of Abraham that he looked on it as a thing impoſſible to beget children at an 100 years old, which he never could have thought, if he had not been born before his father was 170 years old.

Fifthly, It appears that Abraham was born at the 70th year of the age of Terah. The Hebrew and Samaritan texts, the Septuagint and Joſephus, agree in reſcinding the hundred. Now, as the birth of this patriarch is carried no farther back, it is evident, the only means of reconciling Moſes with St. Stephen will be to ſhorten the life of Terah; the Hebrew text and Septuagint agree this patriarch lived 205 years. The Samaritan text ſays he lived but 145 years. And the latter ſeems more correct than the other two. The clearing up the difficulty before us is, we apprehend, a ſufficient proof of it. The 70 years which Terah lived before he begat Abraham, and the 75 years which Abraham lived before he went out of Haran, make up the 145 years of the Samaritan text; and thus Abraham's departure out of this city will be after the death of his father according to St. Stephen's account, and his nativity at the 70th year of Terah according to Moſes.

Some critics ſuſpect a corruption in the Samaritan text, and ground their ſuſpicions on its conſonance with the events, which muſt certainly be a proof of the contrary: for the criterion of truth in hiſtory is clearneſs. The Samaritan text is more ancient than that which Euſebius has inſerted in his Chronological Canons. Before Euſebius who would have changed it? The Chriſtians? They only made uſe of the Septuagint or common Hebrew. The Samaritans? What intereſt of theirs was it to allow 145 years for the life of Terah rather than 205? Wherefore it follows the error is not in the Samaritan text. All the texts agree that the ages of the patriarchs ſhortened ſucceſſively after the flood; the father of Terah lived no more than 148 years, and it is by no means probable, therefore, that Terah lived 205 years: beſides, God had promiſed Abraham a long life; this promiſe, at leaſt, ſhould have extended to the days of his father Terah, which were 205 years, according to the Hebrew text and Septuagint, whereas Abraham lived no more than 175 years, as we read in Geneſis. It is therefore more probable, that God prolonged the life of Abraham 30 years more than the life of Terah: that the Samaritan text is right; that Moſes is exact in his hiſtory and Chronology; that St. Stephen ſpoke according to the truth of ſome Hebrew text which was more correct than any that have been handed down to us.

Thus we have endeavoured to remove this grand difficulty in the ſacred Chronology; and, with regard to the reſt, muſt refer our readers to the authors already mentioned, who have wrote very largely on this ſubject.

CHRONO'METER, a machine contrived by the late ingenious Mr. George Graham, and made ſo exact as to meaſure a ſmall part of time very nicely, even to the 16th part of a ſecond. To one end of an horizontal axis is fixed a contrate wheel of 120 teeth, and, at the other end, there is a little barrel which on its outſide receives the ſtring of a little weight to turn the wheel round; the wheel with its teeth moves an horizontal pinion of 15 leaves (or teeth) fixed to the bottom of a vertical axis on whoſe top is the balance wheel, which is a contrate wheel of 15 teeth cut aſkew; that is, one ſide of every tooth is perpendicular to the plane of the wheel, and the other cut obliquely with a curve. Juſt over this laſt wheel, there is a little axis or rod of ſteel placed horizontally, which has two little pallets at right-angles to each other, ſo placed as to be alternately ſtruck by the upright part of the ſkew teeth on the oppoſite ſides of the balance wheel, in ſuch manner that not one of the teeth of that wheel can paſs by without a ſtroke be made againſt each pallet to give a quarter of a turn to the axis above-mentioned. At the other end of this axis is fixed a wire, at whoſe end is a braſs bob, whoſe center of gravity is diſtant from the horizontal axis 2,45 inches, that is, near two inches and a half, or the 16th part of the length of a pendulum vibrating ſeconds. Therefore, as the weight carries the wheel-work round, the ſkew teeth of the balance wheel muſt ſtrike the pallets fixed to the horizontal axis about which the little pendulum moves; and as that pendulum, on account of its length, vibrates four times in a ſecond, and there muſt be two ſtrokes againſt the pallets for every tooth that paſſes by in the balance wheel, ſo there muſt be two ſwings of the pendulum, or half a ſecond in time, for every tooth of the great wheel that is brought forward by the piviot (whoſe number of teeth is equal to that of the balance wheel) and, as the great wheel has 120 teeth, there will be performed 240 vibrations of the pendulum, whilſt the great wheel goes round; therefore, an hand or index fixed to the great wheel will go round in one minute pointing to 60 large diviſions for ſeconds on the dial-plate, which diviſions are again ſubdivided into four to ſhew the quarters of ſeconds. But then, beſides this, there is a quadrant of a circle of a radius equal to the length of the pendulum, which is divided into four parts by five little braſs pins, fixed to an horizontal axis; which quadrant ſerves not only as a detent to ſet the machine a going in a ſixth part of a ſecond, but alſo to ſtop it in the ſame time, the pins ſtopping the pendulum in any fourth part of its vibration; for, in fixing the pins, regard was had to the time of every fourth part of the vibration, the two ſpaces between the pins next to the loweſt part of the quarter of the circle, which the pendulum vibrates in ¼ of a ſecond, being ſo much greater, as the pendulum moves ſwifter in that part of its vibration.

This Chronometer is of great uſe for meaſuring ſmall parts of time in aſtronomical obſervations, the time of the fall of bodies, the velocity of running waters, and fit for many other purpoſes, where a ſmall ſpace of time is to be meaſured nicely, as from three or four ſeconds to a minute or two; but it is not adapted to meaſure long ſpaces of time very exactly; becauſe, though it ſeems to vibrate exactly a quarter of a circle every vibration, yet it does not really do ſo, and the difference of the lengths of the vibrations in ſuch large arcs makes a difference in time; and, however ſmall that difference is, yet a great many of them create a ſenſible error. In this machine, there is ſometimes an error of ¼ of a ſecond in fourteen ſeconds. This is a fault which all clocks are liable to, that have ſhort pendulums which ſwing large arcs of a circle.

CHRYSA'ETOS, *the golden eagle*, a large and beautiful bird of prey. Its weight is uſually twelve pounds; his general colour a cheſnut brown, with a number of white ſpots; there are but few of them on the back, but a larger number on the belly; his feet are feathered to the toes, and yellow. He is extremely bold and fierce, and will ſeize upon almoſt any thing for prey; his voice is clear and ſhrill, and often makes a moaning noiſe.

That ſpecies of eagle which we call ſimply the eagle, without any addition, is of this kind, and is properly charactered by the name of Chryſaetos cauda annulo albo cincta; a tranſverſe white line on its tail being its moſt obvious diſtinction. *Willughby's Ornithol.*

CHUBB, the Engliſh name for the fiſh called the capito and cephalus by authors, and by ſome of the ancient Romans ſqualus.

The reſorts of this fiſh are eaſily found, for they are generally holes overſhaded by trees, and the fiſh will be ſeen floating in ſuch, almoſt on the ſurface of the water, in a hot day in great numbers. They are but a poor fiſh for the table, and are very full of bones; but they entertain the angler very much, and are of the number of thoſe that are eaſily taken. The beſt manner of fiſhing for him is thus: prepare a very ſtrong rod of a ſufficient length; fix to the hook a graſshopper; place yourſelf ſo as to be perfectly out of ſight of the fiſh, and drop in the bait about two feet from the place where a large Chubb lies; if he does not ſee the angler, he very ſeldom fails biting, and is immediately taken; but he is ſo ſtrong a fiſh that he ſhould be taken out carefully, after a great deal of playing, otherwiſe the tackle will be in danger; a beetle, or any large fly, will anſwer the purpoſe in the place of a graſshopper, and, if there are none of them to be had, the method of fiſhing muſt be altered, and the line be long enough for fiſhing at the bottom. In March and April this fiſh is to be caught with large red worms: in June and July with flies, ſnails, and cherries; but in Auguſt and September the proper bait is good cheeſe, pounded in a mortar, with ſome ſaffron, and a little butter; ſome make a paſte of cheeſe and Venice turpentine for the Chubb in winter; at which ſeaſon this fiſh is better than at any other; the bones are leſs troubleſome in this ſeaſon, and the fiſh is more firm and better taſted; the roe is alſo well flavoured in general. The angler muſt keep his bait for this fiſh at the bottom in cold weather, and near the top in hot, and the fiſh will bite eagerly.

CI′CATRIX *(Dict.)*— In large wounds, where there has been a loſs of ſubſtance, an even Cicatrix is not to be expected without great care in the ſurgeon. When an even, thick, and white matter appears in the wound, it is to be dreſſed either every day, or every other day, as occaſion ſhall require: the ſuperfluous matter muſt at every dreſſing be wiped away with a very light hand; and it is indeed much better to leave ſome of it in the wound, than to treat that roughly in the taking it away; for wiping the wound too roughly hinders the growth of a new fleſh; but a little matter, being left, only performs the office of oil or balſam, in keeping the parts moiſt. Theſe rules being obſerved, new fleſh will preſently ſpring up, and the wound unite: but, that an even Cicatrix may be procured, the ſurgeon muſt endeavour, by degrees, to harden the new fleſh, by the application of a dry lint, covered with a light bandage. When this does not prove ſufficient, it may be proper to uſe ſome of the drying balſams, or drying powder, ſuch as tutty, lapis calaminaris, maſtich, colophony, &c. Rectified ſpirit of wine is frequently uſed for this purpoſe alſo, with great ſucceſs, for it carries a very great aſtringent and drying virtue with it. *Heiſt. Sur.*

CICHO′RIUM, *ſuccory*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the ſemi-floſcular kind, being compoſed of a great many ſemifloſcules, which ſtand upon the embryo fruits, and are contained in a common cup, which afterwards contracts itſelf ſo as to form a ſort of capſule, containing a number of angular, umbilicated, and ſomewhat wedge-like or cuneiform ſeeds.

The ſpecies of ſuccory enumerated by M. Tournefort are fourteen, and by Mr. Miller, five.

The common ſuccory ſtands recommended by moſt of the medical writers, as one of the beſt known aperients and detergents: it is preſcribed in all diſeaſes of the liver, and is a powerful diuretic. Schroder tells us, that it has alſo great virtues attributed to it againſt hæmorrhages; but it is not much regarded at preſent in that light.

CI′MEX, in natural hiſtory, the name of a genus of inſects, the characters of which are theſe: the head is ſmall: the back towards the ſhoulders is broad, and is covered with a cruſtaceous ſubſtance: its ſhoulders are of an angular make, and its wings partly cruſtaceous, partly membranaceous, and are ſo formed, that they exhibit the figure of a croſs, where they meet at the middle of the back; and they have a long proboſcis, which is bent under the belly, and always lies ſtraight, not in a ſpiral form.

Mr. Ray divides the Cimices into two kinds, thoſe of a ſhorter, and thoſe of a longer and narrower make. Of the firſt kind he deſcribes eight ſpecies.

Beſides theſe, there are two ſpecies of water Cimices: the firſt has a long body, and its ſhoulders are black; the wings and the triangle under the ſhoulders are of a ſhining brown, and the hinder pair of legs are very long, and ſerve as oars. The other is ſmaller, and is of a rounded, but depreſſed figure. Its colours are black and a ſhining yellow: the antennæ are very ſhort, and the legs do not ſeem made for ſwimming.

Beſide all theſe, which are properly of the Cimex kind, there is another ſet of inſects mentioned by Mr. Ray, as nearly approaching to them, and deſcribed under the name of cimiſormes muſcæ. *Ray's Hiſt. Inſect.*

CIMO′LIA *alba*, the officinal name of the earth of which we now make tobacco pipes. Its diſtinguiſhing characters are, that it is a denſe, compact, heavy earth, of a dull white colour, and very cloſe texture; it will not eaſily break between the fingers, and ſlightly ſtrains the ſkin in handling. It adheres firmly to the tongue; melts very ſlowly in the mouth, and is not readily diffuſible in water. It is found in many places. That of the iſle of Wight is much eſteemed for its colour. We have vaſt plenty of it alſo near Poole in Dorſetſhire, and near Weddenſbury in Staffordſhire. *Hill's Hiſt. of Foſſ.*

CIRCULA′TION. *(Dict.)* — Dr. Nichols has contradicted the received doctrine of the motion of the heart, and of the Circulation of the blood, both in adults and fœtus's. The Circulation of the blood, according to him, depends on ſix motions: 1°, of the right auricle. 2°, right ventricle. 3°, pubmonary artery. 4°, left auricle. 5°, left ventricle; and 6°, of the aorta. Of theſe, the firſt, third, and fifth are ſynchronous, as are likewiſe the ſecond, fourth, and ſixth; but the firſt, third, and fifth are a ſyncronous to the reſt: and, therefore,

$$\left.\begin{array}{l}\text{The two auricles}\\ \text{The two ventricles}\\ \text{The two arteries}\end{array}\right\}\text{ are alternately }\left\{\begin{array}{l}\text{relaxed}\\ \text{contracted.}\end{array}\right.$$

See *Nichols, Compend. Anat. & Prælect.* 15. *ap. Med. Eſſ. Edinb.* vol. III.

CI′STERN. If the farmers of England would fall into the method uſed in Spain, and at Amſterdam, Venice, and other places, of ſaving the rain water of the whole year, or at leaſt ſo much of it as would be neceſſary, in ciſterns, they would have always water for their cattle in the ſummer droughts, and many thouſand acres of land, now left uſeleſs, might be turned to profit.

The beſt way of preſerving the water, for the ſervice of the houſe, is in Ciſterns in the cellars. Theſe may be made with brick or ſtone, joined with plaiſter of Paris, which will keep out the wet very well; or with a kind of mortar made of ſlaked lime, with linſeed oil, and tow or cotton. A bed of good ſound clay may be laid at the bottom, and on this the bricks for the floor, and then the walls may be raiſed in the ſame manner, only leaving ſpaces behind them, into which clay is to be rammed in the like manner. Thus it will be a clay Ciſtern, faced with brick; and the bricks will keep the clay moiſt, and prevent it from cracking, though it be not full of water. This will do in any ſhady place, as well as in cellars: and thus may a Ciſtern be made in a garden, in ſome ſhady place, and covered over, which may receive the water running from the walks, and will retain it for the ſervice of the garden, all the year.

Where there is want of water for the cattle in the fields, the way is to dig a pond in ſome place into which there is a deſcent; then to cover the bottom and ſides with a double coat of tough clay, each ſix inches thick, and each very well rammed: then to cover the bottom with large ſtones, which will keep the clay moiſt, and prevent its cracking, when not covered with water. But this is a troubleſome thing; for, if there happen to be a crack in any part, it is often found neceſſary to go over the whole work again, before the pond will hold a drop of water.

Another method of making a pond hold water, is to daub it over with clay and mortar mixed together, and then with mortar alone. This has an advantage over the other way, in that, if any crack happens, it may be mended by a cement of clean hair and tallow, mixed with ſlaked lime, and the yolks of eggs, well beat together. This, applied to the crack, will cloſe it ſafely, without the neceſſity of undoing the whole work, as in the other caſe.

In chalky countries it is common to find a low place on the downs, and, digging a hole by way of a pit there, they cover the bottom evenly with the chalk rubbiſh, and, when it is wetted by the rain, they ram it well, and afterwards drive cattle into it, and fold ſheep in it: the conſequence of all which trampling is, that the bottom at length becomes ſo firm, that it holds the water perfectly well. By one or other of theſe means, Ciſterns or reſervoirs may be made in all countries: and our farmers, if they would carefully try one or the other of them, as their land moſt required, would not have ſo much to complain of from droughts. *Mortimer's Huſbandry.*

CI′STUS, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roſaceous kind, compoſed of ſeveral petals, arranged in a circular form. The piſtil ariſes from the cup of the flower, and, finally, becomes a roundiſh or pointed multicapſular fruit, which, when ripe, opens at the top, and generally contains a number of ſmall ſeeds. See *plate* IX. *fig.* 3, which repreſents a branch of the ſweet Ciſtus of candy, *i* the flower, *k* the ſeed veſſel, *l* the ſeed veſſel open, *m* the ſeed.

The ſpecies of Ciſtus, enumerated by M. Tournefort, are twenty, and by Mr. Miller, ſeventeen.

The ſeveral ſpecies of this beautiful ſhrub are to be propagated by ſowing their ſeeds on a gentle hot bed, or on a warm border of common rich earth in March. When the plants are grown to be three inches high, they ſhould be tranſplanted either into ſmall pots, or into a border of rich earth, placed at ten inches diſtance. They will require ſome ſcreening from hard weather for the firſt winter, and muſt be watered at times. In the ſpring following, they muſt be carefully removed, with as much as poſſible of their own earth about them, and be placed where they are to remain. They are very bad plants to remove, when old.

They may alſo be propagated by cuttings, planting them in a rich bed, and ſhading them with matts, and watering them carefully for two months: they will by that time have taken root, and may be treated as the ſeedling plants of the ſame age. *Miller's Gard. Dict.*

CI′TREÆ *Menſæ*, in antiquity, tables made of the wood of the citron-tree, very beautiful, and greatly eſteemed by the ancient Romans.

CITRI′NUS, in natural hiſtory, the name of a peculiar ſpecies of ſprig cryſtal, which is of a beautiful yellow.

It is very plentiful in the Weſt-Indies, and is found in ſome parts of Bohemia. Our jewellers have learned from the French and Italians, who are very fond of it, to call it citrine, and often cut ſtones for rings out of it, particularly out of the pyramid, which is always finer than the column; and theſe, after they have paſſed through two or three hands, are generally miſtaken for topazes. *Hill's Hiſt. of Foſſ.*

CI′TRON *(Dict.)*—The ſeveral ſorts of Citrons are cultivated much in the ſame manner as the orange-tree; to which we ſhall refer the reader to avoid repetition: but ſhall only remark, that theſe are ſomewhat tenderer than the orange, and ſhould therefore have a warmer ſituation in winter, otherwiſe they are very ſubject to caſt their fruit. They ſhould alſo continue a little longer in the houſe in the ſpring, and be carried in again ſooner in the autumn; as alſo have a warmer and better defended ſituation in the ſummer, though not ſo much expoſed to the heat of the ſun, in the heat of the day.

And as their leaves are larger, and their ſhoots ſtronger, than thoſe of the orange, they require a greater plenty of water in the ſummer; and in winter they ſhould have but little water at each time, which muſt be oftener repeated. The ſoil ought to be much the ſame as for the orange-tree, but not quite ſo ſtrong.

The common Citron is much the beſt ſtalk to bud any of the orange or lemon kinds upon, it being the ſtraighteſt and freeſt growing tree: the rind is ſmoother, and the wood leſs knotty, than either the orange or lemon, and will take either ſort full as well as its own kind; which is what none of the other ſorts will do: and theſe ſtocks, if rightly managed, will be very ſtrong, the ſecond year after ſowing, capable to receive any buds, and will have ſtrength to force them out vigorouſly; whereas it often happens, when theſe buds are inoculated into weak ſtocks, they frequently die, or remain till the ſecond year before they put out: and thoſe that ſhoot the next ſpring after budding, are often times ſo weak as hardly to be fit to remain, being incapable to make a ſtraight handſome ſtem, which is the great beauty of theſe trees. *Miller's Gard. Dict.*

CITRON-*wood*, ſo named by the Europeans, on account of its ſcent and colour; and what the Americans call candle-wood. What is uſually brought in billets of more than a thouſand pounds weight, is the trunk of a great tree, which grows commonly in the American iſles, and to a very great height. Its leaves, which reſemble thoſe of the laurel in ſhape, are very large, and of a bright green. Its flowers have the ſcent of jaſmine, and are like orange-flowers. Its fruit is black, and the bigneſs of pepper. It is this wood which ſome authors take for the true citrine ſantal, which is an inſufferable fraud, the difference, both in price and quality, of theſe two woods being very great.

The cheat is diſcoverable, not only in that the billets of the true ſantal weigh not more than a hundred pounds, whereas thoſe of the Citron-wood, as we have ſaid, weigh upwards of a thouſand pounds: but alſo, becauſe the ſantal is of a ſoft and agreeable taſte and flavour, reſinous, and moderately heavy; and, on the contrary, the Citron-wood is weighty, compact, oily, and of a ſtrong ſmell, inclining to that of the fruit from whence it takes its name. This wood is fit for turners and inlaid work, it taking an excellent poliſh.

CI'TRUL, *the water melon.* This plant hath trailing branches, as the cucumber, or melon, and is chiefly diſtinguiſhed from the other cucurbitaceous plants, by its leaf, which is deeply cut, and jagged, and by its producing an eatable fruit. See *plate* XIII. *fig.* 1. where *a* is the flower, *b* the fruit, *c* the ſeed.

You muſt, in order to cultivate this plant, firſt provide yourſelf with ſome ſeeds, which ſhould be two or three years old; for new ſeeds are apt to produce vigorous plants, which are ſeldom ſo fruitful as thoſe of a moderate ſtrength. Having provided yourſelf with good ſeed, you ſhould prepare an heap of new dung the beginning of February, which ſhould be thrown in a heap, for about twelve days, to heat; then you ſhould make a hot bed for one ſingle light, for which one good load of dung will be ſufficient; this dung ſhould be well wrought in making of the bed, and muſt be beaten down pretty cloſe with a dung fork, that the heat may not be too violent, and of longer continuance. When the dung is thus laid, you ſhould cover it about four inches thick, with good light earth; and, having ſpread it very even, you ſhould put the frame and glaſs over it, leaving it to warm four or five days, before you put the ſeeds into it; obſerving, if the ſteam riſes pretty much, to raiſe up the graſs with a ſtone, to let it paſs off. Then, if you find your bed in proper temper, you may ſow your ſeeds therein in drills, covering them over with earth, about half an inch. After this, if you find your bed very warm, you muſt give it air in the day-time, by raiſing the glaſſes; but, if the bed is cool, you muſt cover it well with matts every night, as alſo in bad weather. In four or five days after, you muſt prepare another hot bed, to receive theſe plants, which will be fit to tranſplant in ten days, or a fortnight, at moſt, after the ſeeds are ſown. This bed need not be very large; for a few of theſe plants will fill a large quantity of frames, when they are planted out for good: and, while the plants are young, there may be a great quantity kept in one light; ſo that thoſe perſons who raiſe early cucumbers and muſk-melons, may alſo raiſe their plants in the ſame bed; for two or three lights will be ſufficient to raiſe plants of all three kinds, to ſupply the largeſt families, until they are planted out for good. In the management of theſe plants, while young, the chief thing to be obſerved is, to let them have a large ſhare of air, whenever the weather will permit, otherwiſe the plants will draw up weak, and be good for little. As theſe plants require two or three hot beds, to bring them to perfection, it will be the better way to put the plants into baſkets, as ſome do in raiſing of early cucumbers; but you ſhould not plant more than two plants in each baſket; for, if one of them lives, it will be ſufficient: therefore, when both the plants ſucceed, you ſhould draw out the weakeſt and moſt unpromiſing of them, before they begin to put out their ſide-ſhoots, otherwiſe they will entangle, and render it difficult to be performed, without greatly injuring the remaining plant.

The baſkets in which theſe plants are to be planted, need not be more than a foot diameter; ſo that one light will contain eight of them, which will be ſufficient for twenty-four lights, when they are planted out for good; for, where the plants are vigorous, one ſingle plant will ſpread ſo far as to fill three lights; and, if they have not room, they ſeldom ſet their fruit well. Theſe baſkets may remain in the nurſery beds until the plants have ſpread, and put out many runners; for, when the heat of this bed declines, it is ſoon revived, by adding a proper lining of warm dung to the ſides of the bed, quite round; ſo that when they are taken out of this bed, and placed in the ridges where they are to remain, the heat of the beds will laſt ſo long as to ſet their fruit, which is of great conſequence; for, when the plants are ridged out very young, the beds are generally made of a great thickneſs in dung, in order to continue their heat; ſo that, for ſome time after they are made, they are ſo extreme hot, as to endanger the ſcalding of the plants; and, by the time the fruit begins to appear, there is little heat left in the beds, which often occaſions the fruit to drop off, and come to nothing.

After theſe plants are placed in the beds where they are to remain, you muſt carefully lead the ſhoots as they are produced, ſo as to fill each part of the frame, but not to croud each other; and be careful to keep them clear from weeds, as alſo to admit freſh air, whenever the weather will admit: they muſt alſo be frequently watered, but do not give it them in great quantities. *Miller's Gard. Dict.*

CI'TRUM. The ancient Romans had a ſort of tables made of an elegant wood, and called Citrum; theſe have been ſuppoſed, by ſome, to be made of the wood of the citron-tree, and by others, of the cedar; but it appears plainly, that they were made of neither, but of a wood peculiar for its fineneſs, and very different from both.

The more modern writers of the Mooriſh hiſtory tell us, that about mount Atlas, and in ſome of the iſlands on the coaſts of Africa, there grow cedars, which much reſemble the cypreſs-tree; and of the wood of their trunk they at this time make very beautiful tables, and of a large price. The name cedar is become very uncertain in its ſignification, and we at preſent call the junipers of the Weſt-Indies the Virginia and Bermudas cedars. It is poſſible that this cedar of the Africans, which grows like the cypreſs, may be the Citrum of the Latins, and thya of the Greeks; and that the citreæ and thyinæ menſæ may have been made of its wood. Vitruvius alſo tells us, of trees reſembling the cedar in their growth, and the cypreſs in the leaves. Theſe muſt be different from both, and muſt have a peculiar name, and might probably have been the trees called thya by the Greeks, and Citra by the Latins, of which theſe famous tables were made.

CI'TY. It has been obſerved that large Cities are more liable than other places to peſtilential and putrid diſorders, which is owing to the ſtagnation and corruption of the air. This is always the caſe in thoſe which are low and unprovided with common ſewers; where the ſtreets are narrow and foul, the houſes dirty, water ſcarce, and jails and hoſpitals crowded: alſo, when in ſickly times, the burials are within the walls, or when dead animals and offals are left to rot in the kennels or on dunghils; when drains are not provided to carry off any large body of ſtagnating water in the neighbourhood; when fleſh meats make the greateſt part of the diet, without a proper mixture of greens, bread, wine, or fermented liquors; from the uſe of old mouldy grain. In proportion to the number of theſe and the like cauſes concurring, a City will be more or leſs ſubject to peſtilential diſeaſes, or to receive the leaven of the true plague brought into it by any merchandize. *Pringle, Obſerv. on the Diſeaſes of the Army.*

CI'VES, in botany, a very ſmall ſpecies of onion, which never produces any bulbs, and ſeldom grows above ſix inches high in the blade, which is very ſmall and ſlender, and grows in tufts and bunches. This uſed to be in great requeſt for ſallads in ſpring, as being milder than other onions which had ſtood the winter, but at preſent it is not much regarded. The way of propagating it is by parting the roots in autumn, and planting them, at ſmall diſtances, three or four in a hole; they will ſtand the winter very well, and be fit for uſe early in the ſpring.

CLA'NGULA, in zoology, the name of a ſpecies of duck found about the ſea-coaſts, and called in Engliſh the golden eye. Its body is ſhort and thick; its head large, and its neck ſhort; its beak is ſhort and broad, and is all over black; its head is of a very obſcure and duſky green, yet gloſſy, and there is a large white ſpot at each angle of the beak; the iris of the eyes is of a beautiful yellow; the neck, ſhoulders, breaſt, and belly are white, and the back black; the wings are black and white, and the tail is wholly black; the legs are very ſhort, and the feet very broad, and both are of a ſaffron colour; the hinder toe is ſmall, but is edged on each ſide by a membrane, which adds much to its breadth.

CLAP-*net*, among ſportſmen, a ſort of net contrived for the taking of larks with a looking-glaſs, by the method called daring, or doring. The nets are ſpread over an even piece of ground, and the larks are invited into the place by other larks faſtened down, and by a looking-glaſs compoſed of five pieces, and fixed in a frame, ſo that it is turned round very ſwiftly, backwards and forwards, by a cord pulled by a perſon at a conſiderable diſtance behind a hedge.

CLAR, or CLAER, in metallurgy, bone-aſhes perfectly calcined, and finely powdered, kept purpoſely for the covering the inſide of coppels.

CLARIGA′TIO, in Roman antiquity, a ceremony that always preceded a formal declaration of war. It was performed in this manner; firſt four heralds crowned with vervain were ſent to demand ſatisfaction for the injuries done the Roman ſtate. Theſe heralds, taking the gods to witneſs that their demands were juſt, one of them, with a clear voice, demanded reſtitutions within a limited time, commonly thirty-three days; which being expired, without any reſtitution made, then the pater patratus, or prince of the heralds, proceeded to the enemies frontiers, and declared war.

CLATTE′ in heraldry, a term borrowed from the French, to expreſs ſuch lines as are ſometimes found in the old paintings, and engravings of arms. Theſe lines are of an irregular kind, and not reducible to any other proper lines of heraldry, as the engrailed, indented, embattled, or the like. *Neſbit's Heraldry.*

CLAVA′RIA, in botany, the name given by Vaillant, and continued by Linnæus, to a genus of fungus's, the characters of which are, that they grow perpendicularly, and have a ſimple and uniform ſurface; theſe have been called alſo, by the ſame Vaillant, under ſome ſmall varieties in the ſpecies, corallo-fungus, and by Tournefort coralloides.

CLA′VICLE (*Dict.*)—*Fracture of the* CLAVICLE. The Clavicle is extremely ſubject to be fractured, both from its tranſverſe poſition, and from its ſmallneſs. Whether it happens to be broken near the humerus, or near the ſternum, its end that is next the humerus always deſcends lower than the other, from the weight of the arm which was before ſuſtained by the Clavicle and head of the ſternum; and, notwithſtanding that part of it next the ſternum remains immoveable by the deſcent of its other end, it can ſcarce happen, but they will in ſome degree collapſe over one another.

The reduction of a fractured Clavicle is not very difficult, eſpecially when the fracture is tranſverſe; nor is it uſual for the humerus, with the fragment of the Clavicle, to be ſo far diſtorted as not to be eaſily reduced by the fingers. The difficulty, however, is much greater to keep the bone in its place when the fracture has been reduced, and that moſt of all when the bone has been broken obliquely. For this there are two reaſons; for the circular bandages, with which the bones of the arms and other extremities are uſually held very firm, cannot be applied here, by reaſon of the form and diſorder of the part, and then the weight of the depending arm ſoon pulls to pieces what the ſurgeon has been replacing.

This fracture is to be reduced in the following manner: the patient muſt be placed on a low ſeat, and an aſſiſtant is to thruſt his knee againſt the middle of the patient's back, between his two ſhoulders; then laying hold of both the patient's arms with his hands, he muſt pull them gently and gradually backwards, by which means the Clavicles will be properly extended: while this is doing, the ſurgeon muſt ſtand before, and endeavour to replace the bone with both his hands, ordering the aſſiſtant to hold the bone in that poſition; he is then to apply a narrow and thick compreſs, ſo as to fill up the cavities above and below the Clavicle; upon theſe he is to lay two more narrow compreſſes made in the form of an X; over all theſe he is to apply a piece of paſte-board, accommodated to the ſhoulders and neck, and firſt ſteeped in ſpirit of wine, or oxycrate; then he muſt place a ball under the arm, or elſe bind it ſeveral times with a thick roller, to prevent the humerus from ſubſiding; and laſtly the whole is to be properly bound up, and the arms ſuſpended by a ſaſh or ſling hung acroſs the ſhoulder, about the neck. The plaiſters that have been uſed to be employed on this occaſion, have, of late years, been found to be wholly uſeleſs. When ever there are any looſe ſplinters of the bone that are entirely ſeparated, which, though they ſhould not wound, or hurt the fleſh, yet will obſtruct the meeting of the Clavicle, it ſeems altogether requiſite to open the ſkin, and remove them before the reduction of the bone, treating the wound as uſual: but, if there be any ſplinters which ſtill adhere to the bone, and prick the adjacent parts, and impede the reduction, they muſt be alſo either taken off with the forceps, or elſe forced back into their places, by which they may be again united to the bone. But to divide the parts, and remove the fragments, requires great caution, leſt ſome of the large ſubclavian veins, or arteries, be wounded in the operation, and thereby a fatal hæmorrhage be produced. *Heiſter, Surg.*

CLA′VUS *hyſtericus*, in medicine, a name given to a peculiar ſpecies of a head-ach, more frequently attacking women than men, and with them uſually owing its original to a ſuppreſſion of the menſtrual diſcharges. In ſome caſes, the pain is leſs violent, and only attends people during the three or four firſt days of the menſtrual diſcharge. In others, the pain is more violent, and almoſt continual; and when to the common cauſes of it there is added a venereal taint, which is no uncommon caſe, it becomes then the moſt terrible of all pains in the head.

Signs of it. Theſe are a piercing pain about the fore head or temples, reſembling that of a nail driven into the head: this pain ſometimes alſo extends itſelf over the whole head: with this there generally is a ſenſation of pain about the ſagittal ſuture in particular, and a remarkable coldneſs there: often there is an inflation and redneſs of the face, with a noiſe and ringing in the ears. To theſe there are not unfrequently added a ſlight fever, a chilneſs of the extremity, a remarkable laſſitude, and want of appetite, with frequent eructations and nauſeas, and coſtiveneſs of the bowels. It generally returns about the time of the menſes; or, in caſes where it is continual, it rages with more than ordinary violence at that time. Among the women, thoſe are moſt ſubject to it who lead ſedentary lives, and feed high, and who are naturally paſſionate, and of a haſty temper.

Method of cure. The firſt care in this reſpect is to keep the bowels lax, for they are almoſt always naturally coſtive in this diſeaſe: emollient clyſters are the moſt proper means of this; and, where purges are required beſides, they muſt always be of the moſt gentle and leaſt vellicating kind. After theſe, the violent emotions of the blood are to be quieted by powders of nitre, antimony diaphoretic, crabs eyes, and cinnabar; and, if there be a ſpiſſitude in it, the natural and diuretic ſalts are to be given, in a ſcruple at a time, every day. Tartarum vitriolatum alone, given in this manner, frequently has a very great effect. If it be found neceſſary, beſides this a gentle opiate may be ſometimes given, ſuch as a ſmall doſe of the ſtorax pill: and, externally, ſpirit of wine and camphor is not a little ſerviceable. By way of prevention, it is extremely proper to bleed at ſpring and autumn every year: and, above all things, to keep regular in regard to the menſtrual diſcharges. Gentle purges are to be given at times, and neceſſary exerciſe above all things to be adviſed; and this ſhould always be the more inſiſted upon, the more averſe the patients are to it, and the more they love to indulge in a ſedentary courſe. *Junker's Conſp. Med.*

CLEAT, in ſhip-building, a piece of wood faſtened to the yard arm of a ſhip, to keep the ropes from ſlipping off the yard. *Manwayring.*

CLEW, of the ſail of a ſhip, is the lower corner of it which reaches down to that earing where the tackles and ſheets are faſtened; ſo that when a ſail is made going, or ſloping by degrees, ſhe is ſaid to have a great Clew: and a ſhip is ſaid to have a great Clew, when ſhe has a very long yard, and ſo has much canvas in her ſails.

CLEW-*garnet*, among ſeamen, a rope faſtened to the Clew of the ſail, and from thence running in a block ſeized to the middle of the main and fore-yard. Its uſe is to hail up the Clew of the ſail cloſe to the middle of the yard, in order to its being furled.

CLEW-*line*, is the ſame to the top-ſails, top-gallant ſails, and ſprit-ſails, that the Clew-garnet is to the main-ſail and fore-ſail, and has the very ſame uſe. In a guſt of wind, when a top-ſail is to be handed, they firſt hale home the lee Clew-line, and by that means the ſail is handed much eaſier.

CLINCH *of a cable*, is that part of it which is bent about the ring of the anchor, and then ſeized or made faſt.

CLINCH-*bolts*, in a ſhip, are ſuch as are clinched with a riveting hammer at thoſe ends which come through.

CLI′NCHING, in the ſea language, a kind of ſlight caulking uſed about the ports on a proſpect of foul weather: it is done by driving a little oakum into their ſeams, that the water may not come in at them.

CLOCK (*Dict.*)—To adjuſt the period of a Clock, it is not neceſſary that the line of ſight through the teleſcope ſhould deſcribe the meridian. If it always deſcribes the ſame vertical circle at every tranſit of a ſtar, it is ſufficient. For the intervals of time between the ſucceſſive appulſes of a fixed ſtar to the ſame vertical, are equal to the intervals between its appulſes to the meridian. But, leſt the uncertainty of the air's refraction ſhould cauſe any difference in the times, it is better to have the vertical circle near the meridian; and to obſerve a ſtar near the equator, becauſe its tranſit is quicker. Now, the line of ſight may be kept in the ſame vertical circle at every obſervation, by examining the level of the tranſverſe axis every time; and by obſerving alſo, whether the croſs hairs always cover the ſame mark upon a diſtant object, which in the night time muſt be illuminated by a lanthorn. For then the line of ſight will deſcribe the ſame vertical, notwithſtanding any warping of the materials or even of the building to which it is fixed. Now, we learn from aſtronomy, that the period of the Clock will be exactly equal to a ſolar day of a mean length, if the ſame fixed ſtar come to the croſs hairs 3 minutes 56 ſeconds ſooner every ſubſequent night than the night before it. For the interval of time between the apparent appulſes of a fixed ſtar to the ſame point of the heavens, is the ſame as the period of the earth's motion about its axis, which is called a ſidereal day, and is 3′. 56″. ſhorter than a ſolar day of a mean length; I ſay of a mean length, becauſe ſolar days, or the interval between the ſun's appulſes to the meridian, are unequal. But the error in the Clock's period will be diſcovered more exactly, by comparing two remote obſervations rather than two ſucceſſive ones. For example, ſuppoſe a ſtar comes to the croſs hairs at 9 h. 30′. 18″.

by the Clock, and ſeven days after at 8 h. 50′. 24″. by the Clock; the difference of theſe times is 39′. 54″. and a ſeventh part of it is 5′. 42″; which ſhews that the diurnal period of the Clock is 5′. 42″. longer than a ſidereal day; whereas a ſolar day of a mean length is but 3′. 56″. longer: and by conſequence the diurnal period of the Clock is 1′. 42″. too long.

CLOSE-*fights*, aboard a ſhip, are ſuch bulkheads as are in a fight put up fore and aft in the ſhip, that the men may ſtand behind them ſecure, and fire upon the enemy; and, if the ſhip is boarded, ſcour or clear the decks.

CLOTH (*Dict.*)— The goodneſs of Cloth, according to M. Savary, conſiſts in the following particulars: 1. That the wool be of a good quality and well dreſſed. 2. It muſt be equally ſpun, carefully obſerving that the thread of the warp be finer and better twiſted than that of the woof. 3. The Cloth muſt be well wrought, and beaten on the loom, ſo as to be every-where equally compact. 4. The wool muſt not be finer at one end of the piece than in the reſt. 5. The liſts muſt be ſufficiently ſtrong, of the ſame length with the ſtuff, and conſiſt of good wool, hair, or oſtrich feathers, or, which is ſtill better, of Daniſh dog's hair. 6. The Cloth muſt be free from knots and other imperfections. 7. It muſt be ſcowered with fuller's earth, well fulled with the beſt white ſoap, and afterwards waſhed in clear water. 8. The hair or nap muſt be well drawn out with the teazel, without being too much opened. 9. It muſt be ſhorn cloſe, without making it threadbare. 10. It muſt be well dried. 11. It muſt not be tenter-ſtretched, to force it to its juſt dimenſions. 12. It muſt be preſſed cold, not hot preſſed, the latter being very injurious to woollen cloth.

CLO'VER, a ſpecies of the trifolium. See the article TRIFOLIUM.

Clover is greatly cultivated in England for feeding of cattle, and is eſteemed very profitable, becauſe the great quantity of cattle which this graſs will maintain, does very much enrich all clayey lands, and prepare them for corn in two or three years, which is the length of time that this crop will continue good.

In the choice of this ſeed, that which is of a bright yellowiſh colour, a little inclining to brown, ſhould be preferred; but the black rejected as good for little.

Ten pounds of this ſeed will be ſufficient for an acre of ground; for if the plants do not come up pretty thick, it will not be worth ſtanding. The land in which this is ſown ſhould be well plowed, and harrowed very fine, otherwiſe the ſeeds will be buried too deep, and thereby loſt.

The beſt time to ſow it is about the beginning of Auguſt, at which ſeaſon the autumnal rains will bring up the plants in a ſhort time; whereas, when the ſeeds are ſown in the ſpring, if it be done very early, they are many times burſt with wet and cold; and, if it be done late, they are in danger of miſcarrying from drought: whereas in autumn, when the ground has been warmed by the ſummer's heat, the rains then falling greatly promote the vegetation of ſeeds and plants.

The ſeeds ſhould be harrowed in with buſhes; for, if it be done with a common harrow, they will be buried too deep.

Moſt people have recommended the ſowing of this ſeed with ſeveral ſorts of corn; but if it be ſeaſoned, as before directed, it will be much better, if ſown alone; for the corn prevents the growth of the plants until it is reaped, and taken off the ground; ſo that one whole ſeaſon is loſt; and many times, if there be a great crop of corn upon the ground, it ſpoils the Clover, ſo that it is hardly worth ſtanding; whereas, in the way before directed, the plants will have good roots before winter; and in the ſpring will come on much faſter than that which was ſown the ſpring before under corn.

About the middle of May this graſs will be fit to cut, and there ſhould be great care taken in making it; for it will require a great deal more labour and time to dry than common graſs, and will ſhrink into leſs compaſs; but, if it be not too rank, it will make extraordinary rich food for cattle. The time for cutting it is when it begins to flower; for, if it ſtands much longer, the lower part of the ſtems will begin to dry, whereby it will make a leſs quantity of hay, and that not ſo well flavoured.

Some people cut three crops in one year of this graſs; but the beſt way is but to cut one in the ſpring, and feed it the remaining part of the year, whereby the land will be enriched, and the plants will grow much ſtronger.

One acre of this graſs will feed as many cattle as four or five acres of common graſs: but great care ſhould be taken of the cattle when they are firſt put into it, leſt it burſt them. To prevent which, ſome turn them in for a few hours only at firſt, and ſo ſtint them as to quantity; and this by degrees, letting them at firſt be only one hour in the middle of the day, when there is no moiſture upon the graſs, and ſo every day ſuffering them to remain a longer time, until they are fully ſeaſoned to it: but great care ſhould be had never to turn them into this food in wet weather; or, if they have been for ſome time accuſtomed to this food, it will be proper to turn them out at night in wet weather, and let them have hay, which will prevent the ill conſequences of this food: but there are ſome who give ſtraw to their cattle, while they are feeding upon this graſs, to prevent the ill effects of it; which muſt not be given them in the field, becauſe they will not eat it where there is plenty of better food. There are others who ſow rye graſs amongſt their Clover, which they let grow together, in order to prevent the ill conſequences of the cattle feeding wholly on Clover: but this is not a commendable way, becauſe the rye graſs will greatly injure the Clover in its growth.

Where the ſeeds are deſigned to be ſaved, the firſt crop in the ſpring ſhould be permitted to ſtand until the ſeeds are ripe, which may be known by the ſtalks and heads changing to a brown colour; then it ſhould be cut in a dry time: and, when it is well dried, it may be houſed until winter, when the ſeeds ſhould be threſhed out; but, if the ſeeds are wanted for immediate ſowing, it may be threſhed out before it be houſed or ſtocked; but then it muſt be well dried, otherwiſe the ſeeds will not quit their huſks.

It has been a great complaint amongſt the farmers, that they could not threſh out theſe ſeeds without great labour and difficulty; which I take to be chiefly owing to their cutting the ſpring crop when it begins to flower, and to leave the ſecond crop for ſeed, which ripens ſo late in autumn, that there is not heat enough to dry the huſks ſufficiently: whereby they are tough, and the ſeeds rendered difficult to get out; which may be intirely remedied by leaving the firſt crop for ſeed, as hath been directed.

When the cattle are fed with this hay, the beſt way is to put it in racks, otherwiſe they will tread a great quantity of it down with their feet. This feed is much better for moſt other cattle than milch cows, ſo that theſe ſhould rarely have any of it, leſt it prove hurtful to them: though, when it is dry, it is not near ſo injurious to any ſort of cattle, as when green.

COAL (*Dict.*)— There are various kinds of Coal, as the hard duſky black Coal.—This is one of the ſpecies of Coal in common uſe in London, and many other parts of the kingdom, and is called Scotch coal, though that name is not ſtrictly applied to this ſpecies alone; but the following kind, more diſtinctly called Welch Coal, is often ſold under the ſame denomination. It is a conſiderably firm and compact ſubſtance, of a moderately cloſe texture, and pretty heavy: it is naturally of a rough, rugged, and a duſty ſurface, and is uſually ſeen in flat maſſes, though it naturally conſtitutes large and continued ſtrata; but, being of a laminated ſtructure in theſe, it naturally breaks into maſſes of this ſhape in digging, and theſe more readily ſplit, or break horizontally, than in any other direction, though by no means regularly or evenly in that. It is rough and harſh to the touch, and of a rude and rough ſurface; it is of a very ſtrong and deep black, but not at all gloſſy; and, when broken, is much leſs ſo than any other Coal. Examined by the microſcope, it appears of a tolerably cloſe and compact texture, of an irregular laminated ſtructure, and conſiderably bright.

It is very readily inflammable, and burns briſkly, giving a bright white flame, and burning away very quick into aſhes, not into cinders, in the manner of the common Coal. This is owing to its being more purely bituminous, and regularly inflammable; the maſſes of the common Coal becoming extinct before they are half conſumed, theſe never going out till they are wholly burned away.

It is dug in great quantities in many parts of the kingdom; about Limington there is ſo much of it, and ſuch quantities ſent from thence, that in every place it is called Limington Coal.

The hard gloſſy COAL.— This is a ſpecies of coal ſometimes ſold in London under the name of Scotch Coal, but known in many parts of this kingdom under the name of Welch Coal; and is much eſteemed for its burning with leſs ſmoke than any other kind.

It is a very firm and compact body, of a cloſe, even, and regular texture, and conſiderably heavy; it is of a tolerably ſmooth ſurface, and ſoft to the touch, and is uſually brought to us in moderately large and irregular flat lumps. In the earth it compoſes very large and thick ſtrata, which being of a laminated ſtructure, it naturally falls into maſſes of this ſhape in breaking. It is the hardeſt of all the ſpecies of Coal, but is not nearly ſo hard as the ampelites: it breaks more eaſily horizontally than in any other direction, though not regularly or evenly in that, and, when freſh broken, is very bright and gloſſy, and of a very fine deep black.

Examined by the microſcope, it appears of a very remarkable even texture, and of a laminated ſtructure, being compoſed of numerous ſmall and thin plates, or flakes, laid cloſely on one another, and each of theſe of many other, much thinner and finer; the microſcope ſhews, however, ſome part of theſe thinner flakes to be much purer, blacker, and more gloſſy than the reſt.

It is dug in vaſt quantities in Wales, and in many parts of England; it is very readily inflammable, and burns with a bright, vivid, white flame, and almoſt wholly without ſmoke, but does not conſume ſo faſt as the former ſpecies, or burn away at once to aſhes, but make cinders, like the common. It is ſo remarkable for its burning without ſmoke, that, in ſome parts of this kingdom, and in general in Wales, they make malt with it without previous burning.

The friable gloſſy Coal.— This is a ſubſtance extremely well known, being the common firing of London, and of the greateſt part of the kingdom.. It is dug in different degrees of purity and goodneſs in different places ; and the fineſt of this kind is known, among the dealers in Coal, by the name of Tanfield- moor Coal, the place where it is dug.

It is a friable ſubſtance, of a ſmooth and even texture, and but moderately heavy, being much lighter than either of the former ſpecies, though heavier than the cannel, or ampelites : it is of an irregular and uneven ſurface, and uſually comes to us in large thick maſſes, in various ſhapes, but not remarkably flat. It conſtitutes immenſe ſtrata in the earth, and is in thoſe of an irregularly laminated ſtructure, and thence is naturally raiſed in broad and flat, rather than any other ſhaped pieces ; but theſe are ſo brittle, that they are eaſily broken tranſverſly, and, therefore, ſeldom retain long their original flat form. It is ſmooth on the ſurface, and ſomewhat ſoft to the touch, and is of leſs hardneſs than any other coal ; it breaks with a tolerably even, and very remarkably bright, ſurface, and is of a fine deep ſhining black.

Viewed by the microſcope, it appears of an irregular laminated ſtructure, and cloſe texture, and of a very remarkable brightneſs.

It is very readily inflammable, and does not burn ſoon to aſhes.

It is dug about Newcaſtle in England, whence it has its name of Newcaſtle Coal, and in vaſt plenty in a great many other parts of the kingdom.

Coal-*balls*.— In the country of Liege, they uſe a kind of balls made of Coal and clay, for firing. Theſe balls are made with one third of clay, without ſand or gravel, and two thirds of Coal-duſt, well mixed, and formed either into round balls, or into bricks. This Coal duſt, being the refuſe of the mine, makes this ſort of firing cheap. See *Philoſ. Tranſ.* N°. 460. *Sect.* 3.

COA'MINGS, in ſhip-building, are thoſe planks, or that frame, which raiſe up the hatches higher than the reſt of the deck. Loopholes, for muſkets to ſhoot out at, are often made in the Coamings, in order to clear the deck of the enemy, when a ſhip is boarded.

CO'BALT *(Dict.)*— Cobalt put into a coated retort, and ſet over a ſtrong fire, yields thick fumes, which by degrees aſſemble themſelves in the neck, and upper part of the veſſel, in form of a ſolid ſubſtance. This is white arſenic, or ratsbane, but the ore is ſeldom ſo pure as to yield theſe flowers white and perfect from the beginning ; they are often blackiſh at firſt, and, after this, red, which ſhews that there is ſome portion of common ſulphur in the Cobalt, which, mixing with the arſenic, turns it red, as it will common white arſenic, eſpecially if a little ſcoriæ of copper be added, or in the firſt caſe, if a little copper be contained in the Cobalt.

Theſe red flowers form themſelves into a ſolid ſubſtance of a laminated ſtructure, and have much the appearance of a regulus of ſome kind ; but they alter on being expoſed to the air, and, though very bright and gloſſy at firſt, they become opake and dull afterwards. When roaſted, as the miners term it, in a reverberatory oven, in which the flame of the wood is beat back upon the ore, it yields a white duſty ſubſtance like meal, which ſticks to the top of the oven, and is collected for the making of common white arſenic, and the other kinds. The remaining ſubſtance, after all theſe white flowers are raiſed, is only the fixed earth which turns into that blue glaſs called ſmalt.

Biſmuth ores, treated in the ſame manner, yield their metal for the common uſes, as the Cobalt yields its arſenic ; and the remainder, like that of the Cobalt, is an earth eaſily fuſible into the ſame blue glaſs.

CO'CCUS *Polonicus*, an inſect which may properly enough be called the cochineal of the northern part of the world. As the cochineal loves only the hot climates, this creature affects only the cold ones. It is collected for the uſe of dyers, but the crops of it are much ſmaller, more difficultly made, and the drug itſelf greatly inferior to the true cochineal. It is commonly known by the name of Coccus polonicus, or the ſcarlet grain of Poland. Poland is indeed the place where it is gathered in the greateſt abundance, but it is not the only one ; it is found in many other of the northern countries, and may very poſſibly be produced in ſome of the more temperate ones, where it is not known, as it is very much hid by nature from the eyes of common obſervers.

This kermes of Poland, if it may be ſo called, is found affixed to the root of a very ſmall plant, and uſually to the ſame plant, which has been thence called the polygonum cocciferum. Authors have informed us of the ſame berry, as it is often called, alſo growing at the roots of the mouſe-ear, rupture wort, pimpernel, and pellitory of the wall ; that it is in no other than dry ſandy places, and that it is found at the roots of theſe plants. Breynius, in 1731, printed, at Dantzick, a very curious account of this production, which proves it inconteſtably to be an animal, and gives us many reaſons for knowing it to be of the progall-inſect claſs. *Reaumur, Hiſt. Inſ.*

Toward the end of June, the Coccus polonicus is found in a ſtate to be gathered. Every one of the creatures is then nearly of a ſpherical form, and of a fine violet colour ; ſome of them, however, are not larger than poppy ſeeds, and others of the ſize of a pepper-corn, and each of them is lodged either in part, or intirely in a ſort of cup, like that of an acorn More than half the ſurface of the body of the animal is uſually covered by this cup. The outſide of this covering is rough, and of a blackiſh brown ; but the inſide is ſmooth, poliſhed, and ſhining. On ſome plants they find only one or two of theſe, and on others more than forty ; and they are ſometimes placed near the origin of the ſtalks of the plant.

CO'D-FISH, is the largeſt of the genus of the aſelli, called aſellus maximus by authors, and, ſometimes, aſellus varius, ſive ſtriatus. The characters by which this is diſtinguiſhed from other fiſhes of the ſame genus are theſe : its colour on the back and ſides is a duſky olive, variegated with yellow ſpots ; its belly is white ; its ſides have a long white line running their whole length, from the gills to the tail, which, at the abdomen, is curved, but elſewhere ſtraight ; its ſcales are very ſmall, and adhere firmly to the ſkin ; its eyes are large ; at the angle of the lower jaws there hangs a ſingle beard, which is ſhort, ſeldom exceeding a finger's length ; its tongue is broad ; it has ſeveral rows of teeth, one of which is much longer than all the others. Among theſe there are ſome moveable teeth, as in the pike ; and in the palate, near the orifice of the ſtomach, and near the gills, it has ſmall cluſters of teeth. It has three back fins, two at the gills, and two at the breaſt, and two others behind the anus ; and the tail is plain. *Willughby's Hiſt. Piſc.*

COIN (*Dict.*)—*Flemiſh* Coins.— Thoſe of gold are imperials, rides, or philips, alberts, and crowns.

Thoſe of ſilver are philips, rixdollars, patagons, ſcalines, and gulden : and thoſe of copper, patards.

Patard, or penny.

8	Groat.						l.	s.	d.
16	2	Single ſtiver, equal to					0	0	$1\frac{1}{4}$
96	6	6	Shilling,				0	0	$7\frac{1}{2}$
288	18	30	3	Gulden,			0	2	0
720	90	50	$2\frac{1}{2}$	$2\frac{1}{2}$	Rixdollar, dollar, patag.		0	4	6
2104			$7\frac{1}{2}$		$2\frac{1}{2}$	Imperial.	0	11	3

Note, The rixdollar, dollar, and patagon, are nearly on the ſame foot with the crown, or piece of eight.

German Coins.— Thoſe of gold, are ducats, which are of various kinds ; oboli of the Rhine, and florins : of this laſt kind there are ſome likewiſe of ſilver ; beſides rixdollars and izelottes, which are all of that metal.

Thoſe of copper, are the creux, or kreutzer, and fenin.

Fenin, equal to $\frac{7}{3}$ of a farthing ſterling.

8	Creux, or kreutzer.									
192	24	Dollar.								
348	$43\frac{1}{2}$	$1\frac{8}{10}$	Obolus.					l.	s.	d.
432	54	$2\frac{1}{10}$	$1\frac{2}{10}$	Izelotte.				0	2	9
480	60	$2\frac{3}{10}$	$1\frac{3}{10}$	$1\frac{1}{10}$	Gulden, or florin.			0	3	0
650	100	$3\frac{8}{10}$	$2\frac{1}{10}$	$1\frac{9}{10}$	$1\frac{6}{10}$	Rixdol.or dollar.		0	4	6
1068	133	$5\frac{8}{10}$	$2\frac{8}{10}$	$1\frac{2}{10}$	$2\frac{1}{10}$	$1\frac{3}{10}$	Ducat.	0	7	6

Swiſs Coins, are ratzes and blazes ; of Billon.— The ratze, equal to $\frac{3}{4}$ and $\frac{1}{8}$ of a penny ſterling.— Blaze of Bern, nearly on the ſame footing with the ratze.

Poliſh Coins.— Beſides the rixdollars ſtruck here, which are common to other countries ; the Poles ſtrike ſilver roups, abras, and groats.

	s.	d. Sterl.
Roup —— ——	0	$4\frac{3}{4}$
Abra — —	1	$0\frac{1}{5}$
Groch —— ——	0	$0\frac{1}{2}$ and $\frac{1}{3}$

Daniſh Coins, are the horſe, the marc lubs, and the ſcheſdal of ſilver.

	s.	d. Sterl.
Horſe —— ——	1	$1\frac{1}{2}$
Marc lubs ——	1	6
Scheſdal, two marcs, or lubs	3	0

Swediſh Coins.— Thoſe of ſilver are the chriſtines, carolines, and cavaliers. Thoſe of copper the rouſtique, alleuvre, mark and money.

s. d.

	s.	d. Sterl.
Chriſtine	1	$1\frac{1}{2}$
Caroline	1	$5\frac{1}{4}$
Mark	0	$2\frac{1}{3}$
Rouſtique, $\frac{1}{8}$ of the mark	0	$0\frac{1}{4}$ and $\frac{1}{8}$ of $\frac{1}{3}$
Alleuvre, $\frac{1}{2}$ of the rouſtique	0	$0\frac{1}{8}$ and $\frac{1}{16}$ of $\frac{1}{3}$

The Swediſh money, properly ſo called, is a kind of copper, very ſoft and malleable, cut in little ſquare pieces, or plates, about the thickneſs of three Engliſh crowns, and weighing five pounds and a half; ſtamped at the four corners with the Swediſh arms; and current in Sweden for a rixdollar, or piece of eight.

Muſcovite COINS.—There are two kinds of copecs in Muſcovy, the one of gold, the other of ſilver; the laſt called alſo denaing, or pence. Their

Copec, or kapeke of gold, worth	1	$6\frac{1}{12}$ Sterl. but current in
the Czar's territories for	1	9
Copec of ſilver, or denaing of an oval form, worth	0	1 Sterl. but current for ſomewhat more.
Poluſk, $\frac{1}{2}$ of the copec	0	$0\frac{1}{2}$
Moſtoſke, $\frac{1}{4}$ of the copec	0	$0\frac{1}{4}$

Turkiſh COINS.— The only gold ſpecies ſtruck in the grand ſeignior's territories, is the ſultanin, called alſo ſcheriff, or ſequin.

Their ſmall monies are the para, or paraſi, called alſo parat, and meidein, and the aſpre, both of ſilver.

	s.	d. Sterl.
Sultanin ſcherif, or ſequin, equal to the ducat of gold, or	9	0
Para, parat, or paraſi	0	$1\frac{1}{2}$
Shakee of Aleppo and Scanderoon	0	$3\frac{1}{2}$
Aſpre	0	$0\frac{2}{3}$ but ordinarily,
by reaſon of the baſe alloy, no more than		$\frac{1}{2}$

For the other Coins of Europe; ſee the article EXCHANGE, in the Dictionary.

COINS *of the coaſts of Barbary.*— The current Coins ſtruck here are rubies, medians, ziams, and metecals; all of gold: the laſt of which are ſtruck at Morocco, the reſt at Fez, Algiers, and Tunis; which beſide have doublas of ſilver, and burbas of copper.— Tunis, has its naſaras of ſilver, its blanquilles likewiſe of ſilver, and felours of copper.

Other Coins of Africa, are the merigal of gold, current in Sofala, and the kingdom of Monopotapa; and the pardo of ſilver, current in Moſambica.

	s.	d. Sterl.
Rubie, equal to 35 aſpres, or	1	9
Menian, 50 aſpres, or	2	7
Ziam, zian, or dian, two menians, or	5	2

Metecal, a kind of ducat of different fineneſs, conſequently of different value; whence very conſiderable difficulties in commerce. The difference ariſes hence, that there is no mint fixed, or regular coiners at Morocco, but every Jew and goldſmith ſtrikes ducats after his own manner in open ſhop.

	s.	d. Sterl.
Double, equal to 80 aſpres, or	4	6
Burba, $\frac{1}{12}$ of an aſpre, or	0	$0\frac{1}{12}$
Blanquille,	0	$2\frac{1}{4}$
Felours, $\frac{1}{2}$ of the blanquille, or	0	$0\frac{1}{4}$ and $\frac{1}{12}$
Merigal, worth about	18	0
Pardo,	1	3

Perſian COINS.— Theſe are either ſilver, or copper; gold they have none: of the firſt kind are the abaſſi, mamodi, ſhahee, and biſti: of the ſecond the kabeſqui, and half kabeſqui; the tela, or cheraſis, indeed is gold; but it is leſs a money than a medal, though it has ſome courſe in commerce.

	s.	d. Sterl.
Abaſſi, equal to	1	$4\frac{1}{2}$
Mamodi, $\frac{1}{2}$ the abaſſi	0	$8\frac{1}{4}$
Shahee, $\frac{1}{2}$ the mamodi,	0	4 and $\frac{1}{2}$

Biſti, ſome relations make this a Coin worth about one penny half-penny; but others only a term of accompt, ſignifying 10 dimars, or $\frac{1}{1000}$ part of a toman.

Caſbequi, or cabeſqui, equals $\frac{5}{12}$ of a penny ſterling.—Tela, or cheraſis, uſually ſtruck at the acceſſion of a new king, and at the beginning of each new year; its weight and worth various.

Chineſe COINS.—Throughout the kingdom of China and Tonquin, there are not properly any Coins ſtruck; inſtead of theſe, they cut their gold and ſilver into little pieces of different weights; thoſe of gold, the Dutch, from their figure, which reſembles a boat, called golchuts: thoſe of ſilver, the natives call leam; the Portugueze, taels.— Their ſmall money is of copper; ten of theſe make their ſhilling, and ten of thoſe their crown, or leam.

Beſide theſe, they have a ſmall money of lead, mixed with the ſcum of copper, having holes in the middle to ſtring them on for the eaſe of numbering: this ſpecies is called caxa, cas, and pitis; and the ſtring, which uſually holds 200, is called ſanta. They are ſo very brittle, that they never fall without breaking into a great number of pieces; and, if left all night in ſalt water, ſtick ſo cloſe together that they cannot be ſeparated.

There are two kinds of golchuts, great and ſmall.—Golchut, an ingot, which, at 3l. 3s. per ounce, uſually amounts to 101l. 5s. ſterling.—Other golchuts only weigh half as much; their value in proportion.

Tael, or leam, equal to 6s. 8d. ſterling.

Copper money $\frac{1}{1000}$ part of the teal, or ſomewhat more than $\frac{1}{4}$ of a farthing.

Caxa, caſes, or pitis, $\frac{1}{3}$ of a farthing ſterling, 300,000 of theſe are nearly equal to 56 Dutch livres.

Caxa larger, $\frac{1}{1000}$ of a piaſtre, or piece of eight.

COINS *of Japan*—The Japoneſe ſtrike coupants, both of gold and ſilver, and copper pieces with holes in the middle, like thoſe of China; ſix hundred of theſe make the tael. Their other monies, or quaſi monies, are ingots, which they cut like the Chineſe of different weights, chiefly three; the largeſt of the weight of ſix rials, viz. forty-eight taels, the tael equivalent to ſeventy-five Dutch ſtyvers. The ſecond equal to ſix taels and an half; and the third to $\frac{5}{8}$ of a rial, or one tael $\frac{1}{16}$.

Beſides theſe, they have a ſmall ſilver money, in form of round beans, of no determinate weight, uſually weighed by maiſes; the common payment being by ten maiſes, which make one tael.

	l.	s.	d. Sterl.
Coupant of gold, weighing one ounce ſix drachms; its figure a long oval, the longeſt diameter about four inches, and the ſhorteſt half an inch.	6	12	6
Other coupants of gold, near $\frac{1}{3}$ of the former, amounting to about	2	4	2
Coupant of ſilver, current at	0	4	6
Copper money	$\frac{7}{15}$ of a farthing.		

COINS *of Siam.*—In the dominions of Siam are ſtruck gold pieces five or ſix grains heavier than the half piſtole of Spain; but theſe are rather pieces of curioſity, than of uſe in commerce.

Their ſilver Coin is the tical, or baat; the dimenſions whereof are the mayon, or ſeling, foang, and ſompayc. Theſe pieces are all ſtrangely ſtruck: in form they reſemble nuts, a little flatted at the extremities; and are ſome of them cloven like horſe-ſhoes; on two of the ſides are ſome Siameſe letters.—Their copper money, called bia, is round and thick: beneath this is the cauris.

	s.	d. Sterl.
Gold ſpecies of Siam	7	0
Tayl,	6	$11\frac{1}{3}$
Mayam, or maſs $\frac{1}{16}$ of the tayl,	0	$5\frac{1}{4}$ and $\frac{1}{8}$
Foang, $\frac{1}{2}$ the mayam,	0	$2\frac{3}{4}$
Sompayc, $\frac{1}{2}$ the foang,	0	$1\frac{1}{4}$ and $\frac{1}{48}$
Copper Coin, or farthing of Siam,	0	$0\frac{6}{10}$

COINS *of the coaſts and iſlands of the Indies.*—The principal, and thoſe moſt generally current, are pagodos, rupees, larins, fanos, or fanons, and coupans, each whereof are ſtruck both of gold and ſilver.

Beſides theſe general Coins, are particular ones, viz. at Goa, St. Thomas's of gold.—Along the Perſian gulf, about Mecca, and throughout Arabia, the larin.—Along the coaſts of Malabar, and at Goa, the pardao and xeraphin of ſilver.—At Bantam, the fardos; at Malabar, the tare; at Siam the tayl, with its diminutions the mayam, foang, ſompayc, and demi-foang; all of ſilver.— At Surate, Agra, and the reſt of Indoſtan, the pecha, or peſſa, and doudous, all of copper.—The baſarucos and chedas, of tin.

	l.	s.	d. Sterl.
Pagodo, gold, denominated from its impreſſion, and Indian idol.	0	5	0
Pagodo, ſilver, its value very different; the ſmalleſt eight tangas, and the tanga ninety baſarucos; equal to	0	8	0
Rupee, gold,	1	11	6

Rupee, ſilver, its fineneſs and value various: there are three kinds current, viz. the rupees Siceas, the rupees of Surat, and rupees of Madras.

	s.	d. Ster.
Rupees Siceas, worth at Bengal	2	11
—of Surat	2	3
—of Madras	2	$5\frac{1}{2}$

Note, This is to be underſtood of the new rupees; for as to the old ones, of each kind, their value is leſs: thoſe of Madras, v. gr. are but equal to 1s. 11d. ſterling, thoſe of Surat 2s. and the Siceas 2s. 4d.

	s.	d. Ster.
Larin, in form of a round wire, or cylinder, equal to the barrel of a pen; bent in two, and a little flatted at each end, to receive the impreſſion of ſome Arabic, or Perſian characters.	0	11
Fanos, or fanon, gold, is of different fineneſs, weight, and value; the largeſt worth	0	9
The ſmalleſt	0	$2\frac{1}{2}$
Fanos, ſilver,	0	$1\frac{1}{4}$
Coupant, ſee COINS *of Japan.*		
St. Thomas, equal to	9	0
Xeraphin	2	1
Fardos	2	$8\frac{1}{2}$
Tare	0	$0\frac{1}{2}$

	s.	d. Ster
Tical, ſee Coins *of Siam.*		
Pecha, or peſſa, — — — — —	0 :	$0\frac{1}{2}$
Doudou, $\frac{1}{13}$ of fanos, or ſomewhat leſs than	0 :	$0\frac{1}{2}$
Baſaruco or Budgerook, $\frac{1}{5}$ of a farthing.		
Cheda is of two kinds, the one octogonal, current at — — — — — —	0 :	$1\frac{3}{4}$
The other round — — — — —	0 :	$0\frac{1}{3}$

Mogul Coins.—In the dominions of the great Mogul, are roupies, mamoudas, and pechas; the firſt both of gold and ſilver; the ſecond of ſilver alone, and the third of copper.

There are others ſtruck by the princes tributary to him, and the powers bordering on him, ſcarce current beyond their reſpective territories: particularly a ſmall ſilver Coin ſtruck by the king of Matoucha, whoſe territories lie to the north of Agra, of the value of the pecha of Mogul, but half as heavy again.—The raja of Parta-jajamoula, to the north of Patua, likewiſe ſtrikes ſome little pieces, both of ſilver and copper, of ſmall value.—The raja of Ogden, who commands between Brampour, Seronge, and Amadabath, a ſmall ſilver Coin, equal to ſix-pence ſterling; and another of copper, equal to an halfpenny ſterling. The king of Cheda and Pera, a tin-money called cheda.—The king of Achem, little ſlight gold pieces, worth about fifteen-pence ſterling.—And tin pieces, eighty of which are equal to the Engliſh penny, current in the iſles of Sumatra.—The gold Coin of the king of Macaſſar and Celebes is taken by the Dutch for a florin.—The king of Camboya ſtrikes only pieces of ſilver and copper: his gold, wherein he abounds, is negotiated by weight. —The kings of Java and Bantam, in the ſame iſland, and thoſe of the Molucca iſlands, ſtrike only copper Coins: they allow foreign ſilver ſpecies to be current in their territories, but coin none.

	s.	d. Ster.
Roupia, ſee Coins *of the coaſts, &c. of India.*		
Mamouda, or mamotha, its value is not fixed: in the kingdom of Mazarate, the great mamouda is equal to — — —	0 :	11
The ſmall, half the great one — — —	0 :	$5\frac{1}{2}$
Pecha, ſee Coins *of the iſles of India.*		
Silver piece of Matoucha — — —	0 :	$0\frac{1}{2}$
Silver piece of the king of Ogden — —	0 :	6
Copper piece of the ſame — — — —	0 :	$0\frac{1}{2}$
Cheda, ſee Coins *of the iſles, &c. of India.*		
Gold piece of the king of Achem — —	1 :	3
Tin piece of the ſame — — — —	0 :	$0\frac{1}{80}$
Gold piece of the king of Macaſſar, taken by the Dutch for a guilder, — — —	1 :	$10\frac{1}{2}$

To the number of current Coins which have diſtinct names to ſpecify them, may be added many more, both in Europe and Aſia, only denominated and known from their value; ſuch are thoſe called ſimply pieces, with the addition of their price; as in Spain, the piece of eight rial, in England the piece of twenty-one ſhillings, or guinea; in France the piece of four francs, piece of ten ſols, or ſhillings; piece of four ſols; piece of two ſols; of ſix blanks; of 30, 15, 6, 4, &c. deniers, or pence.

Shells current for Coins.—Theſe ſerve in many places for money; and are brought from the Maldives, and called in the Indies cowries: on the coaſts of Africa they change their name, and are called bouges.

In America they take a third name, viz. porcelains. Indeed theſe laſt do not come from the Maldives; there being ſhells found in the Weſt-Indies much like thoſe of the Eaſt.

In the kingdom of Congo is another kind of ſhells, called zimbi; though ſome will have them the ſame with the cowries.

Cowries, coris, or bouges, are white ſhells, current particularly in the eſtates of the great Mogul; dug out of the ground by the Maldivians: ſixty-five are uſually reckoned equivalent to the pone, a ſmall copper Coin, worth about an halfpenny ſterling; which brings each cowry to $\frac{1}{130}$ of a penny ſterling. Porcelains are nearly on the ſame footing with the cowries.

Zimbi, current particularly in the kingdoms of Angola and Congo. Two thouſand zimbis make what the negroes call a macoute; which is no real money, whereof there is none in this part of Africa, but a manner of reckoning: thus, two Flemiſh knives they eſteem a macoute; a copper baſon, two pounds weight, and twelve inches diameter, three macoutes; a fuſy ten, &c.

Fruits current for Coins.—There are three kinds of fruits uſed for Coins; two in America, particularly among the Mexicans; which are the cacao and maiſe: the other in the Eaſt-Indies, viz. almonds; brought thither from Lar, and growing in the deſarts of Arabia.

Cacao, fifteen of theſe are eſteemed equivalent to a Spaniſh rial, or ſeven pence ſterling.

Maiſe has ceaſed to be a common money ſince the diſcovery of America by the Europeans.

Almonds are chiefly uſed where the cauris are not current. As the year proves more or leſs favourable to this fruit, the value of the money is higher or lower: in a common year, forty almonds are ſet againſt a peſcha, or halfpenny ſterling; which brings each almond to $\frac{1}{20}$ of a farthing.

Ancient Coins are thoſe chiefly which have been current among the Greeks, Jews, and Romans.

For Jewiſh Coins, their Values and proportion ſtand thus:

					l.	s.	d. Sterl.
				Gerah — — — — — — —	00 :	00 :	$1\frac{57}{160}$
10				Bekah — — — —	00 :	00 :	$1\frac{1}{16}$
20	2			Shekel — — —	00 :	00 :	$2\frac{3}{8}$
1200	120	50		Maneh Mina hebraica	05 :	14 :	$0\frac{3}{4}$
60000	6000	3000	60	Talent —	342 :	03 :	9

	l.	s.	d.
Solidus aureus, or ſextula, worth— —	00 :	12 :	$0\frac{1}{1}$
Siclus aureus, worth — — — —	1 :	16 :	6
A talent of gold, worth — — —	5475 :	00 :	0

Value and proportion of the ancient Grecian Coins.

										l.	s.	d. Ster.
									Lepton — — — —	0 :	0 :	$0\frac{31}{336}$
7									Chalcus — — —	0 :	0 :	$0\frac{31}{48}$
14	2								Dichalcus — —	0 :	0 :	$1\frac{7}{24}$
28	4	2							Hemiobolium —	0 :	0 :	$2\frac{7}{12}$
56	8	4	2						Obolus —	0 :	1 :	$1\frac{1}{6}$
112	16	8	4	2					Diobolum —	0 :	2 :	$2\frac{1}{3}$
224	32	16	8	4	2				Tetrobolum —	0 :	5 :	$0\frac{2}{3}$
336	48	24	12	6	3	$1\frac{1}{2}$			Drachma	0 :	7 :	3
662	96	48	24	12	6	3	2		Didrachmon	1 :	3 :	2
1324	112	96	48	24	12	6	4	2	Tetr. ſtat.	2 :	7 :	0
1060	384	120	60	30	15	$7\frac{1}{2}$	5	$2\frac{1}{2}$	$1\frac{1}{4}$ Pent.	3 :	2 :	3

Note, Of theſe the drachma, didrachm, &c. were of ſilver, the reſt for the moſt part of braſs. The other parts, as tridrachm, triobolus, &c. were ſometimes coined.

Note alſo, the drachma is here, with the generality of authors, ſuppoſed equal to the denarius: though there's reaſon to believe, that the drachma was ſomewhat the weightier.

	l.	s.	d. Ster.
The Grecian gold Coin was the ſtater aureus, weighing two attic drachms, or half of the ſtater argenteus; and exchanging uſually for 25 attic drachms of ſilver; in our money — —	0 :	16 :	$1\frac{3}{4}$
According to our proportion of gold to ſilver — — — — — —	1 :	00 :	9
There were likewiſe the ſtater cyzicenus, exchanging for 28 attic drachms, or — — — —	0 :	18 :	1
Stater philippicus, and ſtater alexandrinus, of the ſame value.			
Stater diricus, according to Joſephus, worth 50 attic drachms, or —	1 :	12 :	$3\frac{5}{8}$
Stater cræſius, of the ſame value.			

Value and proportion of the Roman Coins.

						l.	s.	qrs. Sterl.
					Teruncius — — — — —	0 :	0 :	$0\frac{775}{1000}$
2					Semilibella — — — —	0 :	0 :	$1\frac{55}{100}$
4	2				Libella As — — —	0 :	0 :	$3\frac{1}{10}$
10	5	$2\frac{1}{2}$			Seſtertius — — —	0 :	1 :	$3\frac{3}{4}$
20	10	5	2		Quinarius Victoriatus —	0 :	3 :	$3\frac{1}{2}$
40	20	10	4	2	Denarius —	0 :	7 :	3

Note, Of theſe the denarius, victoriatus, ſeſtertius, and ſometimes the as, were of ſilver, the reſt of braſs. See As, &c. in the Dict.

There were ſometimes alſo coined of braſs the triens, ſextans, uncia, ſextula, and dupondius.

	l.	s.	d. Ster.
The Roman gold Coin was the aureus, which weighed generally double the denarius; the value of which, according to the firſt proportion of coinage, mentioned by Pliny, was — —	1 :	4 :	$3\frac{3}{4}$
According to the proportion that obtains now amongſt us, worth —	1 :	0 :	9
According to the decuple proportion, mentioned by Livy and Julius Pollux, worth — — — — — —	0 :	12 :	11

	l.	s.	d. Ster.
According to the proportion mentioned by Tacitus, and which afterwards obtained, whereby the aureus exchanged for 25 denarii, its value — —	0 :	16 :	1$\frac{3}{4}$

COI'NING, in the tin works, is the marking the tin, when caſt into blocks, or ſlabs, with the figure of the lion rampant. This is done by the king's officer. The king's cuſtom is four ſhillings for every hundred weight. *Ray's Engl. Words.*

COLD (*Dict.*)—Cold is the deſtroyer of all vegetable life, when increaſed to an exceſſive degree; and it is hard to ſay how much increaſe of it the hardier of them are, or are not able to bear. We find many of our garden plants and flowers, which ſeem to be very ſtout and hardy, go off at a little increaſe of Cold beyond the ordinary ſtandard. In the ſevere winter, in 1683, Mr. Bobart tells us, that the artichoaks and colliflowers all periſhed; and that the odoriferous ſuffrutices, ſuch as thyme, ſage, lavender, hyſſop, and the like, were generally killed, very few eſcaping, except ſuch as had been planted the preceding year, and were therefore ſo low as to have the advantage of a covering of ſnow over them; which is the defence nature has given to the natives of the coldeſt countries, and proves ſuperior to any thing that can be invented by art for their preſervation. In the corn fields, ſuch parts of them as had remained covered with ſnow, had eſcaped very well, the corn all looking freſh and vigorous, after the melting of it in the ſpring: but, when the lands had lain ſo expoſed that the ſnow had melted off, the crop was generally deſtroyed, and the farmer obliged to new ſow the place. *Phil. Tranſ.* Numb. 165.

COLE-*ſeed*, the ſeed of the naphew or napus, propagated in many parts of England to great advantage, for the oil expreſſed from the ſeed. It is much ſowed in the moory lands in the fen countries. The freſheſt mould is found beſt for it, or what the farmers call a luſty ſoil, which is newly broken up, and has been long at reſt. They commonly give two tilths to the ground they ſow with Cole-ſeed; but, if they manure it, then only one. They lay on the manure, a little before they begin to plow; and, plowing in the morning, ſow that very day. The time of ſowing is in June, July, and Auguſt: July is the beſt month. They ſow the ſeed over furrows, a peck to an acre, and buſh-harrow it; they then have a crop that time twelvemonth, which they ſhear or reap as they do wheat, diſpoſing it into little heaps. When it has lain about a fortnight upon the ground, they threſh it upon a ſail-cloth, with common flails; then winnow it, and afterwards ſend it to the mills. *Morton's Northampt.*

The land where this has grown, is very well prepared by it for wheat; though ſome ſow oats upon it, as wheat ſucceeds beſt of all after it. When the oil is preſſed out of the ſeeds, they uſe the remaining cakes in ſome places as firing; but in others they give them to their cows and other cattle in winter, when other food is ſcarce. In ſome places, they mix the powder of theſe cakes with water, and give it to their calves till they are three or four days old, inſtead of milk, and it does as well for them, till they are able to eat graſs or hay. It is a good method to burn the ſtubble on the Cole-ſeed lands, for it is ſo ſtumpy that it is of no uſe to plow it in. *Mortimer's Huſb.*

CO'LLAR, in ſhip-building, a rope faſtened about her beak-head, into which the dead man's eye is ſeized that holds the main-ſtay. There is alſo a collar, or garland, about the main-maſt head, which is a rope wound about there, to ſave the ſhrouds from galling.

COLLAR *of a plough*, a term uſed by our farmers to expreſs a ring of iron, which is fixed to the middle of the beam, and ſerves to receive the end of two chains, the lower one called the tow chain, and the upper one called the bridle chain. The lower chain is fixed at its other end to the box, and the upper, or bridle chain, to the ſtake which runs parallel with the left-hand crow-ſtaff. Theſe chains, by means of this collar, and their other inſertions, ſerve to join the head and tail of the plough together. In ſome places the bridle chain is not fixed to the collar, but to the beam itſelf, by means of a pin; and this is the better way on many accounts. *Tull's Huſbandry.*

CO'LOGNE *Earth*, a ſubſtance uſed in painting, much approaching to amber in its ſtructure, and of a deep brown. It has generally been eſteemed a genuine earth, but has been diſcovered to contain a great deal of vegetable matter, and, indeed, is a very ſingular ſubſtance.

It is dug in Germany and France: the quantities conſumed in painting, in London, are brought from Cologne, where it is found very plentifully; but our own kingdom is not without it, it being found near Birmingham, and on Mendip hills, in Somerſetſhire; but what has been yet found there is not ſo pure or fine, as that imported from Cologne. *Hill's Hiſt. of Foſſ.*

CO'LONY (*Dict.*) — In order to give a clear account of the cauſes and effects of theſe ſettlements, it will be proper to diſtinguiſh them into ſix ſeparate claſſes.

1. About 350 years after the flood the whole human race were but one family; at the death of Noah his deſcendants, being too numerous to live together, ſeparated. The poſterity of each of the ſons of this patriarch, Japhet, Sem, and Ham, divided into different tribes, ſet out from the plains of Shinar in queſt of new habitations, and every tribe became a diſtinct people: thus, they gradually peopled the different countries of the earth, in proportion as the reſpective countries they went into could ſupport and maintain them.

Such was the firſt kind of Colonies; neceſſity was the cauſe, and the effect was the ſubdiviſion of the tribes or nations.

2. Though men were thus ſcattered over the face of the whole earth, yet every different country was not ſo completely occupied by its antient inhabitants, but that new ones might ſhare it with them.

In proportion as countries were at a greater diſtance from the common center, from which all nations ſet out, every ſeparate family wandered at pleaſure, without making any fixed abode; but in thoſe countries where a larger body of men ſtaid, nature and mutual convenience uniting them, they formed ſocieties. Ambition, diſſenſion, war, and even their increaſe, in a courſe of time, drove ſome parts of theſe ſocieties to ſeek new habitations.

Thus Inachus, a Phœnician, came and founded the kingdom of Argos in Greece, whoſe poſterity was driven out by Danaus, another adventurer, who came out of Ægypt. Cadmus, not daring to return to his father Agenor, king of Tyre, landed on the confines of Phocis, and there laid the foundation of the city of Thebes. Cecrops at the head of an Ægyptian Colony built the city, which afterwards, under the name of Athens, became the ſeat of arts and ſciences. Africa with unconcern ſaw the walls of Carthage riſe, which ſoon after made it tributary. Italy received the Trojans who had eſcaped from the ruin of their country. Theſe new inhabitants introduced their laws and ſciences into thoſe countries, whither chance had conducted them; but they only formed little ſocieties, and almoſt all erected themſelves into republics.

A multiplicity of citizens, in a territory either of narrow limits or little fertility, has given an alarm to liberty; and policy has removed this inconvenience by eſtabliſhing Colonies. Nay, even the loſs of liberty has ſometimes engaged a part of the people to quit their own country, in order to form a new ſociety, more agreeable to their own minds.

This, among others, gave birth to moſt of the Greek Colonies in Aſia, in Sicily, Italy, and Gaul. The views of conqueſt and ambition did not enter into their ſcheme. Although, in general, every Colony preſerved the laws, the language, and religion of the metropolis, yet it was free, and depended only on its founders.

This ſecond kind of Colonies had different motives, but the effect which diſtinguiſhes them, was to multiply independent ſocieties among nations; to promote commerce between them, and poliſh their manners.

3. As ſoon as the earth had ſuch a number of inhabitants, that a diſtinction of property became neceſſary, this property occaſioned differences between them. Theſe differences were decided by the laws among the members of a ſociety, but could not be ſo determined among independent aſſociations; power decided, the vanquiſhed yielded to the victor, and the ſpirit of conqueſt invaded the minds of men.

The conqueror, to ſecure his frontiers, diſperſed the conquered in countries under his allegiance, and gave their territories to his own ſubjects, or contented himſelf with building and fortifying new towns in them, which he cauſed to be inhabited by his ſoldiers, and the citizens of his own ſtate.

Such was the third kind of Colonies, examples of which may be found in almoſt all ancient hiſtories.

By means of theſe Colonies, Alexander took in ſuch a multitude of conquered people with ſuch rapidity. The Romans, in the infancy of their republic, made uſe of them to increaſe it; and, at the time when their vaſt empire extended itſelf in every part of the world, theſe were the barriers, which, for a long time, defended it againſt the Parthians, and people of the North. This kind of Colony was a conſequence of conqueſt, and, indeed, its defence.

4. The excurſions of the Gauls into Italy, of the Goths and Vandals into all Europe and Africa, and of the Tartars into China, form a fourth kind of Colonies. Theſe people, driven out of their country, by more powerful people or diſtreſs, or perhaps attracted by the knowledge of a milder climate and more fruitful country, conquered to ſhare the kindlier ſoil with thoſe they had ſubdued, and only to make one nation with them. Quite different from other conquerors, who ſeem to have ſet out only in purſuit of enemies, as the Scythians in Aſia, and the founders of the four great empires.

The effect of theſe Colonies of Barbarians, was to exterminate polite arts, and ſpread ignorance throughout the countries wherein they ſettled, at the ſame time that they increaſed the number of people, and founded powerful monarchies.

5. The fifth kind of Colonies is ſuch as have been founded by a ſpirit of commerce to enrich their mother people, or metropolis.

Tyre, Carthage, and Marſeilles are the only cities of antiquity, which laid the foundation of their power on their trade; and they only followed this plan in ſome of their Colonies. Utica, built by the Tyrians, near 200 years before the flight of Eliza, more known by the name of Dido, never pretended to any ſovereignty in the realms of Africa, but only ſerved as a port for the Tyrian ſhips to put into, in the ſame manner as the Colonies eſtabliſhed at Malta, and along the coaſts frequented by the Phœnicians. Cadiz, one of their moſt ancient and famous Colonies, only pretended to the trade of Spain, without intermeddling with the adminiſtration of its government, much leſs giving it laws. The founding Lilybæum in Sicily gave the Tyrians no notion of conquering that iſland. Commerce alone was not the object of the eſtabliſhment of the Carthaginian ſtate, though the city ſought to aggrandize itſelf by commerce. Carthage made war to extend or preſerve that trade to itſelf only, and therefore diſputed with Rome a right to Sicily, Sardinia, Spain, and Italy, even at the walls of that city. The Carthaginian Colonies along the coaſts of Africa, on both ſides the ſea to Cerne, rather augmented the riches of the ſtate than ſtrengthened the power of its dominion. Marſeilles, a Colony of Phocæans, driven out of their own country, and afterwards out of the iſle of Corſica by the Tyrians, as they inhabited a barren country, attended to nothing but their fiſhery, trade, and independence. Their Colonies in Spain, and the ſouthern coaſts of Gaul, were planted with the ſame view.

Such ſort of ſettlements were doubly neceſſary to people who applied themſelves to commerce. They who knew not the uſe of the compaſs, were afraid to venture too far from the ſhore; they made coaſting voyages, and their navigation was ſo timorous, that it made frequent ports neceſſary: the generality of the people they traded with, ſet a certain value on the commodities they intended to part with, and came down out of the inland countries, at the time of the arrival of the ſhips, to exchange them for what they wanted.

The form of theſe Colonies has a great affinity with thoſe of the European nations trading to Africa and the Indies, which have ſtore-houſes and forts for the ſecurity and convenience of their trade. Our own nation therefore make a more conſiderable figure as merchants in thoſe countries, than any other in Europe, becauſe they do not endeavour to conquer the inhabitants, and acquire the poſſeſſion of large dominions.

6. The diſcovery of America, about the end of the fifteenth century, has increaſed the European Colonies, and preſents us with a ſixth kind of them.

All theſe have had commerce and culture both at once for the object of their ſettlement. It was neceſſary for them, firſt, to conquer that part of the country they intended to poſſeſs, drive out the ancient inhabitants, and introduce new.

As theſe Colonies were only eſtabliſhed for the benefit of the mother country, it follows:

1. That theſe Colonies muſt immediately depend upon it, and conſequently be under its protection.

2. That the trade ought to be excluſive to the founders. A Colony of this nature anſwers its end ſo much the better, in proportion as it promotes the manufactures, employs a greater number of hands, and gives the balance of trade to its mother country in her commerce with other nations. Theſe three benefits may unite in ſome particular circumſtances, and one of the three may in ſome meaſure compenſate for the whole; but, if the Colony is deficient in this reſpect, it is plainly pernicious to its mother country, and weakens it.

Thus the profit of the trade and culture of our Colonies reſults from, 1. The larger product which their conſumption occaſions to the proprietors of our own lands, the expence of culture deducted. 2. What our mechanics and mariners receive, who work for them, and on their account. 3. What neceſſaries they ſupply us with. 4. What ſuperfluities they furniſh for exportation.

From theſe premiſſes many concluſions may be drawn.

Every Colony ought to be confined to ſuch arts and objects as may be uſeful to its mother country. If a Colony deals at foreign markets, and conſumes foreign commodities, the mother country is a ſufferer in proportion to ſuch dealings, and ſuch conſumption; therefore, a reſtraint in this caſe is no attempt on the liberty of the Colony, but is ſtrictly juſt. Colonies become more uſeful, by how much they are rendered more populous, and their lands are better cultivated.

The ſtate ſhould be at the firſt expence of eſtabliſhing Colonies; children ſhould inherit equally, at the death of their fathers, in order to fix a greater number of inhabitants on the ſpot. The firſt expence of the ſtate is not all; till the Colony has acquired ſtrength to ſupport itſelf, and ſettled a trade to maintain itſelf, it will continually ſtand in need of the protection and aid of its mother country. The Colonies of America having eſtabliſhed a new form of connection and commerce, it has been neceſſary to make new laws in them. Able legiſlators have principally had in view the protection and cultivation of the Colony; but, when theſe are come to ſome perfection, it may ſo happen, that ſuch laws may become contrary to the deſign of inſtituting Colonies, which was to promote trade. When a ſtate has ſeveral Colonies which may carry on a mutual trade, the way to augment their ſtrength and riches is to encourage it.

Upon the whole, it appears the liberty of Colonies ſhould be reſtrained by the mother country. But all monopolies, impoſitions, particular privileges, or exemptions, are extremely pernicious; and, though their effect may not be felt immediately, will certainly end in the deſtruction of the Colony; for whatever contributes to raiſe the price of commodities, without increaſing their real value, muſt ruin the trade of the Colony.

CO'LOUR (*Dict.*)—Tranſparency, whiteneſs, blackneſs, and Colours, as conſidered in bodies, depend upon certain particular ſtructures, textures, or arrangements of the parts of bodies, as the following inſtances will abundantly demonſtrate.

Glaſs, cryſtal, diamond, nitre, borax, and other tranſparent ſolid bodies, loſe their tranſparency, and appear white upon their being reduced to powder; that is, by a bare alteration of their groſs texture, or a ſimple reduction to ſmaller parts; ſo as to reflect many of the rays of light, which they before tranſmitted. And the ſame holds of the white of eggs whiſked up to a froth, frothy water, &c.

Black talc, by being made red-hot in the fire, is turned of a gold Colour; ſyrup of violets, by boiling heat, loſes its beautiful violet-Colour, ſo as at length to become pale, or colourleſs; white loaf-ſugar, being barely melted over the fire, without water, immediately changes its whiteneſs, and becomes brown; or, by a longer continuance, black; ſo that a ſingle grain of this black ſubſtance will tinge a pint or a quart of fair water, or colourleſs brandy, of a beautiful yellow, brown, or ſtraw Colour; for which purpoſe it is uſed by diſtillers, and others.

All the finer, coloured flowers, as violets, carnations, roſes, &c. loſe of their Colour, barely by being expoſed to the open air for any long time; ſo as at laſt to appear perfectly diſcharged, or white, as if they had been expoſed to that particular diſcharger of Colour in ſilks, &c. the fume of burning brimſtone. And the ſame is remarkable of the finer or lighter kinds of Colours in ſilks, or the light blues, yellows, and reds, particularly the light grain-coloured ſilks; all which Colours are gradually changed, diſcharged, or aboliſhed, in wearing, or by the ſilks being long expoſed to the action of the air. But the ſcarlet Colour is more fixed and durable. And, in general, the deeper any Colours are, the more fixed and durable they prove; as being thus not ſhades, as the pinks, light blues, &c. are, but true Colours, correſponding to the original Colours of light. Add to this, that dyers conſtantly find their Colours prove brighteſt, or ſtruck to the beſt advantage, when the air is clear. Laſtly, the blue eſſential oil of camomile-flowers loſes its Colour, and changes to a dirty green, by being expoſed to the air.

Different waters ſtrike different Colours with the ſame tinging ingredients. Thus irony waters turn black, or inky, with galls, green tea, &c. And dyers find ſome certain waters more proper for their purpoſes than others. And, in general, the pureſt and lighteſt waters ſtrike the beſt Colours with dying-ſtuffs. And hence it is that ſuch waters as have, by long ſtanding, putrified, or fermented, and purged themſelves, being not filtred through the common filtring-ſtone or ſand, are found to extract and communicate Colours to the greateſt advantage.

Salts, having a power to alter the textures of vegetables, conſequently produce changes of Colours therein. Thus moſt flowers, whether blue or red, as violets, roſes, &c. turn green with alkalies: But violets turn red, and roſes have their native redneſs greatly heightened by acids; ſo again, the yellow roots of rhubarb, turmeric, &c. are heightened, or made redder, by alkaline ſalts.

As metals have a ſtrong texture in their metalline form; ſo they preſerve their natural Colours durably, unleſs corroded or diſſolved by their particular menſtruums: after which, their ſolutions ſtrike particular durable Colours, or afford the ſtrongeſt ſtains.

Iron, diſſolved in ſtale ſmall-beer, gives the beautiful yellow uſed in callico-printing; when ſublimed with ſal armoniac, it alſo affords a yellow. And the common iron-moulds made by ink are owing to the iron diſſolved in copperas, whereof the common black writing ink is made.

Copper, melted with zink, appears of a gold-Colour; diſſolved in aqua-fortis, it affords a beautiful green; and, in any urinous ſpirit, a beautiful blue; and the ſolutions may be reduced to dry Colours by cryſtallization, or evaporation. The ſame metal precipitated with common ſalt, out of aqua-fortis, gives the turquoiſe Colour to white glaſs, when melted therewith. Tin, a white, or colourleſs metal, affords a light blue Colour, by being fluxed with antimony and nitre. The ſame metal is neceſſary in ſtriking the ſcarlet-dye, with aqua-fortis and cochineal: its calx, by ſtrong fuſion, turns a glaſs of the opal Colour.

Lead, being corroded by the fumes of vinegar, makes the fine white called ceruſe, and the white fucus called the magiſtery of lead; by being coloured in a ſtrong naked fire, it becomes minium, or red-lead; and this, melted into glaſs with ſand, is the foundation of the art of imitating all the coloured gems: for this glaſs itſelf will reſemble the hyacinth; and, by the addition of prepared gold and tin, the ruby; the ſapphire with cobalt, the emerald with iron and copper, the amethyſt with gold, and the granat with iron, &c.

Silver, another white, or colourleſs metal, being diſſolved in aqua-fortis, if chalk is put to the ſolution, turns of a beautiful purple, or amethyſt Colour: and its own ſolution, though pale as water, durably ſtains the nails, the ſkin, the hair, and other animal ſubſtances, brown or black.

Quickſilver, mixed with brimſtone, makes a black maſs; and this, by ſublimation, affords the beautiful red pigment called cinnabar, or vermilion: and the ſolution of quickſilver, being precipitated with common ſalt, yields a ſnow-white powder; which alſo turns black, by being mixed with ſulphur.

Gold, diſſolved in aqua-regia, affords a fine yellow liquor, which ſtains animal ſubſtances beautifully purple: and, if the ſolution be ſufficiently weakened with water, and mixed with a ſolution of tin, a fine red or purple powder may be thus obtained for ſtaining glaſs moſt beautifully red.

Many mineral ſubjects are natural pigments; as native cinnabar, ochre, black-lead, &c. but particularly the yellow earth called light ochre, found in Shattover-hills, which is uſed native, as a light yellow, and by calcination makes a light red. This Colour England ſupplies Italy with; and Le Gar would frequently ſay he had been no painter without it.

Colours may alſo be produced, deſtroyed, and regenerated upon ſimple mixture: for,

Put dry red roſe-leaves into ſpirit of wine; and, by ſtanding a little therein, the roſe-leaves will loſe their red Colour, without manifeſtly tinging or altering the liquor; then add a little oil, or ſpirit of vitriol, thereto, and the liquor will appear of a red Colour. But, if a little alkaline or urinous ſpirit be poured to the mixture, the red Colour preſently changes to a green; which, by the addition of a little more ſpirit of vitriol, turns to a red Colour again.

Make a ſlight infuſion of bruiſed galls in water, ſo as not to diſcolour the water; filtre the infuſion; make alſo a weak ſolution of green vitriol in water, and filtre the liquor, ſo that they may both appear pellucid: theſe liquors being now mixed together, an inky blackneſs will immediately ariſe; but, if a little oil of vitriol be added to the mixture, the blackneſs will, by degrees, totally vaniſh, and the liquor appear pellucid again; though the blackneſs may be recalled by the addition of a little ſalt of tartar.

If a little bruiſed camphire, which is a very white ſubſtance, be put into pellucid oil of vitriol, and the containing glaſs be ſhook for ſome time, the camphire will diſſolve, and gradually change the mixture to a brown, and at length to a full black. But, upon the addition of fair water, the blackneſs entirely vaniſhes, and the camphire riſes to the top in its priſtine form, and native whiteneſs.

If the ſhavings of lignum nephriticum be infuſed for ſome time in cold water, and the clear liquor be decanted into a clean glaſs, and viewed from the light, the liquor will appear of a beautiful blue; but, if viewed towards the light, of a yellow. If a little ſpirit of nitre be put to this liquor, it loſes its power of reflecting the blue rays; but the addition of a little oil of tartar, per deliquium, recovers that power again.

If logwood be infuſed in water, it gives a red Colour; which, upon the addition of a little ſpirit of urine, turns to a fine purple: but this may be changed to a bright red, by dropping in a little ſpirit of common ſalt.

An infuſion of braſil-wood, or cochineal, in water, is much heightened, in its red Colour, by the addition of ſpirit of urine, and lowered or turned paler by the ſpirit of ſalt.

If ſpirit of wine be digeſted upon recent camomile-flowers, and diſtilled over from them in a glaſs retort, the ſpirit will thus acquire a beautiful blue Colour; which may be made deeper by being drawn over again from freſh flowers.

A beautiful blue tincture being made by digeſting ſpirit of urine upon filings of copper, the addition of a little oil of vitriol intirely deſtroys the blue Colour, as a little ſpirit of ſalt turns it to a green.

Pellucid oil of vitriol being mixed with pellucid oil of turpentine, or the eſſential oil of aniſeeds; or more particularly with oil of cloves; they thus turn into a thick, red balſam.

And ſo again, if a pellucid common oil be, by means of a little wax, and continued triture, gradually mixed with fair water; they thus unite into a very thick, white ſubſtance, balſam, or cold cream.

Oil of vitriol, being diſtilled over from quickſilver, leaves a white powder behind; to which, if water be poured, the powder preſently becomes of a beautiful yellow.

To a ſolution of quickſilver, in ſpirit of nitre, add ſpirit of urine, and a white powder will be precipitated; to another parcel of the ſame ſolution add oil of tartar per deliquium, and a yellow powder will fall to the bottom: to a third parcel of the ſame ſolution add ſpirit of urine, and the precipitate obtained will be of a fleſh-Colour.

If a clean new pen be dipped in ſpirit of vitriol, and the common deep blue paper be wrote upon therewith, the letters appear of a very bright and beautiful red: and, in the ſame manner, pellucid ſpirit of ſalt ſtains a black hat red.

A pellucid ſolution of ſaccharum ſaturni in water, being wrote with, becomes inviſible upon the paper, when dried: but the bare fumes of another tranſparent liquor, viz. an infuſion of quicklime and orpiment in water, will ſoon render the inviſible writing black and legible. And thus thoſe commonly called inviſible or ſympathetic inks are made.

The volatile ſalt of ſal armoniac, a white body, and the cryſtals of copper, a green one, will, by mixture, become purple. Salt of ſteel, a green body, and ſugar of lead, a white one, being mixed together, the ſurface of the mixed powder will appear red, whilſt the internal parts are of a dirty white.

That original and ſimple, as well as compound Colours, are producible by mixture, appears from many experiments.

If the ſun's rays paſs through two pieces of differently coloured glaſs, for inſtance, a blue and a yellow piece, laid upon each other, and theſe rays be received from the glaſſes upon white paper, they then appear of a beautiful green.

It is common, with the dyers, to dye the cloth firſt blue with woad, and turn that blue into a green by the yellow called dyers weed, or luteola.

To a fine yellow ſolution of pure gold, in aqua-regia, add a deep blue ſolution of copper in ſpirit of urine, and the mixture will appear green.

Blue and yellow ammel, being melted together, conſtitute a green one.

The painters make a great variety of compound Colours, by mixing two, three, or more different Colours together, either on their pallat, or the canvas.

A mixture of the ſeven, or even five, original Colours, will make a white; and the more perfectly, the finer and more perfect the coloured bodies are. Thus, if a large top be painted on its upper ſurface, one part red, another yellow, another green, another blue, and another violet; this ſurface whilſt the top is ſpinning briſkly (ſo that the motion ſhall confound the ſeveral Colours, or make them appear mixed to the eye) will exhibit a dirty kind of whiteneſs. And in like manner, by mixing together powders of different Colours, as vermilion, orpiment, indigo, verdigreaſe, &c. in proper proportions, the compound powder will, in a ſtrong light, appear to be white. And, if differently coloured flames could be brought to mix, this experiment might be made in greater perfection.

Flames are of different Colours, according to the bodies that produce them. Thus the flame of burning camphire is white, like the focus of a burning-glaſs; the flames of ſpirit of wine, and ſulphur, are blue; the flame of white wax is white, inclining to blue; that of tallow white, but rather inclining to yellow, &c. Whence proceeds the difference of the Colours of bodies, as viewed by day-light, candle-light, fire-light, ſulphureous light, &c. And, for making experiments to this purpoſe, oil might be impregnated with certain metals, as particularly copper and iron, by triture and digeſtion, ſo as to exhibit their particular flames.

The priſmatic or original Colours may be imitated to conſiderable perfection in liquors, where the parts of the tinging ſubſtances are rendered extremely minute or fine. Thus a ſolution of cochineal in ſpirit of urine, viewed in a ſtrong light, affords a moſt vivid and beautiful red; a ſolution of copper in ſpirit of urine yields a glorious blue; a ſolution of verdigreaſe in diſtilled vinegar is an excellent green; a ſolution of gold in aqua-regia makes a fine yellow; an infuſion of violets in hot water affords an excellent violet-Colour, &c. And, from a thorough acquaintance with theſe liquors, and the methods of varying, mixing, and heightening their Colours, many improvements in the arts depending upon Colours, dyes, and ſtains, might be rationally expected.

CO'LTIE, among the timber merchants, a word uſed to expreſs a tree which has a defect in ſome one of its annual circles, which renders it unfit for many of the uſes it might otherwiſe have been fit for. In this caſe ſome one of the annual circles, near the center, is perceived by the eye to be thicker than the reſt, and its ſap veſſels larger. It has an appearance much different from that of the others, and is ſo looſly connected both to its inveſtient and inveſted circles, that, on ſawing a tranſverſe piece of the trunk off, it will ſlip out from the others, and ſo leave the heart looſe, and the reſt hollow, ſeeming to have been only fitted, not connected, to the others. In ſplitting the wood for the other uſes, it yet more readily drops out, and the timber of ſuch a tree is therefore much leſs fit for general uſe than that of others. It is not eaſy to ſay to what accident, in the growth of the tree, this is owing: but it ſeems probable that it expoſes the tree to other accidents; in particular, Bobart ſeems to think, that among the trees which were ſplit by the hard froſt, in the year 1683, while other trees of the like ſizes and kinds eſcaped, this coltineſs might be the occaſion of the miſchief, as well as their being wind-ſhaken, or lagged. *Phil. Tranſ.* N°. 165.

CO'LUMBINES, *aquilegia*, in botany, a genus of plants much cultivated in gardens.

The manner of propagating Columbines is either by ſowing, or parting the old roots; but, the old roots being very apt to degenerate, the ſowing them is much the beſt method.

The ſeeds muſt be ſown in a nurſery bed in Auguſt or September, and, in the March following, the plants will appear above the ground, at which time they muſt be carefully cleared of weeds, and watered gently at times, if the dryneſs of the ſeaſon requires it. In the beginning of May, they will be ſtrong enough to tranſplant, and muſt then be placed at eight inches diſtance, in beds of good, freſh, undunged earth, and they muſt here be alſo kept cleaned from weeds, and watered as they may require it; at Michaelmas they may be removed into the borders of the flower-garden, and in the May following they will flower. *Miller's Gard. Dict.*

CO'LURE (*Dict.*)— It is diſputable over what part of the back of Aries the equinoctial colour paſſed in the time of Hipparchus. Sir Iſaac Newton, in his Chronology, takes it to have been over the middle of the conſtellation. Father Soucict inſiſts on its having paſſed over the dodecatemorion of Aries, or midway between the rim and firſt of the tail. We have ſome obſervations, in the Philoſophical Tranſactions, N° 466, concerning the poſition of this Colure in the antient ſphere, from a draught of the conſtellation Aries, in the Aratæa publiſhed at Leyden and Amſterdam 1652, which ſeem to confirm Sir Iſaac's opinion; but the antiquity and authority of the original draught may ſtill remain in queſtion.

COMBINA'TION (*Dict.*)—The ingenious Mr. John Smeaton has given us, in the Philoſophical Tranſactions, Vol. XLVII, the following new Combination of pullies. See *Plate fig.* VX. 9.

The axis in peritrochio, and the compound pulley, are the only mechanic powers, which can with convenience be applied to the moving large weights, when the height, to which they are intended to be raiſed, is conſiderable. The excellence of the former is, their working with little friction; that of the latter, in their being eaſy to be moved from place to place, and applied extempore, as occaſion requires.

The preſent method of arranging pullies in their blocks may be reduced to two. The firſt conſiſts in placing them one by the ſide of another, upon the ſame pin; the other in placing them directly under one another, upon ſeparate pins. But in each of theſe methods an inconvenience ariſes, if above three pullies are framed in one block. For, according to the firſt method, if above ſix pullies are placed by the ſide of one another, as the laſt line, by which the draught is made (or, as it is commonly called, the fall of the tackle) muſt neceſſarily be on the outſide pulley or ſhieve, the difference of their friction will give it ſo great a tendency to pull the block away, that as much will be loſt by the rubbing of the ſhieves againſt the block, on account of its obliquity, as will be got by increaſing the number of lines.

The ſecond method is free from this objection; but, as the length of the two blocks, taken together, muſt be equal to the ſum of the diameters of the ſix pullies, beſides the ſpaces between for the ropes, and the neceſſary appendages of the framing, were there more than three pullies in each block, they would run out into ſuch an inconvenient length, as to deduct very conſiderably from the height, to which the weight might otherwiſe have been raiſed: ſo that, upon thoſe accounts, no very great purchaſe can be made by the common tackles of pullies alone.

In order therefore to increaſe its power, ſometimes a ſecond tackle is fixed upon the fall of the firſt; but here it is obvious, that, whatever be the power of the ſecond tackle, the height to which the weight might otherwiſe have been raiſed by the firſt, will be leſs in the ſame proportion as the purchaſe is increaſed by the ſecond.

Again, very frequently the fall of the firſt tackle is applied to an axis in peritrochio, which increaſes the purchaſe very commodiouſly without the inconveniencies laſt mentioned; but then the machine is rendered cumberſome, and, conſequently, leſs fit for a moveable apparatus.

All thoſe impediments I have avoided, by combining the two methods, above deſcribed, in one. The pullies are here placed in each block in two tier; ſeveral being upon the ſame pin as in the firſt method, and every one having another under it, as in the ſecond; as alſo that, when the tackle is in uſe, the two tier, that are the remoteſt from one another, are ſo much larger in diameter than thoſe that are neareſt, as to allow the lines of the former to go over the lines of the latter without rubbing.

From this conſtruction ariſes a new method of reeving the line upon the ſhieves: for here, let the number of ſhieves be what it will, the fall of the tackle will always be upon the middle ſhieve, or on that next the middle, according as the number of pullies on each pin is odd or even.

To do this, the line is fixed to ſome convenient part of the upper block, and brought round the middle ſhieve of the larger tier of the under block; from thence round one of the ſame ſort, next the center one of the upper block; and ſo on till the line comes to the outſide ſhieve, where the laſt line of the larger tier falls upon the firſt ſhieve of the ſmaller, and, being reeved round thoſe, till it comes at the oppoſite ſide, the line from the laſt ſhieve of the ſmaller tier again riſes to the firſt of the larger, where it is conducted round, till it ends on the middle ſhieve of the upper block on the larger tier, as will appear more plain, by inſpection of the figure annexed.

In this method all the lines are clear of one another, and the blocks are kept parallel. The model which I had the honour to ſhew the Society, and from which I made the draught, is a compoſition of twenty ſhieves, five on each pin. With this model, which may eaſily be carried in the pocket, I have raiſed 600 weight. But with a tackle of this ſort, properly executed in large, one man will eaſily raiſe a ton, and a greater number in proportion.

I have tried ſeveral numbers of ſhieves as far as 36; but 20 ſeems to be the largeſt number, that will anſwer well in practice.

A very commodious tackle of twelve might be executed in wood, in the ſame manner that common blocks are made.

COMEDO'NES, a name given to a ſpecies of worm, with which the children of Miſnia, and ſome other countries, are terribly afflicted; and of which Hoffman, in his treatiſe of Endemial Diſeaſes, gives this account: children in the country are frequently ſeized with a ſort of tabes, which ſo deſtroys their fleſh, that they appear merely like ſhadows: the common people generally ſuppoſe thoſe children to be under the influence of witchcraft, but ſuch as have enquired more narrowly into the diſtempers, have found that it is owing to certain worms, reſembling black hairs, or cords, lodged under the ſkin. When the ſkin is rubbed with honey, in a bath, or any warm place, they will appear and come out; but, when it is contracted by cold, they keep concealed within.

CO'MMA *of Pythagoras*, is the difference between ſix tones major, and the octave; or between 19 octaves, and 12 twelfths. It will therefore be expreſſed by the proportions $\frac{531441}{524288} = \frac{9^6}{8^6} : \frac{2}{1} = \frac{3^{12}}{2\;9}$. The ſmall figures, written above the larger, ſignify the exponents of their powers.

C'OMMERCE (*Dict.*)—Commerce owes its original to our wants, real or imaginary: Nature is contented with little, but luxury and ambition have extended Commerce to ſupply their wants; and the rich ſupport induſtrious numbers to furniſh ſplendor and magnificence. Convenience introduced it; and its progreſs has been principally owing to the increaſe of mankind, who have found it neceſſary to extend trade for their mutual ſupport. The hiſtory of Commerce (ſee the article in the Dictionary) affords us three important reflections.

1ſt. People by induſtry may ſupply the defects of their native country, and poſſeſs more riches than thoſe who are the natural proprietors of them. Gold and ſilver are agreed on to pay the value of commodities, but are of no more uſe than as they make us able to procure them. Induſtry ſupplies every country with what it wants, and by that means enriches itſelf: without induſtry no people ever can be rich.

2d. The people inſenſibly loſe their trade, who do not carry it to the greateſt extent. Every branch of trade ſuppoſes a want of what is exported, and the profits ariſing from merchandize enable us to extend Commerce. Nothing is more dangerous to a trading nation than to force the people they trade with to ſupply their own wants, or procure them elſewhere. Wonders of induſtry have come to maturity, in the womb of neceſſity. The efforts of induſtry are like the courſe of an impetuous torrent, whoſe waters ſtruggle with violence againſt the banks which confine it, till at laſt it overflows them, and diffuſes itſelf all over the plains.

3d. Whatever nation carries on a great trade, muſt be proportionally populous and opulent. The conveniences and comforts of life are the moſt powerful attractions that act upon men: could we ſuppoſe a trading people to ſubſiſt in a country where the neighbouring people did not apply themſelves to trade, what would be the conſequence? The trading people would ſoon have all the foreigners, becauſe their Commerce would employ and pay them.

Theſe three reflections point out the principles of Commerce, in a body politic. Agriculture and induſtry are the eſſence of them; they have ſo neceſſary a connection, that, if either has the balance againſt the other, the public ſuffers. Without induſtry the fruits of the earth will be of no value; if agriculture be neglected, the ſource of Commerce is dried up.

The object of trade in a ſtate, is to employ as many hands as poſſible. Agriculture and induſtry are the only means of ſubſiſting; if theſe are both profitable to the ſtate that employs them, the ſtate will never want hands.

The effect of trade is to ſtrengthen the ſtate, which ſtrength conſiſts in the number of people its political riches draw to it; that is, its real and relative wealth taken together.

The real riches of a nation conſiſt in the degree of independence it has on any other to ſupply its own wants, and the ſuperfluity it is capable of exporting to ſupply the wants of other nations. The relative riches of a nation conſiſt in the quantity of money or value its Commerce draws to it, compared with that of other neighbouring nations. A combination of theſe real and relative riches conſtitutes the art and ſcience of adminiſtering political Commerce.

Every proceeding in trade, contrary to theſe principles, is pernicious to trade itſelf.

Thus, Commerce may be beneficial or detrimental: to convince us of which, we muſt diſtinguiſh between the profit of the merchant and the profit of the ſtate. If the merchant imports foreign commodities which impede the conſumption of domeſtic manufactures, the merchant will enrich himſelf by the ſale of them; but the public will be a loſer, more ways than one. 1ſt. By the value paid to foreigners. 2d. By the wages paid to the different artificers employed in the different manufactures. 3d. By the value that the growth of the materials in the country or colony would have produced to the country or colony into which they are imported. 4th. By the profit which would ariſe from the circulation of all theſe ſeveral ſums.

If the materials are of the growth of the colonies, the ſtate will beſides loſe the benefit of navigation. If the materials are foreign, this diſadvantage ſubſiſts equally; and, inſtead of the loſs of our own product, it will be by the exchange of the national commodities in return for theſe materials. The gain of a ſtate is, therefore, exactly what we have mentioned; and the ſtate muſt be a loſer in caſe of the preceding ſuppoſitions. The gain of the merchant conſiſts in the exceſs of the price of the ſale above the price of the purchaſe.

The merchant may in ſome caſes be a loſer, and the ſtate a gainer: if a merchant imprudently ſends the manufactures of his own country abroad into countries where they are not wanted, he will loſe by the ſale of them; but the ſtate will have gained by the growth of the materials, and the employment of artificers in the manufacture of them.

Commerce ſeems moſt rationally eſtabliſhed on the nine following maxims.

1ſt. The exportation of ſuperfluities is the moſt clear gain.

2d. The moſt advantageous manner of exporting ſuperfluities of our own produce is to manufacture them firſt.

3d. The importation of foreign materials to be manufactured at home, inſtead of taking them ready manufactured, is a great ſaving to a ſtate.

4th. Bartering one commodity for another is in general advantageous, except in caſes where it is contrary to the foregoing principles.

5th. The importation of commodities which hinder the conſumption of thoſe of our own product, which interfere with our own manufactures, or put a ſtop to the culture of our lands, is pernicious.

6th. The importation of foreign goods, merely for the uſe of luxury, is a real loſs to the ſtate.

7th. The importation of ſuch foreign goods as are wanted, of abſolute neceſſity, cannot be accounted an evil, though a nation is impoveriſhed by ſuch importation.

8th. Importation of foreign goods, to re-export them, procures a certain benefit.

9th. To let our ſhips out for freight to other nations is a beneficial branch of trade.

Every operation of Commerce ought to be regulated by theſe principles, and formed upon this plan.

COMPA'RTMENTS, in gardening, are beds, plats, borders, and walks, laid out according to the form of the ground, and depend more on a good fancy, than on any ſet of rules, for their conſtruction. They are alſo ſometimes merely diverſities of knots of flower gardens or parterres, of which there are an infinite variety, according to the fancy of the deſigner.

Plain Compartments, are pieces of ground divided into equal ſquares and flower beds, marked out by line, and made of regularly equal length and breadth. Some allow to theſe ſquares borders of two feet broad, if the plot of ground be ſmall, and, if larger, of three feet, and edge the borders with box, or with upright hardy thyme: the alleys up between are to be laid with ſand or gravel, and kept clean weeded.

CO'MPASS (*Dict.*)—Before the invention of the Compaſs, which is between 300 and 400 years ago, the navigating of ſhips was a very tedious and precarious operation: but the Compaſs enables the mariner to hold his courſe over the ſeas in as direct and true a tract, as the land-carrier directs his carriage in a well beaten road. Hence it might be reaſonably imagined, that no neceſſary expence or care ſhould ever be wanting in the conſtruction of this moſt uſeful inſtrument: but it has ſo happened, that ſcarce one ſea Compaſs in ten is fit for the uſe for which it is made; and this has aroſe from their being fabricated by unſkilful and ignorant workmen, for the wholeſale dealers in the ſhipping way; who generally pay no more regard to the conſtruction of this inſtrument, whereon the ſucceſs of the voyage and the lives of the men in a great meaſure depend, than they do to any indifferent thing of the ſame price.

There are, however, Compaſſes uſed in the royal navy, and ſome few trading ſhips, which are conſtructed with more care, and on better principles; and are therefore vaſtly preferable to thoſe commonly uſed in the merchants ſervice, which, from their compoſition, ſeem as though they had been contrived purpoſely to vary from what was to be expected of them: ſuch as joining the outſide box together with iron nails; making the needle of ſoft wire, and diſpoſing it in form of a rhombus, in expectation that the magnetical forces of the ſides would conſpire to act in the diagonal: making the pin and ſocket ſo badly, as to prevent the traverſing of the card, &c. &c.

But it muſt be obſerved, that it is only within a few years that ſea Compaſſes have been made free from the multitude of inconveniencies to which the beſt conſtructed of them were liable to before: ſuch as, 1. Needles having ſeveral poles, occaſioned by their irregular ſhape, the beſt kind being ſtraight bars with flat ends. 2. The needles being made of ſuch a temper as was neither ſuſceptible of receiving, or retaining half the virtue it was poſſible to give them; and, conſequently, they were not with due ſtrength and perſeverance directed towards the poles of the world. 3. The want of proper means to reſtore their loſs of magnetiſm, while on a voyage. 4. The troubleſome and inaccurate methods of rectifying a damaged pin on which the card turned, together with the expence attending the uſe of agate caps or ſockets, than which none are ſo proper. 5. The want of proper contrivances to hinder the card from being affected by the various motions of the ſhip. Theſe, and ſeveral other imperfections, have been happily removed by the labours of the truly celebrated Dr. Gowen, knight, F.R.S. whoſe admirable invention of giving magnetiſm to ſteel bars, greatly ſuperior to any power they could derive from the natural loadſtones, joined to a multitude of experiments which he has made for the marine ſervice, have produced the means of conſtructing ſea Compaſſes ſo perfect, that there ſeems nothing farther to be wiſhed for, as neceſſary to this inſtrument. It may be reaſonably expected, that ſuch correct Compaſſes will readily come into general uſe, as there have been ſeveral trials made of them both in men of war, and merchantmen: but, like ſeveral other uſeful improvements, it muſt wait till time has removed old prejudices. See *Magnetical* NEEDLES in the Dictionary, and AZIMUTH *Compaſs*, in the Supplement. *Robertſon's Navigation.*

The Compaſs has been ſometimes obſerved to be diſturbed by the electricity of its glaſs cover, and this from ſo ſlight an application of the finger, as was barely neceſſary to wipe off a little duſt. The ſame glaſs, rubbed a little more with the finger, a bit of muſlin, or of paper, would attract either end of the needle, ſo as to hold it to the glaſs for ſeveral minutes, far out of the due direction, according to what part of the glaſs was moſt excited. And, when the needle, after adhereing to the glaſs, has dropped looſe, and made vibrations, thoſe would not be biſected, as uſual, by that point where the needle ſhould reſt, but either be made all on one ſide, or be very unequally divided, by means of ſome remains of electrical virtue in that part of the glaſs which had attracted the needle, until at length, after fifteen minutes or more, all the electricity being evaporated, the magnetical power took place. The cure for this inconvenience, is to moiſten the ſurface of the glaſs: a wet finger will do it immediately and effectually. *Phil. Tranſ.* N°. 480.

CO'MPOSITE *Capital.—Plate* IV. *fig.* 14, in the Dictionary, repreſents, in a ſide view, a Compoſite capital, and *fig.* 15. a plan of the ſame capital inverted.

CO'MPOSTS (*Dict.*)—Compoſts are various, and ought to be different, according to the different nature or quality of the ſoil, which they are deſigned to meliorate; and according as the land is either light, ſandy, looſe, heavy, clayey, or cloddy.

A light looſe land requires a Compoſt of an heavy nature, as the ſcouring of deep ditches, ponds, &c.

So, on the other hand, a land that is heavy, clayey, or cloddy, requires a Compoſt of a more ſprightly and fiery nature, that will inſinuate itſelf into the lumpiſh clods, which, if they were not thus managed, would very much obſtruct the work of vegetation.

The great uſe of Compoſts is for ſuch plants as are preſerved in pots or tubs; or ſometimes it is uſed for ſmall beds or borders of flower gardens; but it is too expenſive to make Compoſts for large gardens, where great quantities of ſoil are required: in ſuch caſes the only compoſition that can be made with moderate expence, is, where the land is too light and ſandy, to lay marl, clay, or any other heavy dreſſing upon the land: the beſt ſeaſon for this work is in autumn, when it ſhould be ſpread abroad, and expoſed all the winter, that the froſt and rain may diſſolve and ſeparate the clods, whereby it will be rendered fine by the ſpring of the year, when it may be dug into the ground; and if, before this is done, there is ſome rotten ſtable dung, or neat's dung, added to it, the land will be greatly mended by it.

But where the land is heavy, and of a clayey or loamy nature, then light ſharp dreſſings are the beſt Compoſts; ſuch as ſand, aſhes, or near London, where it can be had, the ſoil of the ſtreets is an excellent dreſſing, becauſe theſe will ſeparate the parts of the clay and loam, and prevent its binding hard in dry weather; ſo that all ſorts of plants will thrive much better in it than they would, before this compoſition was added.

In the making a Compoſt for ſuch plants as are kept in pots or tubs, the ſame thing is to be obſerved; for, where the natural ſoil of the place is ſtiff and heavy, there ſhould be a ſufficient quantity of ſand and rotten dung added, ſo as to render it light, eſpecially for all plants which do not delight in a ſtiff ſoil; and, on the other hand, where the ſoil is naturally too light or ſandy, there ſhould be a proper quantity of loam and rotten neat's dung mixed with it, to give it a firmer texture; and theſe ſhould be proportioned to the ſeveral qualities of the plants which the Compoſt is deſigned for; this is to be underſtood, where large quantities of earth are wanted, in places where it may be difficult to get the ſorts of earth proper for the plants it may be deſigned for; which, in ſome countries, cannot be had, unleſs it is fetched from a great diſtance; therefore, where that is the caſe, there will require ſome ſkill in making a Compoſt of ſuch materials as can be more eaſily procured, which may anſwer the purpoſe as nearly as poſſible; but, where a ſmall quantity only is wanted, there can be no great difficulty, at proper ſeaſons, to procure what may be wanted of the proper ſoils to make ſuch a Compoſt as is neceſſary for the plants.

In making of any Compoſt, great care ſhould be had, that the ſeveral parts are properly mixed together, and not to have too much of any one ſort thrown together; therefore, when three or four ſeveral ſorts are to be mixed together, there ſhould be a man or two placed to each ſort, in proportion to the quantity of each; for if two parts of any one ſort are requiſite to be added, there ſhould be two men put to that, and but one to each of the other: and theſe men muſt be careful to ſpread each ſort in ſuch a manner over each other, as that they may be exactly mixed together. Another thing which ſhould be obſerved is, never to lay theſe Compoſts in too large heaps, but rather continue them in length, laying them up in ridges, ſo that the air and ſun may more eaſily penetrate through it; and, as theſe compoſts ſhould, if poſſible, be made a year before they are uſed, that they may enjoy a ſummer's ſun and winter's froſt, they ſhould be frequently turned over, which will prevent the growth of weeds, and expoſe every part of the heaps equally to the ſun and air, which is of great advantage to all ſorts of Compoſts; for the more they are expoſed to the influence of theſe, the better will the earth be prepared for vegetation; which is evinced by the fallowing of land, which, when rightly managed, is equivalent to a dreſſing. *Miller's Gard. Dict.*

CO'MPRESS (*Dict.*)— It is frequently the cuſtom among ſurgeons, after the plaiſter and other dreſſings are applied, to cover all with a Compreſs, which is made of the ſofteſt old linen, four, ſix, or eight times doubled. Theſe are of ſervice, not only by preſerving the parts from the injuries of the external air, but alſo for the ſecuring and fixing the plaiſters and other dreſſings. Compreſſes are alſo frequently applied where no plaiſter is made uſe of, and that ſometimes dry, ſometimes wetted with certain liquors, which are ſuppoſed to be ſtrengthening, emollient, reſolving, lenient, cooling, &c. They are frequently dipped in the decoctions of certain herbs, into wine, ſpirits of wine, vinegar, or oxycrate, and ſometimes into lime-water, and are adminiſtered either cold or hot, as the nature of the caſe requires. Compreſſes are of various forms; ſome are ſquare, others oblong, others triangular, and others in form of a croſs, according to the part they are to be applied to, and according to the occaſion and ſituation. Some are called ſtraight, others oblique, others tranſverſe, and others annular, as thoſe that ſurround the arm or foot. There are ſome alſo neceſſarily made in the form of an aſteriſm; ſome are divided either on one or both ſides, as far as the middle; ſometimes they form a hexagon, and ſometimes are round or globular, reſembling a ball: theſe are uſed in luxations of the os humeri, and are placed under the axillæ. Sometimes Compreſſes of a much ſmaller ſize are required, which are either ſquare for the wounds of the blood veſſels, to reſtrain hæmorrhages; or taper, for ſectures of wounds, or in ligatures of the arteries.

Compreſſes of all kinds are intended for theſe purpoſes: 1. to preſerve and cheriſh the natural heat of the body. 2. To ſecure the dreſſings that are laid under them. 3. To convey liquid remedies to parts wounded or otherwiſe diſordered, and to prolong the uſe of them. 4. To fill up any cavities or depreſſions of the parts, that the dreſſings, eſpecially in fractures, may be applied with greater ſecurity: and, laſtly, to prevent bandages from bringing a troubleſome itching, or other pain or uneaſineſs on the ſkin. *Heiſter's Surg.*

CONCHÆ *anomiæ*, in natural hiſtory, the name of a foſſile ſhell-fiſh, found in great abundance, and in great variety of ſpecies, but not known in any of them living, on the ſhores or in the ſeas of our own or other countries. In Glouceſterſhire, and ſome other of our counties, theſe are found as common as pebbles on the ploughed lands in other places. They are a ſort of bivalve ſhells, the valves of which are of unequal extent, both of them convex, and the head or beak of the longer valve crooked, and falling over the head of the other. See *Plate* XV. *fig.* 10.

CO'NCLAVE (*Dict.*)— It depends on the members of the Conclave themſelves to pitch upon a place, for the Conclave has no determined one; but, for ſome time, the palace of St. Peter, otherwiſe called the Vatican, has been always made uſe of, both for the greatneſs of the place, and other conveniencies; ſo that the cardinals never ſtand to deliberate now, but only for form's ſake. They build then in a great apartment of this palace as many deal cellulæ as there are cardinals, with lodges and places for the conclaviſts that ſhut themſelves in to wait and ſerve the cardinals. Theſe little chambers have their numero or number, and are drawn at hazard; ſo that it happens very often, that cardinals of different factions lodge near one another. Theſe are made up during the nine days of the ceremony of the pope's funeral, all which time, any body may go into the Conclave, and ſee the cellulæ, which are hung on the outſide with green ſerge or camblet; only thoſe that belong to the deceaſed's favourites, or to them promoted by him, who have theirs covered with deep violet-coloured cloth, and over each is the cardinal's arms that lives in it. Between the cellulæ and the windows of the palace is a long gallery for the conveniency of the Conclave, and it is from this the cellulæ receive their light. The next day after the pope's burial, that is, the 10th after his death, the cardinals having heard a maſs, they call the holy Ghoſt's, go in proceſſion two by two to the Conclave, where they all meet in the chapel every day, morning and evening for a ſcrutiny, which is done by writing their ſuffrages in little billets, and putting them in a chalice that ſtands upon the altar; when all are put in, two cardinals are choſen by the reſt to read openly them that are named, and keep an account of the number for each; and this is done till two thirds join for the ſame perſon, but a pope is ſeldom choſen after this manner; whence it happens, that after the ſcrutiny they come to what they call an accez, that is, a trial, whether he that has moſt voices in the ſcrutiny could come to two thirds; but it is obſervable, that they cannot give their ſuffrages, in the accez or acceſs, to thoſe they have appeared for in the ſcrutiny. If this does not ſucceed, they have recourſe to the way of inſpiration, which is an open declaration, or, rather, a conſpiracy of many cardinals to cry together, ſuch a cardinal is pope; as, for example, Altieri papa is begun by one or two, chief of a party, when they find ſuffrages enough to aſſure them that this method will not fail; and then the reſt of the cardinals are forced to join, that they may not incur the pope's diſpleaſure, who would be choſen in ſpite of them. As for the ſcrutiny, it is done thus: each cardinal prepares his billet, wherein he writes his own and his name he is for, and another word of device. The cardinal's name is writ under a fold of the paper, and ſealed with a ſeal for that purpoſe. The name of the choſen is writ by a conclaviſt under another fold without ſeal, and the word by which the cardinal knows it is his name that is read, is writ on the outſide, as, Deo volente, or ſome ſuch-like. The fold that covers the cardinal's name is never opened until the pope is choſen, who, to know thoſe that helped towards his promotion unfolds all. The motto ſerves in the accez, that it may appear, that each cardinal has given another beſide that they gave in the ſcrutiny, ſeeing two billets with different perſons under the ſame name; and at the end of the ſcrutiny and accez, if the ſuffrages be not ſufficient for the election, they burn all the billettings, that the chuſers names may be kept ſecret. During the Conclave, each cardinal is allowed but two ſervants, or three at moſt; and this only to princes, or for ſome particular privilege. Several preſs for this employment, becauſe the new choſen pope gives each conclaviſt three or four hundred livres, and they have the pleaſure of ſeeing all that paſſes; yet the place is troubleſome enough, becauſe they muſt take in the meat and drink from a certain place common to all that live in the ſame part, and muſt wait at table, and be as ſtreightly confined as their maſters. *Hiſtoire du Conclave.*

CO'NCORD, *Concordia*, in mythology, a goddeſs much eſteemed amongſt the ancient Romans. Julius Cæſar, and Tiberius, built her a temple. She was generally repreſented under the ſhape of a young girl clad in the old faſhion, crowned with a garland of flowers, holding a baſon with a heart in her right hand, and in the left a bundle of rods. There is an old medal of the emperor Nerva, wherein union is repreſented by a woman who bears a lance in her left arm, and a buckler in the other, and by a ſhip's ſtern and colours with theſe words, Concordia exercitum, S. C. Angeloni mentions this laſt in the Hiſtory of the Cæſars, p. 102. In other medals they repreſent union with two horns of plenty in one hand, and a veſſel of fire in the other. When Concord is invincible, ſhe is repreſented by an armed Geryon, a golden crown on his head, with ſix arms and as many feet; in three of his hands he holds a lance, a ſcepter, and a ſphere, and lays the other three on a ſhield. *Tit. Liv.*

CONFE'CTIO *cardiaca*, a name given, in the late London Diſpenſatory, to the ſo much eſteemed medicine, commonly known by the name of the Confectio Raleighana, or Sir Walter Raleigh's cordial. The compoſition is alſo altered, as well as the name, and is ordered now to be made in the following manner: take freſh tops of roſemary and juniper berries, of each a pound; the leſſer cardamum ſeeds, freed from their huſks, zedoary, and ſaffron, of each half a pound. Draw a tincture from theſe, with a gallon and a half of proof ſpirit; reduce this tincture, when filtred, to the weight of about two pounds and an half, by a gentle evaporation; then finiſh the electuary by adding the following ſpecies finely powdered; viz. of compound powder of crab's claws, ſixteen ounces; cinnamon and nutmeg, of each two ounces; cloves, an ounce; double refined ſugar, two pounds. *Pemberton's London Diſpenſatory.*

CONFECTIO *Paulina*, a name given in the late London Diſpenſatory, to the compoſition which uſed to be called Confectio Archigenis. It is now ordered to be made in the following manner: take coſtus or zedoary, cinnamon, long-pepper, black-pepper, ſtrained ſtorax, galbanum, opium, and Ruſſia caſtor, of each two ounces; of ſimple ſyrup, boiled to the conſiſtence of honey, an equal weight to thrice the ſpecies. *Pemberton's London Diſpenſatory.*

CO'NGER, in zoology, the name of the ſea eel, a very voracious and extremely large fiſh of the eel kind.

It grows to an enormous ſize, four or five cubits being a common length with it, and its thickneſs that of a man's thigh. It is of a pale grey on the back, and a fine milk-white on the belly, and has on each ſide a ſtraight white line, ſomewhat broad, made as is were of a double row of dots, and running from the head to the tail; the top of its back fin is black all the way; and in the end of his upper jaw, juſt at the noſe, he has two ſhort tubular horns, out of which a mucous liquor may be ſqueeſed. Their fleſh is very agreeable, but is not eaſy of digeſtion. *Willughby's Hiſt. Piſc.*

CONICHTHYODO'NTES, in natural hiſtory, a name given by Dr. Hill to a genus of foſſile bodies, called by other authors plectronitæ, from their ſuppoſed reſemblance to the ſpur of a fighting cock.

CONSTI'TUENT *Parts*, in chemiſtry. The Conſtituent parts of bodies are their diſſimilar parts, into which they may be reſolved, by the rules of that art. They are thus called in diſtinction from the integrant parts of bodies, which are parts of the ſame nature and properties with the bodies themſelves. Thus quickſilver, diſſolved by aqua-fortis, may be ſeparated from the diluted menſtruum, by means of a copper-plate, in its own form; this therefore was only divided into its integrant parts: but cinnabar, reſolved by chemiſtry into ſulphur and mercury, is divided into its Conſtituent parts, neither of theſe, nor any particle of them, being cinnabar, or having its properties. *Shaw's Lectures.*

CONSTRU'CTION *of equations* (*Dict.*)—The learned Baker, in his Clavis Geometrica, has given us the following elegant method of conſtructing cubic and biquadratic equations.

Let the parameter, or latus rectum, be called $1 = L$ (*Plate* XV. *fig.* 11.) and its vertex a; then, at right angles to the axis, inſcribe $RA = \frac{1}{2}p$, for half the ſecond term in the equation; then ſhall its point A be the vertex of the diameter A D, to be drawn parallel to the axis; ſo that the diſtance of this diameter from the axis is always $\frac{1}{4}$ of p, or $\frac{1}{4}$ of pL, for L is equal to 1; and conſequently when $p = o$, or when the ſecond term is wanting, A D will be in the axis, and the points R, a, A, all coincident. Next, in this diameter he determines the point D by the length of A D, and then erects in D a perpendicular to D A, as D H, whoſe length he alſo determines, and by that means finds H, the center of the circle which is to interſect or touch the parabola: and this he performs by what he calls his central rule, viz.

$$1.\quad \frac{L}{4} + \frac{pp}{8L} \pm \frac{q}{2L} = b = AD;\ \text{And,}$$

$$2.\quad \frac{p}{2} \pm \frac{ppp}{6LL} \pm \frac{pq}{4LL} + \frac{r}{2LL} = d = DH.$$

Which two rules, becauſe $L = 1$, may be contracted thus,

$$1.\quad \frac{1}{4} + \frac{pp}{8} \pm \frac{q}{2} = B = AD.$$

$$2.\quad \frac{p}{2} + \frac{ppp}{6} \pm \frac{qp}{4} \pm \frac{1}{2}r = d = DH.$$

And you muſt obſerve, that in the former of theſe rules + ſignifies downwards from the point A, and — upwards from it; and in the latter rule + ſignifies towards the left-hand, as — doth towards the right; ſo, according as the affirmative or negative roots prevail, H will be on the left or right-hand of D.

And in both parts, if p, q or r be $= o$, the member where it is found will vaniſh and become alſo $= o$.

As to the ſigns of the quantities in his rule, he makes p always retain the ſign it hath in the equation, but q always puts on a contrary one to what it had there; r is always with a poſitive ſign, except when pr have contrary ſigns in the equation, and then r will always have a negative ſign in the rule.

Having thus, by his central rule, found H the center of the circle, the next work is to determine the radius; and, if the equation be no higher than a cubic, H A is always the radius; but, if it be a biquadratic, then ſuppoſing — S, or that the fifth term, or abſolute number, be a negative quantity, take in the line A H, produced both ways, if there be occaſion, $AI = L$ above, and $AK = S$; and, making I K a diameter, deſcribe the ſemicircle K L I, and erect at the point A the line A L perpendicularly; which therefore will be a mean proportional between A K and A I: I ſay, the circle muſt paſs through L, and H L will be the radius.

But, if it be + S, you muſt draw another diameter H A, and therein fit in or apply $AZ =$ to L A before found; for now the ſquare of A L is to be taken from H A, as in the former caſe it was to be added to it; which will find the point Z through which the circle muſt paſs, and the radius will be H Z, which circle being drawn, it will cut the parabola in 4, 3, 2, or 1, or in no point; and, according to the number of ſuch interſections, will the real roots of the equation be found, which will be always ſo many perpendiculars from thoſe points to A D, as, *e. gr.* N Q on the left-hand, M o on the right, &c. Of which, if there be no p or ſecond term, and alſo it be $-r$, then on the left-hand are the poſitive roots, and the negatives ones on the right-hand: but if the ſecond term be there, and with a negative ſign, as $-p$, then N o on the left-hand are affirmative, and the others M o on the right negative; but, if it be $+p$, it is, on the contrary, N o negative, and M o poſitive.

CONSTRUCTION, *in grammar* (*Dict.*)—The Conſtruction is generally more ſimple, eaſy, and direct in the modern tongues than in the ancient: we have very few of thoſe inverſions which occaſion ſo much embarraſſment and obſcurity in the Latin; our thoughts are uſually delivered in the ſame order wherein the imagination conceives them: the nominative caſe, for inſtance, always precedes the verb, and the verb goes before the oblique caſes it governs.

The Greeks and Latins, M. St. Evremont obſerves, uſually end their periods, where, in good ſenſe and reaſon, they ſhould have begun; and the elegance of their language conſiſts, in ſome meaſure, in this capricious arrangement, or rather in this tranſpoſal and diſorder of the words.

CONSTRUCTION, is either ſimple or figurative.—Simple, is that wherein all the terms, or parts of the diſcourſe, are placed in their natural order.

Figurative CONSTRUCTION, is that wherein we recede from this ſimplicity, and uſe certain expreſſions, ſhorter and more elegant than nature affords.

The ſyntax, or Conſtruction of words, are diſtinguiſhed into two parts, concord, and regimen or government.

CONTA'GION (*Dict.*)—In times of peſtilential Contagion, the phyſician, and others who attend upon the ſick, are in the moſt imminent danger of falling into the ſame condition; nor have any of the ſo much boaſted preſervatives againſt this been found of any conſequence; on the contrary, the very remedies, many of them at leaſt, which have been contrived on this occaſion, are very dangerous, when lodged in imprudent hands, as well as uſeleſs and improper in all. The beſt methods of ſafety are, firſt, never to viſit a patient in any infectious diſorder, when one is faſting, but ſome generous wine ought always to be drank firſt. Some are of opinion that it is proper to eat firſt a piece of bread and butter, ſoaked in vinegar, either ſimple, or with rue firſt ſtamped in it. When one is in the patient's apartment, great care is to be taken never to eat or drink there, nor to ſwallow one's ſpittle; and it is no idle cuſtom in thoſe who are continually in the infected room to chew zedoary, myrrh, angelica, cinnamon, or the like warm and aromatic drugs; for all theſe things promote a plentiful diſcharge of ſaliva from the mouth, which it is certain, when ſwallowed, cannot but often carry peſtilential particles down with it into the ſtomach, whence they will eaſily find their way into the blood. It may be added as a good rule, that we never ſtay too long in an infected room; for a conſtitution that could have reſiſted the Contagion for a ſmall time, may eaſily be overpowered by too long a continuance in the way of it.

After one is returned home from a viſit of this kind, it is always proper to waſh one's hands and mouth with vinegar and water; to change cloaths, hanging the former in the air, and then to drink ſome warm liquor, as tea of ſcordium, ſage, or other herbs of that kind, or, in their place, coffee; for this opens the pores, and, if any ſmall quantity of the peſtilential virus ſhould have mixed itſelf with the blood, expels it by a gentle perſpiration. It may be alſo of great aſſiſtance to all about the ſick, from preventing them from being infected, to hold frequently ſponges dipped in vinegar to their noſes, and frequently to ſprinkle vinegar on a red-hot iron, in the room, to correct and mend the air. *Heiſter's Surgery.*

CONTI'NUOUS *Fevers*, a term uſed by the medical writers to expreſs ſuch fevers as have no intermiſſions, but have ſome ſort of regular remiſſions from the violence of their ſymptoms every day. They are thus called by way of diſtinction from the continent fevers, which never have the leaſt remiſſions.

Of the number of Continuous fevers, are the quotidiana continua, and the catarrhal fevers, which are more violent every day towards evening, and are much more mild in the middle of the day. *Junker's Conſp. Med.*

CO'NTOR, or CUNTOR, a bird of Peru, ſaid to be the largeſt in the world. With its wings expanded, it meaſures fixteen feet from the tip of the one to the other; a ſingle feather of it is four feet two inches long; its beak is ſtrong enough to tear off the hide, and rip up the bowels of an ox. Two of them will attempt a bull, and devour him. *Phil. Tranſ.* N°. 208.

CONTRA'RY *Propoſitions*, in logic, univerſal propoſitions, one of which affirms, and the other denies, the ſame predicate of the ſame ſubject; as every ſquare is a parallelogram, and no ſquare is a parallelogram. Theſe propoſitions differ in quality, but not in quantity, and therefore are diſtinguiſhed from contradictory propoſitions, which differ in quantity and quality.

Contrary propoſitions cannot be both true, but may both be falſe: whereas, in contradictory propoſitions, one is neceſſarily true, and the other falſe.

CONTU'SIONS *of the cranium*. When the cranium is violently contuſed, it will be diſcovered by the tumor and ſoftneſs of the part, by the ſeparation of the integuments from the cranium, and by the collection of ſtagnating blood which appears to be confined under the ſkin. In this caſe you are to endeavour to divide the confined fluids, by attenuating medicines externally applied, or to diſcharge them by making an opening with a knife, or, laſtly, to bring them to ſuppuration.

When the extravaſation of fluids is very conſiderable, it is beſt to diſcharge the greateſt part of them inſtantly by inciſions, and what remains will then eaſily be diſperſed. Fomentations, and medicated bags of the warm herbs, rue, wormwood, ſavin, ſcordium, &c. quilted into bags, and boiled in wine, or in water, with a mixture of ſpirit of wine, or malt, or mellaſſes ſpirit. But, where it is found impracticable to divide and attenuate the ſtagnating fluids, the ſuppuration of them muſt be attempted, and, if the contuſion have been but ſmall, after the ſuppuration is formed, and the matter diſcharged, the wound will eaſily heal, by the application of a vulnerary balſam.

In violent contuſions, where there is no opening, or but a very ſmall one, the wound muſt be inlarged with the knife, to prevent the neighbouring parts from being corroded, and by this means the wound will be eaſily cleaned, and the cure performed by the method before laid down. When the pericranium is wounded, but not in ſo great a degree as to lay the cranium bare, the wound is to be dreſſed with warm balſamic medicines. But, where the cranium is expoſed and laid bare, its external lamella being robbed of its nouriſhment, by the deſtruction of the veſſels, by which it was conſtantly ſupplied, it will loſe its natural colour, and become yellow, livid, black, and, by degrees, ſeparate from the neighbouring parts, and exfoliate, which will greatly protract the cure of the wound. To haſten this exfoliation, the ſurgeon ought to bore ſeveral holes through the denudated part, as deep as the diploe, with an awl, or ſuch like inſtrument. This operation not only forwards the exfoliation of the part, but makes way alſo for the ſprouting up of new veſſels. The dreſſing, which ought to be repeated each time with great expedition, is to be applied in the following manner: when the wound is well cleaned, pledgits thoroughly ſaturated with the mild balſamics, with the addition of a ſmall quantity of honey of roſes, are to be laid upon the injured part of the cranium; over theſe a ſticking plaiſter is to be applied; and over that the proper bolſter and bandage. Theſe applications ſhould be continued till the cranium appears ſound, and the wound is in a condition to heal. *Heiſter's Surg.*

CONVO'LVULUS, *bind-weed*, in botany, the name of a very large genus of plants, which ſome have alſo made much larger than it really is, by making every climbing plant belong to it. The characters, however, of the Convolvulus, properly ſo called, are theſe: they have flowers conſiſting only of one leaf each, formed into the ſhape of a bell, and uſually very wide at the mouth. From the cup of the flower ariſes a piſtil fixed to the lower part of the flower, in the manner of a nail; this ripens into a roundiſh membranaceous fruit, which is uſually ſurrounded by the cup, and in ſome ſpecies is unicapſular, in others tricapſular, and contains ſeeds uſually of an angular figure.

Tournefort has enumerated fifty-ſix ſpecies of Convolvulus.

COO'PERAGE, in mechanic arts, the art of making all kinds of caſks, &c.

COO'PERS. This is a neceſſary and extenſive buſineſs, in all its branches, which are,

Thoſe which make caſks, not tight, chiefly for dry goods, package, and ſoap.

Others that make all ſorts of tight caſks, for holding liquids. Both theſe are ſmart work, but the latter by much the nicer part; and they take with an apprentice generally the ſum of 10 or 20 l. whoſe working hours are from ſix to eight, in which time ſome good hands will earn 3 s. or 3 s. 6 d. but the common wages are 15 s. a week.

And to ſet up a maſter in the dry way will require from 200 to 500 l. except they keep to ſoap caſks only, as ſome do, which is eaſier work, and does not require ſo much money. One who keeps to the making of butts, hogſheads, &c. for brewers, vinegar merchants, ſhipping, &c. requires a good ſtock of the beſt ſtaves, and of courſe more money to carry on their buſineſs: But there are thoſe alſo who work moſtly on the leſſer ſort of tight caſks, which is much lighter work, and takes leſs money.

Laſtly, the wine Coopers, whoſe province is not only to look after the caſks, but the liquor itſelf, in which many of them are alſo great dealers. Theſe will not take an apprentice with leſs than 20 l. and, if importers, perhaps, not leſs than 50 or 60 l. had need have 1000 or 2000 l. ſtock: and a journeyman in this part has ſeldom more than the others, unleſs they are extraordinary cellar-men, who have ſometimes 40, 50, or 60 l. a year and their board.

They were incorporated into a company in the year 1501, in the reign of Henry VII, and, by an act in the 20th year of Henry VIII, they were authorized to gauge all beer, ale, and ſoap veſſels for a farthing each: livery fine 15 l.

Their hall is in Baſing-hall-ſtreet, and their court-day on the firſt Tueſday in the month.

They have alſo an handſome barge, in which they attend the lord mayor to Weſtminſter, on the day of his inſtallation.

Arms. Girony of eight ſable and gules, on a cheveron between three annulets, or, a croze between two axes ſable, on a chief vert three lillies argent. Motto. Love as brethren.

CO'PPEL (*Dict.*) — The matter of which Coppels are to be made, muſt be ſuch as can reſiſt the ſtrongeſt fire, ſuch as will not run eaſily into glaſs with vitrifiable bodies, as glaſs of lead, &c. and ſuch as may be reduced into a well coherent, though porous maſs. The beſt earth for this purpoſe is found to be that which is made of calcined bones of all animals, a very few excepted, eſpecially ſwines bones; for a Coppel made of the bones of this creature is found to receive ſomething metallic into it, at the ſame time that it abſorbs the glaſs. The beſt bones for this purpoſe are thoſe of calves, horſes, ſheep, and oxen; and, of theſe, the ſmalleſt bones are always to be preferred, as they are the more eaſily calcined, eſpecially ſuch as have been long expoſed to the air.

The calcination of theſe bones is to be made in an open fire, for a few hours or more, according to their ſize, and ſuch ſhould be choſen as have the leaſt fat about them. The calcination is known to be perfect, when there is not a black ſpot remaining, either on the outſide of the bone, or within it, when broken. When the bones are perfectly calcined, they muſt be reduced to a very fine powder, either by the grinding on a porphyry, or ſifting through a fine ſieve, after beating. This powder muſt be alſo carefully waſhed in warm water; for, during the calcination, the bones are almoſt always impregnated with the ſalt of the aſhes of the fuel.

This powder is called by ſome clar, and is an excellent ſubſtance for Coppels. The bones of fiſhes, when ſmall, are yet more eaſily calcined than thoſe of other animals: this may be done with eaſe in an open earthen veſſel, and the powder of theſe is preferable even to the former.

Parget, or plaiſter of Paris, made of various kinds of ſpar, tho' all kinds will not do for this purpoſe, is alſo excellent: but, as there are ſome ſorts of ſpar which will not afford a proper plaiſter, it is proper to try in a ſmall quantity firſt. The calcination is to be made in an earthen veſſel, covered with a tile, in an open fire. The ſpar crackles a little with the heat, and, when this noiſe is over, the calcination is perfect.

As the preparation of bone aſhes for this uſe, however, is tedious, and the proper ſorts of ſpar not always or every-where to be had, the want of them may be ſupplied with the aſhes of vegetables, properly prepared: but, leſt the Coppels ſhould vitrify, by reaſon of the alkaline ſalt in theſe aſhes, the following method muſt be obſerved in their preparation: Waſh off the lighteſt and fineſt part of the aſhes from hot wood embers, with warm water, through a ſieve, that the fineſt part of the aſhes may not fly away, nor any of the embers be mixed with them; pour upon this duſt pure boiling water; and ſtir it with a ſtick; when the aſhes have ſubſided, decant off the water, and pour in freſh boiling water, ſtirring all together, as before: when this has ſettled, decant it off again; and repeat this operation with freſh water every time, till the water have not the leaſt taſte of the ſalt, but is perfectly inſipid. When this laſt water is decanted off, add a freſh quantity; ſtir the aſhes thoroughly up, and, after eight, ten, or twelve ſeconds, pour off the liquor, as yet thick with the aſhes, into a clean veſſel: part of the aſhes will now remain in the former veſſel; on theſe pour more water, ſtir them, and, after a ſhort reſt, pour off as before into the other veſſel. Repeat this, till in the firſt veſſel there remains only a little ſandy matter, or a few coarſer particles. Let the waſhed aſhes now ſtand, till the water is perfectly clear above them; then decant this carefully off, and you will find theſe aſhes now become a good earth for this uſe, and free from redundant ſalt and oil, and immutable in the fire. Theſe, however, if made into a paſte, and rolled into ſmall balls, and burnt again in a potter's oven, and then waſhed anew, become purer and better ſtill.

Finally, put a ſmall quantity of the aſhes of beaſt or fiſh bones into a very clean earthen veſſel, and calcine them a ſecond time, for a few hours, in a moſt violent fire; afterwards waſh them with water, and grind them to a perfectly fine powder on a pophyry, and keep this preparation, as alſo each of the others, ſeparate, for the more or leſs nice uſes. This laſt preparation is properly called clar, or caer, by the German metallurgiſts.

For the hollow of the Coppels, which is to contain the metal, muſt be a ſpherical ſegment, and not very deep: firſt, that the ſurface of the melted maſs, be it ever ſo ſmall, be diſtinctly viſible to the artificer's eye; and, ſecondly, that the metal, left in that cavity, may melt together in one globule. But the outſide of the Coppel muſt be only a ſmall matter convergent towards the baſis, like a truncated cone, that it may ſtand firmly on its baſe: and, that this figure may be regularly given to theſe veſſels, it is convenient to have copper or braſs moulds for the making them.

Now, to make Coppels from theſe preparations, take bone aſhes of beaſts or fiſhes, either alone, or take two parts of wood aſhes to one part of theſe, and mix them perfectly in a marble mortar, or on a porphyry or levigating ſtone; then add to the mixture, by ſeveral quantities, juſt ſo much either of pure water, or of the whites of eggs diluted with water, as will be neceſſary to make the matter ſtick together, when ſtrongly preſſed between the fingers: and great caution muſt be uſed, not to exceed or fall ſhort of this proportion of the fluid. If you uſe the calcined ſpar, it muſt be made up with a ſolution of vitriol.

Put a ſufficient quantity of this matter, thus wetted, into a ſmall mortar, ſupported on a firm prop, and preſs down the matter cloſely with your fingers, that the capacity of the mortar may be quite full: lay the reſt aſide.

Then put the peſtle, made for a mould to make the Coppels, perpendicularly on the ſurface of the matter in the mortar, and with a mallet drive it down with three or four blows, according to the different diameter of the Coppel that is to be made: thus make the maſs conſiderably compact; but take great care that the peſtle do not rub againſt the ſides of the mortar. When this is done, remove the peſtle, and ſtrew the cavity it has made in the maſs with aſhes of dry bones of the preparation called claer, ground extremely fine, and ſifted through a fine ſieve: after this, wipe the peſtle with a clean cloth, and put it into the cavity again, driving it in with one or two more blows. Then having at hand a ſmaller wooden plank, ſtrewed a quarter of an inch thick with dry aſhes, put upon it the mortar containing the Coppel already prepared; the Coppel will eaſily quit its mould, and, its inequalities at the upper edge and bottom being taken evenly off with a knife, let it be inverted, and laid aſide in a dry place.

The dry fine aſhes are applied to the inſide of the Coppel, that the little inequalities commonly remaining there may be filled, and it may make a ſort of fine ſieve, admitting through it vitrified bodies, but retaining gold and ſilver. The cavity, being regularly covered with this perfectly fine ſubſtance, prevents any harm from the common matter of the Coppels being a little defiled with ſand, or other powder, eaſy to be vitrified; which is a fault indeed hardly poſſible to be avoided, eſpecially when wood aſhes are uſed. Hence it is plain, that this powder muſt needs be prepared with very great caution, and even the levigating it muſt be done on a very hard ſtone, leſt, if on a ſoft one, ſome particles might perhaps be abraded from its ſurface, and ſpoil the powder.

Coppels had better be too compact than too looſe in their texture, ſince the latter is always a miſchievous accident, whereas the former, by abſorbing the glaſs more ſlowly, is of no other hurt than the retarding the operation a little.

Coppels made of bone aſhes, or of calcined ſpar, are more valuable than thoſe of wood aſhes, as they require not ſo much caution and regularity in the management of the fire; but, if wood aſhes enter the compoſition, the Coppel muſt be made pretty hot before the metal is put into it, otherwiſe the aquerous vapours, forcing their way out, will cauſe the metal to be thrown out in drops; for Coppels of this kind can never be perfectly dried by the air alone, there being always ſomething of an alkaline ſalt yet remaining in wood aſhes, which makes them attract the water out of the air, as the dark colour of theſe aſhes, and the ſolution of ſal armoniac poured on them, alſo ſhew; for this reaſon, theſe aſhes are alſo more diſpoſed to vitrification than thoſe of bones, the latter approaching much nearer to the nature of the incumbuſtible ſtones.

As to the moiſtening the matter of the Coppels, great care muſt be taken not to uſe a fluid too mucilaginous and fat; for this makes the Coppels ſo compact, that they not only either abſolutely reject vitrified bodies, which they are intended to receive, or yield them but a very ſlow or difficult paſſage; but alſo are apt to ſplit, when made very hot, and diveſted of their oily part.

Neither muſt ſuch mucilaginous fluids by any means be uſed, as may produce a great deal of fixed alkaline ſalt in the heating of the Coppel, as the tartareous dregs of fermented bodies do. Nor muſt the aſhes be moiſtened too much; for, if they are, the ſurface of the veſſel will never be perfectly neat.

Some artificers mix about a tenth part of fine waſhed clay to to their aſhes, for the making their Coppels: when this is done, the matter muſt be moiſtened with water only, the clay making the whole ſtick ſufficiently together. Great care, however, muſt be taken, that too much clay is not added, and the different degree of the fatneſs of the clay be attentively conſidered.

The aſhes of bones uſed alone, and ground to a ſufficient fineneſs, require no clay or mucilaginous fluid to increaſe their coheſion, but do very well with pure water alone: and Coppels of this kind, and ſuch as are made of the calcined ſpars, need hardly be made at all hot before the metal is put into them.

The operation, however, when performed in a Coppel made of bone aſhes, or of calcined ſpar alone, takes up a little more time, but it is more ſecurely performed than in Coppels where wood aſhes make a part of the matter of them: for, as the bone or ſpar veſſels receive the vitrified metal more ſlowly, on account of their compact ſtructure, ſo it is leſs to be feared that any of the perfect metals ſhould be abſorbed alſo, even though the management of the fire be not ſo critically minded. *Cramer, Art of Aſſ.*

COPELLING. Silver may be precipitated out of its ore by Copelling alone, in the following manner: roaſt a centner of the ſilver ore in the common way; when roaſted, powder and ſift it very fine, and, if it melts with difficulty, mix with it one centner of litharge: when it is an ore that melts eaſily, this may be omitted. Divide the powder into five or ſix parts, and wrap every one of them ſeparately in ſmall pieces of paper. Put a large Coppel under a muffle in the furnace; ſift it thoroughly; then put into it ſixteen centners of lead. When the lead begins to ſmoak and boil, put upon it one of the ſmall parcels of powdered ore, in its paper; then diminiſh the fire a little. The paper will be immediately conſumed, and the ore caſt to the ſide of the coppel, in form of ſcoriæ. When this is done, increaſe the fire again, and add a ſecond parcel of the ore; and continue this method till all the ore is put in; after which, ſcorify the lead in a ſtronger fire. The ſilver contained in the ore, with that contained in the lead, will now be found in form of a bead in the coppel; and, ſubtracting the known quantity yielded by the lead, the remainder of the weight gives the quantity of ſilver in that centner of ore.

Silver is not the only ore that can be thus worked; many others may be aſſayed in the ſame manner, by Coppelling alone: thoſe are indeed to be excepted from this proceſs, which ſplit, or which corrode the coppels. *Cramer's Art of Aſſ.*

COPPER (*Dict.*)—*The general method of ſeparating* COPPER *from its ore.*—After a proper aſſay, the ore is treated according to the ſubſtances with which it is mixed. If it abounds with ſilver, it is firſt gently warmed or calcined, till a great part of the ſulphur goes off in fume. At Goſlaw in Germany, they firſt break the ore in pretty large lumps, then burn it in an open fire of wood and charcoal; after which they beat it ſmaller, and warm it twice again: and thus make it fit for the firſt furnace, where it is melted into a ſtony red matter, called Copper-ſtone; which, being again roaſted and melted, becomes black Copper; this they roaſt again, in order ſtill more to free it from its ſulphur, and now it is in a fit ſtate to be nealed for its ſilver; which they extract, by adding four parts of lead to one of the black Copper, then melting them together in a ſtrong fire, and caſting the maſs into moulds, where it hardens into blocks. Theſe are carried to another furnace, and buried in charcoal; giving only a gentle heat, till the lead and ſilver melt and run away together into the receiver, leaving the Copper blocks unmelted behind, which are thus honeycombed and drained of their ſilver; but left capable of being brought to tough and malleable Copper, by repeated fuſion. In the Hungarian mines the learned Dr. Brown tells us, that they ſometimes burn the ore, and ſometimes melt it; and this ſometimes by itſelf, and ſometimes mixed with other minerals and its own droſs.

The purification of Copper chiefly depends upon totally freeing it from its ſulphur, which may be done, for the more curious uſes, by melting it ſeveral times with fixed alkali's, nitre, or borax.

After the heterogenous parts have been thrown off, as before directed, from the proper earth of the ore, the pure metal then remains to be ſeparated from this earth by fuſion.

But there are two difficulties, at leaſt one or other of them, always found in this affair. For (1.) This proper mineral earth, how fluxible ſoever it may prove in gold and ſilver, yet ſcarce comes up to the fuſibility of the pure metal, but is apt rather to flow thick and ſluggiſh, unleſs the fire be very intenſe indeed: but it is plain, that, if this ſubſtance remains viſcous, the moleculæ of the metal cannot ſink through it, in order to form a metalline maſs at the bottom. (2.) Sometimes only a very ſmall quantity of pure metal lies concealed in a vaſt body of ſuch adhering earth, or wrapped up with the matter of other metals; whence one of theſe two inconveniences muſt ariſe, viz. either that the ſmall quantity of metal cannot well, under ſo great a load of recrement, come into a little maſs; or elſe, if it could, it muſt of neceſſity be ſo violently agitated and toſſed about by the ſtrong fire required to keep ſo large a bulk of ſlag in fuſion, as in the ebullition to be again involved, as it were, in little drops or bubbles among the pappy maſs of the ſcoria.

Theſe two inconveniences have their remedies. (1.) The firſt is, to add ſuch ſubſtances as promote vitrification, and, at the ſame time, cauſe a thin flux of the vitrified body. Such ſubſtances are, for the large work, ſand, fluxile mud, alkaline ſalts, tartar, nitre, &c. and, for the ſmall, glaſs of lead, a little borax, or any compound flux-ſalt, the baſis whereof are commonly tartar and nitre. (2.) The ſecond is, to add a metal itſelf. This is a common way, and ſeems greatly improveable, if it can be brought to anſwer the expence. In this caſe, as a greater maſs of metal cannot, by the ſame fire, be ſo much agitated and toſſed about as a leſs, or, if it could be agitated as much, yet all its particles would cohere more firmly on a large maſs than in a ſmaller one; hence, by ſuch an addition of metal, the little maſs that would otherwiſe be with difficulty collected from the ſeveral falling particles of the melted matter, is artificially inlarged, ſo as to cover the whole bottom of the melting-pot; in conſequence whereof, all the ſingle metallic particles that fall afterwards, are eaſily catched and detained below, by the large metalline maſs, which there lies ready to receive them.

Copper, being itſelf of difficult fuſion, requires ſuch a fire as is able to melt its glaſſy ſcoria ſufficiently thin, at the ſame time that it is melted itſelf; and this it does, unleſs the flints ſhould prove very obſtinate indeed. Hence bare fuſion, ſometimes, without any other aſſiſtants, will bring out the metal from its ore, and throw it down into a maſs, the ſcoria here flowing ſo thin, as readily to ſuffer the metalline particles to ſink through it; but, when the ore is more ſtubborn, its ſeparation on may be promoted by metalline, or other additions, as above-mentioned.

In ſhort, the difficulty of thus ſeparating the metal from its proper earth is principally found in the ores of ſilver, gold, and Copper; but lead and tin, being very fuſible bodies, are much eaſier melted from their adhering mineral matter.

CO'RAL (*Dict.*)— It had been long the received opinion, that Coral was ſoft in the ſea, and was hardened by the air upon taking it out of the water; and our learned Mr. Boyle was not willing to quit this opinion. But, as experiments are the only way of aſſuring ourſelves of the truth, Boccone, for this purpoſe, went to ſea in one of the Coral-fiſhers veſſels, and, by plunging his arm into the water, had an opportunity of examining the Coral, as they were fiſhing it up, before it came into the air. He invariably found it hard, except at its extremities; where, upon preſſing it between the nails of the fingers, it furniſhed a ſmall quantity of a milky fluid, reſembling in ſome degree the juice of ſpurge or ſow-thiſtle. Boccone obſerves farther, that he ſaw ſeveral furrows under the bark of the Coral, which terminate at the extremities of the branches, about which one might clearly ſee ſeveral ſmall holes of the form of a ſtar, which he imagines are deſtined for the production of branches. Venette's account of Coral, in his treatiſe of Stones, is much the ſame as Boccone's.

The count de Marſigli, in a letter to the Abbé Bignon, in the year 1706, takes notice, that, in order to give the beſt account of the production of Coral, he wanted to be aſſured, whether the milky juice before-mentioned was found therein both in winter and ſummer, which was a matter of diſpute even among the Coral-fiſhers. For this purpoſe he went in winter a few days to ſea with the Coral-fiſhers, and made ſeveral important diſcoveries into the nature of Coral. He ſent the Abbé Bignon an account of ſome branches of Coral, which he found covered with flowers, and which was a thing unknown even to the Coral-fiſhers themſelves. Theſe flowers were about a line and a half in length, and of the ſame diſtance one from another, and formed a ſtar-like appearance. Theſe bodies, which the count de Marſigli imagined were flowers, M. Peyſſonnel afterwards diſcovered to be the inſects inhabiting the Coral. As to the fact, whether the Coral furniſhed a milky juice in winter as well as in ſummer, count de Marſigli obſerved, that he did in December find the milky juice between the bark of Coral and its ſubſtance, in the ſame manner as he did in the month of June preceding.

M. de Peyſſonnel was unwilling, that the idea, which the ingenious diſcovery of the count de Marſigli had given, in relation to the flowers of Coral, ſhould be loſt; and therefore, being at Marſeilles in the year 1723, he went to ſea with the Coral-fiſhers. Being well appriſed of what Marſigli had obſerved, and the manner of his making theſe obſervations, as ſoon as the net, with which they bring up the Coral, was near the level of the water, he plunged a glaſs veſſel therein, into which he conveyed ſome branches of Coral. Some hours after, he obſerved, that there appeared a number of white points upon every ſide of this bark. Theſe points anſwered to the holes, which pierced the bark, and formed a circumſcribed figure with yellow and white rays, the center of which appeared hollow, but afterwards expanded itſelf, and exhibited ſeveral rays reſembling the flower of the olive-tree; and theſe are the flowers of Coral deſcribed by Marſigli.

Having taken this Coral out of the water, the flowers entered into the bark, and diſappeared; but, being again put into the water, ſome hours after they were perceptible again. He thought them not ſo large as the count de Marſigli mentions, ſcarce exceeding in diameter a large pin's head. They were ſoft, and their petals diſappeared, when they were touched in the water, forming irregular figures. Having put ſome of theſe flowers upon white paper, they loſt their tranſparency, and became red, as they dried.

Our author obſerved, that theſe flowers grew from the branches in every direction, from broken ones, as well as from thoſe which were whole; but their number leſſened towards the root; and, after many obſervations, he determines, that what Marſigli took for flowers were truly inſects.

Coral is equally red in the ſea as out of it; and this redneſs is more ſhining, when juſt taken out of the water, than even when it is poliſhed. The bark of Coral, by being dried, becomes ſomewhat pale. The extremities of its branches are ſoft, to the length of five or ſix lines; they are filled with a whitiſh juice tending to yellow. The Coral-fiſhers ſaid, that in the month of May this juice ſometimes appeared upon the ſurface of the bark; but this, notwithſtanding great attention, our author could not obſerve.

The body of Coral, although hard, ſeems to give way a little, when preſſed between the fingers; and, being broken at different diſtances, when juſt taken from the water, there always came therefrom a ſmall quantity of milky juice through certain tubes, which appeared to be deſtined towards the bark.

Having enquired of the fiſhers in what direction the Coral grew in the ſea, they acquainted him, where the depth of the ſea permitted them to dive, that they had found it growing ſometimes perpendicularly downwards, ſometimes horizontally, and ſometimes upwards.

Having verified theſe obſervations during the eight days he ſtaid with the fiſhermen, he adds, that he had never found any pores perceptible in the ſubſtance of the Coral; that there iſſued leſs milk from the large branches than from the ſmaller ones; and that the firſt were harder, and leſs compreſſible.

The bark of Coral covers the whole plant from the root to the extremities of the ſmalleſt branches. It will peel off; but this is only, when juſt taken out of the water. After it has been expoſed for a ſhort time to the air, you cannot detach it from the body of the Coral, without rubbing it to powder. This bark appears pierced with little holes, and theſe anſwer to ſmall cavities upon the ſubſtance of the Coral. When you take off a piece of this bark, you obſerve an infinite quantity of little tubes, which connect the bark to the plant, and a great number of little glands adhering to theſe tubes; but both one and the other do not diſtinctly appear, except when they are full of juice. It is from theſe tubes and glands that the milky juice of Coral iſſues forth. Beſides theſe, you ſee in variety of places the bark puſh itſelf outwards, where the ſubſtance of the Coral is hollowed, and formed into the little cells, taken notice of by Boccone and Marſigli. In theſe you ſee little yellowiſh bodies, of the length of half a line, which terminate at the holes in the bark; and it is from theſe that the flowers appear.

Our author has found branches of Coral, which, having been broken, have fallen upon other branches, have faſtened themſelves thereto, and have thus continued to grow. He has found, when a piece of ſtone, ſhells, or other hard bodies, have offered themſelves between the ramifications of Coral, that it has expanded itſelf over them, and inveloped them in its ſubſtance. He has ſeen pieces of Coral growing upon detached pieces of rock, glaſs bottles, broken pots, and other ſubſtances, from which the plant could receive no nouriſhment. It has been ſaid by great authority, that Coral grows from the rocks perpendicularly downwards; but our author has ſeen ſome growing to a round flint, which muſt neceſſarily have vegetated upwards, like moſt other plants.

M. de Peyſſonnel proceeds to examine, whether or no Coral is a plant, according to the general opinion, or a petrification or congelation, according to ſome; and, after having exhibited the various arguments delivered in ſupport of theſe, he concludes, that Coral, as well as all other ſtony ſea-plants, and even ſponges, are the work of different inſects, particular to each ſpecies of theſe marine bodies, which act uniformly according to their nature, and as the ſupreme Being has ordered and determined. The Coral inſect, which is here called a little urtica, purpura, or polype, and which M. Marſigli took for its flower, expands itſelf in water, and contracts itſelf in air, or when you touch it in water with your hand, or pour acid liquors to it. This is uſual to fiſhes or inſects of the vermicular kind.

When our author was upon the coaſts of Barbary in 1725, he had the pleaſure of ſeeing the Coral inſect move its claws or legs; and, having placed a veſſel of ſea-water with Coral therein near the fire, theſe little inſects expanded themſelves. He increaſed the fire, and made the water boil, and by theſe means kept them in their expanded ſtate out of the Coral, as happens in boiling ſhell-animals, whether of land or ſea. Repeating his obſervations upon other branches, he clearly ſaw, that the little holes, perceptible upon the bark of the Coral, were the openings through which theſe inſects went forth. Theſe holes correſpond with thoſe little cavities or cells, which are partly in the bark, and partly upon the ſubſtance of the Coral; and theſe cavities are the niches, which the inſects inhabit. In the tubes, which he had perceived, are contained the organs of the animal; the glandules are the extremities of his feet, and the whole contains the liquor or milk of Coral, which is the blood and juices of the animal. When he preſſed this little elevation with his nails, the inteſtines and whole body of the inſect came out mixed together, and reſembled the thick juice furniſhed by the ſebaceous glands of the ſkin. He ſaw, when the animal wanted to come forth from its nich, he forced the ſphincter at its entrance, and gave it an appearance like a ſtar with white, yellow, or red rays. When the inſect comes out of its hole without expanding itſelf, the feet and body of it form the white appearance, obſerved by Marſigli; but, being come forth, and expanded, it forms what that gentleman and our author took for the petals of the flowers of Coral, the calyx of this ſuppoſed flower being the body of the animal protruded from its cell. The milk before-mentioned is the blood and natural juice of the inſect, and is more or leſs abundant, in proportion to its health and vigour. When theſe inſects are dead, they corrupt, and communicate to the water the ſmell of putrid fiſh.

The ſubſtance of Coral, by a chemical analyſis, ſcarce furniſhes either oil, ſalt, or phlegm: live Coral with its bark furniſhes about a fortieth part of its weight in theſe; but the bark of Coral alone, in which are contained theſe animals, affords a ſixth part. Theſe principles reſemble thoſe drawn from a human ſcull, hartſhorn, and other parts of animals.

After the accounts here laid down, we are able to aſſign the reaſons of all the particular facts we obſerve in Coral. We ſee, why a branch thereof, broken off and detached from its ſtem, may flouriſh. It is becauſe the Coral inſects, which are contained in its cells, not having been injured, continue their operations; and, drawing no nouriſhment from the ſtem of the Coral, are able to increaſe, detached and ſeparate. How they live and are nouriſhed, is propoſed to be explained in treating of the urtica of the madrepora, in which theſe animals are vaſtly larger, and appear very diſtinctly.

In each hole or ſtar of the madrepora, on which our author lays the evident proof of his new ſyſtem, the urtica, placed in the center of each pore,' cauſes it to increaſe in every direction, by lifting itſelf further and further from the center of the ſtone. And in Coral, and in the lithophyton, the urtica, being niched in their cruſts or barks, depoſits a juice or liquor, which runs along the furrows perceived upon the proper ſubſtance or body of Coral, and, ſtopping by little and little, becomes fixed and hard, and is changed into ſtone; and this liquor, being ſtopped by the bark, cauſes the Coral to increaſe proportionably, and in every direction. In forming Coral, and other marine productions of this claſs, the animals labour like thoſe of the teſtaceous kind, each according to its ſpecies, and their productions vary according to their ſeveral forms, magnitudes, and colours.

If, after what has been here laid down, ſome will ſtill conſider theſe marine productions as plants, they are truly zoophytes, formed by the labour of the animals, which inhabit them, and to which they are the ſtay and ſupport.

By what is exhibited in this work, the author conceives, that he has explained the nature of theſe ſeveral marine productions, which have hitherto been ſo enigmatical. It is true indeed, that no reaſons can be aſſigned, why the œconomy of theſe animals is directed in ſuch or ſuch particular forms, We can no more account for the admirable ſtructure and colour of ſeveral ſpecies of ſhell-fiſh: we muſt in this, as in moſt of the other operations of nature, cry out, O altitudo divitiarum! *Phil. Tranſ.* Vol. XLVII. p. 449.

To theſe obſervations on this curious ſubject, we ſhall add the following of the learned and ingenious Dr. James Parſons, inſerted in the ſame volume of the Philoſophical Tranſactions.

The ſeveral ingenious opinions of ſome of this learned ſociety, upon what M. Peyſſonnel has advanced, concerning the formation of ſome of the ſubmarine bodies by animals, have occaſioned the following conjectures; which I lay before you, not at all preſuming abſolutely to decide a queſtion of ſo difficult a nature, but only endeavour at throwing a little more light upon the ſubject, in general, by ſuch further obſervations, as I thought would be moſt conducive, at leaſt, to come to a little more certainty about it.

I believe it may be ſaid, that there can be no ocular demonſtration of the fabrication of any of theſe bodies, whether by animals, or by vegetation; becauſe this happens under the water, far enough from any human obſervation. Therefore, when at any time ſuch of theſe, as are ſaid to be the work of animals, have been taken up, there is no doubt but that thoſe ſoft gelatinous weakly animals may have been ſeen upon them, and thence have been concluded to be the makers of them. Certainly there is nothing impoſſible to divine providence, in the order and diſpoſition of every thing to the beſt advantage. Among the animals, from the largeſt to the moſt minute, none are deſtitute of proper habitations; and we ſee, amongſt them, prodigious variety in the modes and deſigns of ſuch dwelling-places. Some are capable of erecting for themſelves commodious apartments to live in, as ſhell-fiſh, even out of their own conſtituent parts, as they grow. Others lodge their young in the very ſkins of animals; and, where there are any, who have neither ſagacity nor ſtrength enough to provide places for themſelves, they are at leaſt taught by their Maker to find them ready made.

Such are the bounds ſet to our intellectual powers here, that we can have no means of judging of objects which do not fall immediately under our inſpection, but by comparing them to ſomething elſe, as near them as may be; or by conſidering their proportions and effects; what is probable, what is not, in the phænomena that belong to them; and what abſurdities may ariſe from the uſes and actions aſcribed to them, for certainly they may be eaſily ſeen, by conſidering the objects themſelves.

I would neither conclude, with M. Peyſſonnel, that, becauſe I found animals upon ſuch bodies as he mentions, they were the makers of ſuch bodies; nor that, if one or more kinds of thoſe bodies were actually the work of ſuch creatures, all others, that had any relation to them, muſt alſo be their work; any more than I would, on the other hand, conclude, that, becauſe one or more of theſe ſubmarine ſubſtances were not made by them, none at all were produced by them. I would rather examine the parts of thoſe bodies in as nice and ſcrutinous a manner as poſſible, and compare their characteriſtics with thoſe of other bodies in both the animal and vegetable kingdoms; and, by finding out ſome of their properties only, be, in a great meaſure, able to range them in the rank, which they were deſigned to hold by divine providence.

In order to this, let us ſee firſt what are thoſe animals, which we are acquainted with, who certainly fabricate their dwelling-places, as they grow, for themſelves; and what the common or uſual advantages are, which they are in general obſerved to be endowed with; which will be beſt done by taking a nearer view of them. All the teſtaceous tribe, whether of land or water, and whatever their forms be, may be ſaid to produce their own habitations, but not to fabricate them. For we muſt obſerve, there are but two modes, by which theſe kinds of animals are furniſhed with them; the one by ſecretion from themſelves, and theſe neceſſarily grow with them: the other by a deſigned appoſition of parts of the animals themſelves. Now, in the firſt caſe, there is a neceſſity for a juſt proportion between the animal itſelf, and the ſhelly matter ſecreted from it. It muſt be large enough, and have ſtability and ſtrength in proportion to the matter which it ſecretes, and is to move about with; and it will appear, that this is the general rule through nature: or, if it be an immoveable body, the creature ought certainly to be allowed ſo much ſignificancy and ſtrength, as would, on the one hand, ſeem neceſſary for the ſecretion of ſo much matter as was ſufficient to conſtitute that body, or, on the other, to be capable, by its own proper action, of gathering together the matter, and building up the ſtructure. Where this is wanting, I, for my own part, would be far from haſtily concluding ſuch work to be the fabrication of ſuch ſeemingly weakly inſignificant animals; more eſpecially if, upon theſe very bodies, there were appearances of other characteriſtics, that, at the ſame time, were likely to lead me into another arrangement of them.

I have produced here before you ſuch of the ſhell animals, as are unqueſtionably the makers of their own houſes, that are furniſhed with theſe requiſites mentioned; and others I ſhall now offer you, being ſomewhat nearer thoſe ſaid to form the Coral, &c. than other teſtaceous kinds.

The dentalia are tubular ſhells, formed from their inhabitant animal, as much as a cockle, or an oyſter: and we muſt obſerve, that each of theſe has a ſufficient cavity for its habitation, and in itſelf has the proportional ſize and ſtrength neceſſary for the purpoſe.

The vermiculi marini enjoy the ſame privileges, and are always attached to their ſhells at their poſterior extremities, as well as the others, of whatſoever kind. They are found in groups, adhering together by a natural cement, blended, and, as it were, confounded together; and yet every one has its own cell, and is ſufficient to produce it in thoſe requiſites before-mentioned. All the kinds of theſe have one extremity ſmall, and increaſe in diameter to the anterior extremity; which is indeed the caſe of all the turbinated fiſh of whatſoever kind. To theſe we may add, that the cruſts of cruſtaceous animals, and thoſe of inſects in their chryſalis ſtate, will always ſhew, how neceſſarily an animal muſt have power and ſufficiency to form his habitation, either by ſecretion, or actual operation.

The ſyringoides, ſo called from their forms, carry the ſame teſtimonies of their ſtrength and power; many ſpecies of which we find foſſil, of which I have the honour to ſhew ſeveral ſpecimens: and I have no doubt, but it will be hard to find any creatures ſo deficient, or, in other words, more abandoned to deſtruction by the Creator, than theſe, in any part of nature.

Whatever is conſtructed by an animal, that is, among thoſe that we know with any certainty, it is ſurely to dwell in themſelves, or to depoſit eggs or young in. There was really no need to build a fabric to dwell upon; becauſe all thoſe creatures, ſuch as the polypi of every kind, which attach themſelves to bodies, have innumerable ſorts of matter, to which they can adhere, every-where, near them: and if theſe of the ſea have, in their nature and properties, any analogy with our freſh-water polypi, as to their propagation, and the detachment of their young from themſelves; with the ſeveral kinds of the ſame genus, the polypes à panache, polypes à bouquet, the bell-like polypi, and every other kind, by our ingenious obſerver Mr. Trembley, all which detach their young from them nearly in the ſame manner; one would almoſt be perſuaded, that they were never intended to dwell in cavities, but upon nidus's convenient for their attachment only, with full liberty, at proper times, to detach their young in like manner; who immediately meet ſome one or other of theſe ſubmarine bodies for their ſecurity alſo; for indeed there is hardly room to ſuppoſe any other way of propagation for theſe, than for thoſe of M. Trembley, ſince they are much of the ſame ſubſtance and conſiſtency every way. And it muſt be remarked, that few or no animals that have ſhells of any kind, can ever quit them, but muſt remain in them till they die.

We are now, ſecondly, to conſider ſome of the moſt obvious marks, that diſtinguiſh vegetable from other ſubſtances.

Whatever body is fixed by its root, no matter, whether it be flat or fibroſe, increaſing upwards, and ramifying into ſmaller and ſmaller branches, till they become more and more pointed to their extremities; having fibres either apparently tubular, or only porous or woody; would incline one, who had at all made the works of nature his ſtudy, rather to favour the idea of a vegetable in ſuch a body, than that of any other production. If theſe characteriſtics are common to any of the ſpecies of Corals, corallines, madrepores, &c. it would be no wonder they owed their increaſe to a kind of vegetation; nor would their hardneſs weigh at all againſt it, becauſe every one knows, that water is the univerſal vehicle of all matter into bodies of this kind. It is by water, that the teſtaceous matter is carried into the juices of ſhell-fiſh, and from it detached into the order we ſee it in the ſhells. It is from water that ſparry incruſtations upon vegetables are made: it is a depoſit from water which lines our common tea-kettles with a ſparry cruſt; and it is alſo this fluid that conveys the particles of tartar into the grape, which is afterwards depoſited on the ſides of the wine-veſſel; and, no doubt, it is water which carries up into thoſe hard bodies their ſtony matter; for there can be no doubt of their being organized bodies. Beſides, though the organization, in its origin, is probably flexible enough, yet the arrangement of theſe petrific particles, in ſo exact a manner, would inevitably render the whole hard enough, in the courſe of its growth. Is not the ſhell of a common egg hard enough? And yet its membrane, into the cellules of which the teſtaceous particles were ſecreted and ranged, in order to produce that hardneſs, was ſoft enough before. If we were to make tranſverſe ſections of the generality of theſe bodies, we ſhould ſee a regular radiated order of pores from their central medullary pipes, ſome foliated, others more tubular, others barely porous, all differing from one another only according to their own natures. What more is there in the order of the fibres of trees or plants? Tranſverſe ſections of any of theſe will ſhew you the moſt beautiful figures, in ſuch orders, that can be conceived; which, long ago, that accurate and learned naturaliſt, Dr. Grew has ingeniouſly obſerved, in his Anatomy of Plants, where he has given elegant figures of ſuch ſections in a variety of examples. And although ſome of theſe bodies have their pipes and pores quite ſtopped up, as they grow, yet their external appearance will ſhew them fibroſe.

In like manner ſome trees are ſo very hard, from the ſtrong connection of their parts, that, in a tranſverſe ſection, neither pores nor fibres can be diſtinguiſhed: and they are as ſuſceptible of a fine poliſh as any ſtone. And indeed it would ſeem to me much more difficult to conceive, that ſo fine an arrangement of parts, ſuch maſſes as theſe bodies conſiſt of, and ſuch regular ramifications in ſome, and ſuch well contrived organs to ſerve for vegetation in others, ſhould be the operations of little, poor, helpleſs, jelly-like animals, rather than the work of more ſure vegetation, which carries on the growth of the talleſt and largeſt trees with the ſame natural eaſe and influence, as the minuteſt plant, in a manner, which I have elſewhere explained.

Is it not alſo ſomewhat particular, that, if Corals are the work of theſe inſects, there ſhould be no cavity left behind them, as they raiſe it into branches; but that they ſhould leave it ſolid within? And would it not be very ſurprizing, that ſuch cellular paſſages, as we ſee diverſified into many kinds, ſhould be made by theſe creatures from the baſis, to be left behind them, as they carry up the building, without any further purpoſe, in brain-ſtones, &c. If this was the caſe, and that theſe little creatures could be ſuppoſed to build them, theſe would be a deviation from the general uniformity and purpoſe, that is obſerved every-where elſe: for certainly cells are built by every animal to depoſit ſomething, eggs, young, or other matter, in them; neither of which can be ſaid of the inſects in queſtion.

It has been ſaid, that flies, waſps, and bees, build themſelves cells, in order to make a compariſon between them and theſe polypi. They do ſo; but is there no diſtinction to be made? I can find ſeveral. Bees, waſps, &c. are in themſelves compact ſtrong animals, well made for the work allotted them, very able to bring and put together the materials of their neſts; and, when they have done their work, that proportion between the fabric, and the creatures which raiſed it, is apparent, which all nature points out, and the purpoſe is fulfilled ſoon, in their filling them with what nature had deſtined they ſhould hold. But can this be ſaid of our polypi? Where is that proportion between a little configurated-jelly, and the maſs of matter ſaid to be their work? What is depoſited in the cells they form? What makes others ſolid? And how do theſe jellies ſo wonderfully diſpoſe the fine arrangement of pores, fibres, nodes, branches, &c. And to what purpoſe, if they could be capable of it? In a word, I humbly propoſe to ſum up this eſſay in two general ſentiments; and theſe will be the rule, by which I, for my own part, ſhall always judge of things of this nature; viz.

1. Whatever bodies ſhall be found to carry the appearances and characteriſtic marks of vegetables, even though animals are found upon them, they certainly will paſs with me for ſuch, till ſtronger evidence ſhall evince the contrary.

And 2. I ſhall ever expect to ſee, at leaſt, a ſeeming power, proportion, and ſtability, in animals to render them capable of performing what they may be thought to have done.

Red Coral. The effect of vegetable diſtilled oils on Coral, by the help of a long digeſtion, is ſuch as could not have been imagined, till the experiments of Dr. Langelot ſhewed that they were a ſort of ſolvent for that refractory ſubſtance. This gentleman had put fragments of red Coral into ſome diſtilled vegetable oil, and let them ſtand many months, in hopes of drawing a tincture from them; but without ſucceſs. At length having a digeſting furnace at work, he placed the glaſs in which the Coral and oil were, in the furnace among the other things; the conſequence was, that, after about a month's digeſtion, the pieces of Coral were found to be ſwelled, and higher coloured than before, and, with a few days longer continuance with the ſame heat, the whole quantity of Coral had loſt its original figure, and was blended together into a red mucilage, the oil ſtill ſwimming above it in its priſtine form, and not at all altered in colour: the moſt violent agitation of the veſſel could not cauſe theſe two ſubſtances to mix together, and all the artifice that could be uſed, proved vain toward the tinging the oil with a red colour. After long trial in the ſame, and an advanced heat, the oil was poured off as clear as before, and very little altered in ſmell, or other qualities; and, tartariſed ſpirit of wine being poured on the remainder, with a very ſhort digeſtion took a very high red tincture. This proceſs is a great proof of the power of digeſtion.

The common red Coral yields, by diſtillation in a retort, a volatile vitreous ſpirit, in no inconſiderable quantity; this turns ſyrup of violets green, and makes an efferveſcence with acids, and renders a ſolution of corroſive ſublimate white and milky. And the fixed ſalt drawn from the reſiduum produces a white coagulum in the ſame ſolution; from which it is evident that it is not a mere alkali, but a ſal ſalſum, in ſome degree. Red Coral calcined, even in a very gentle fire, becomes white; the ſame change alſo happens to it, when infuſed a long time in ſome oily ſubſtances, as the oils of aniſe, fennel, or in white wax kept in fuſion. The menſtrua in this caſe acquire a red colour, in proportion as the Coral loſes it. It appears from theſe and ſeveral other experiments, that Coral is not, as ſome ſuppoſe, a mere terreſtrial abſorbent, but that it contains a volatile urinous ſalt, and a bituminous oil, combined with its earthy matter; and on theſe its virtues in medicine principally depend. The red colour of Coral is evidently owing to its bituminous oil, which it is found not difficult to ſeparate, and wholly diveſt it of. It is obſerved, that Coral, newly taken up out of the ſea, contains both the ſalt and oil in greater abundance than that which has been long kept; and it is ſuſpected by many, that its external cortical ſubſtance contains more of it than the interior, harder, and more ſtony matter.

The antients uſed Coral in many external medicines for diſtemperatures of the eyes; and internally as an aſtringent and refrigerating medicine. We uſe it only internally, and that principally in diarrhœas, and bleedings in too great evacuations of the menſes, in the fluor albus. The vulgar attribute to it, beſides theſe virtues, many others, which we have not ſufficient warrant for; ſuch as its ſtrengthening the heart, curing malignant fevers, and reſiſting poiſon; and they tell us, that it will do all this as well, if worn externally, as if taken inwardly; which may very poſſibly be true. *Geoffroy, Mat. Med.*

White Coral. There is no part of the world where white Coral is produced in ſuch abundance, as on the ſhores of the iſland of Ceylon, and others of the neighbouring Indian coaſts. The lime uſed in that part of the world, for building houſes, fortifications, &c. is all made by burning this Coral. It lies in vaſt banks which are uncovered at low water, and it is ſpongy and porous. While young, it grows erect, in form of little ſhrubs, and is then firm and ſolid, and ſmooth on the ſurface, but the branches continually ſhoot out more, and theſe other new ones, till the whole is one confuſed buſh. Theſe branches are all covered with a white viſcous matter, which, in time, hardens upon them, and becomes Coral; and, this filling up all the interſtices between the branches, when they become ſo numerous, and hardening between and over them, the whole becomes one coarſe rock, and the adjoining maſſes of this kind, uniting to one another, form at laſt a continued bank, which has the appearance of a great white rock. In the places where the Coral grows in this manner, there are like banks formed of oyſter-ſhells; the oyſters here grow often to a foot in diameter, and a foot in thickneſs; and it is ſaid, that they continue to increaſe in bulk, after the animal is dead. *Phil. Tranſ.* Numb. 282.

CO'RALLO-*Achates*, in the natural hiſtory of the antients, the name of a very beautiful ſpecies of agate, found at this time in the Eaſt Indies, but not in any plenty, and called, by Dr. Hill, achates miniaceus flavo variegatus, or the red lead-coloured agate, variegated with yellow. Its baſis, or ground colour, is a pale, but very bright red, in which there are diſcovered, on a cloſe inſpection, in moſt of the pieces, multitudes of veins of a dark red, drawn in very fine and cloſe concentric circles, round one or more points, the whole giving a mixt red, not unlike that of our red lead, or that of the common red Coral in its rough ſtate, when firſt drawn out of the ſea. It is always variegated alſo with a number of ſmall and beautiful blotches of a fair yellow, which are ranged with great irregularity in the maſs, but never interſect, or are interſected, by the veins; they are all ſmall, and either round or oblong. It is very hard, and capable of a fine poliſh, and, when wrought, is an extremely elegant ſtone. *Hill's Hiſt. of Foſſ.*

CORALLODE'NDRON, *coral-wood*, in botany, the name of a genus of trees, the characters of which are theſe; the flower is of the papilionaceous kind, but of a very ſingular make; its vexillum is remarkably long, and of the ſhape of a ſword; its alæ and carina ſhort; from the cup of the flower there is a cylindric piſtil, ſurrounded by a fimbriated membrane, which finally becomes a ſort of knotty pod, compoſed of two valves, and containing a number of kidney-ſhaped ſeeds.

CORALLOI'DES, in botany, a term uſed by M. Tournefort to expreſs a genus of muſhrooms; the diſtinguiſhing characters of which are, that they are of a fleſhy fungoſe texture, and are branched in the manner of coral.

CO'RDIA, the ſebeſten, in botany, a genus of plants, whoſe characters are:

The flower is of one leaf, which is funnel-ſhaped, and is expanded at the brim, where it is ſlightly cut into five or ſix parts: the pointal, which is ſituated in the middle of the empalement, afterwards becomes a globular fruit, pointed at one end; which is divided into two cells, in each of which is included one oblong ſeed.

Theſe plants, being natives of warm countries, are too tender to live through the winter in this country, unleſs they are preſerved in a ſtove. They are propagated by ſeeds, which muſt be procured from the countries of their natural growth; for they never produce any in England. Theſe ſeeds muſt be ſown in ſmall pots, which muſt be plunged into a good hot bed of tanners bark in the ſpring; and, if the ſeeds are freſh and good, the plants will begin to appear in five or ſix weeks after. Theſe muſt be brought forward in the hot bed, by being treated as other tender exotic plants; obſerving frequently to water them, as they are aquatic plants; and in July, if the plants have made much advance, they ſhould be gradually hardened; otherwiſe they will grow ſo weak, as not to be eaſily preſerved through the winter. As theſe plants obtain ſtrength, they will become more hardy; but, during the two firſt winters, it will be proper to plunge them into the tan-bed in the ſtove; but, when they begin to have woody ſtems, they may be placed on ſhelves in a dry ſtove, where if they are kept in a moderate degree of heat, they may be preſerved very well. They may alſo be placed abroad in a warm ſituation, in the beginning of July; where the plants may remain till the middle of September, provided the ſeaſon continues warm; otherwiſe they muſt be removed into the ſtove ſooner. *Miller's Gard. Dict.*

CO'RDIAL or *compound waters*, in chemiſtry.—*The beſt method of making* CORDIAL *or compound waters.*

Infuſe a pound of freſh citron-peel in two gallons of good melaſſes ſpirits, commit the whole to the ſtill, draw off the ſpirit gently, with care to avoid the faints: then make up, as they call it, with ſoft water, ſo as to leave the liquor proof, and add half a pound of fine ſugar; and thus you will procure a genuine citron water.

This experiment is general, and ſhews the uſual methods of making all the compound or cordial waters, by thoſe diſtillers who are called compounders, and alſo by the apothecaries; though apothecaries ſeldom make diſtilled waters ſo good as the compounders.

The perfection of this branch of Diſtillation depends upon the obſervance of a few rules, which might be eaſily complied with: and theſe rules we ſhall here lay down, as judging them of conſequence to the improvement not only of the art of the compounder, but alſo of a branch of pharmacy and medicine.

The firſt rule is, to uſe a well-cleanſed ſpirit, that is freed from its own eſſential oil. For, as the deſign of compound diſtillation is to impregnate the ſpirit employed with the eſſential oil of the ingredients, it ought firſt to have depoſited its own.

The ſecond rule is, to ſuit the time of previous digeſtion to the tenacity of the ingredients, or the ponderoſity of their oil. Thus rhodium-wood and cinnamon require to be longer digeſted before they are diſtilled, than calamus aromaticus, or lemon-peel. Sometimes alſo cohobation (that is, the pouring of the ſpirit, once drawn off, upon the ſame ingredients) proves neceſſary; as particularly in making ſtrong cinnamon water; where the eſſential oil is extremely ponderous, and difficultly riſes along with the ſpirit, without one cohobation more.

The third rule, is, to ſuit the fire or ſtrength of the diſtillation to the ponderoſity of the oil intended to be raiſed with the ſpirit. Thus ſtrong cinnamon water ſhould be diſtilled off briſker than the ſpirit of mint or baulm.

The fourth rule is, that a due proportion of only the finer eſſential oil of the ingredients be thoroughly united or incorporated with the ſpirit, ſo as to keep the groſſer and leſs fragrant oil. And this may be chiefly effected by leaving out the faints, and making up to ſtrong proof with fine ſoft water in their ſtead. And upon the obſervance of theſe four eaſy rules the perfection of the art of compound diſtillation ſeems to depend. The addition of fine ſugar to Cordial waters is a thing of leſs moment, and may be uſed or omitted occaſionally. And, if theſe directions be obſerved, there will be no need of fining down Cordial-waters with allum, white of eggs, iſing-glaſs, or the like; for they will be preſently bright, ſweet, and pleaſant-taſted, without any further trouble.

CORIA'RIA, myrtle-leaved ſumach in botany, a genus of plants whoſe characters are:

It is male and female in different plants; the male flower has five leaves, which are joined to the empalement; theſe have ten ſlender ſtamina: the female flowers have the like empalement, and the ſame number of petals; and in the center are placed five pointals, which turn to a berry, incloſing five kidney-ſhaped ſeeds.

The ſort with male flowers is moſt common in England, the other being very rarely ſeen in any of the gardens. Theſe grow wild in great plenty about Montpelier in France, where it is uſed for tanning of leather; and, from this uſe, has been titled by the botaniſts, rhus coriariorum; i. e. tanners ſumach.

Theſe ſhrubs ſeldom grow more than three or four feet high, and, as they creep at the root, they ſend forth many ſtems, whereby they form a thicket; ſo may be planted to fill up vacancies in wilderneſs quarters; but they are improper for ſmall gardens, where they will take up too much room: and, as there is no great beauty in the flowers, they are only admitted for variety.

It may be propagated plentifully from the ſuckers, which are produced from the creeping roots in great abundance: theſe ſhould be taken off in March, and planted into a nurſery, to form good roots; where they may continue one or two years, and then muſt be removed to the places where they are to remain.

This plant delights in a loamy ſoil, which is not too ſtiff; and ſhould be placed where it may have ſhelter from the north and eaſt winds; where it will endure the cold of our ordinary winters very well, and will flower better than if it is preſerved in pots, and ſheltered in the winter, as hath been by ſome practiſed.

CORI'NDUM, *heart-peas*, in botany, a genus of plants whoſe characters are theſe:

It hath a trailing ſtalk, emitting claſpers, whereby it faſtens itſelf to whatever plant it ſtands near: the calyx (or flower cup) conſiſts of three leaves: the flowers conſiſt of eight leaves, and are of an anomalous figure: the ovary becomes a fruit which is like a bladder, and divided into three cells; in which are contained round ſeeds, in form of peas, of a black colour; having the figure of an heart of a white colour upon each.

Theſe plants are very common in Jamaica, Barbadoes, and moſt of the other warm iſlands in the Weſt-Indies; where their ſeeds are ſcattered, and become weeds all over the country.

They may be cultivated in England, by ſowing their ſeeds on an hot bed in March; and, when the plants come up, they muſt be tranſplanted into a freſh hot bed, where they may remain until the middle of May; at which time they may be tranſplanted into pots or borders, and expoſed to the open air. Theſe plants will require ſticks to ſupport them, otherwiſe their branches will trail upon the ground, and be apt to rot, eſpecially in a wet ſeaſon. There is no great beauty in this plant; it is chiefly preſerved as a rarity in the gardens of the curious. It produces its flowers in June, and the ſeeds are perfected in Auguſt.

CO'RN-MILL—AB (*Plate* XIV. *fig.* 14.) is an under ſhot wheel, upon whoſe ſhaft D is fixed a ſpur or cog-wheel (here called a face-wheel) E, whoſe cogs take the rounds of the trundle or lantern G, which carries round the mill-ſtone in the hurſt, or round from I, containing the nether mill-ſtone at V V, and the upper at N N; the axis fixed to the upper mill-ſtone being the iron bar F.

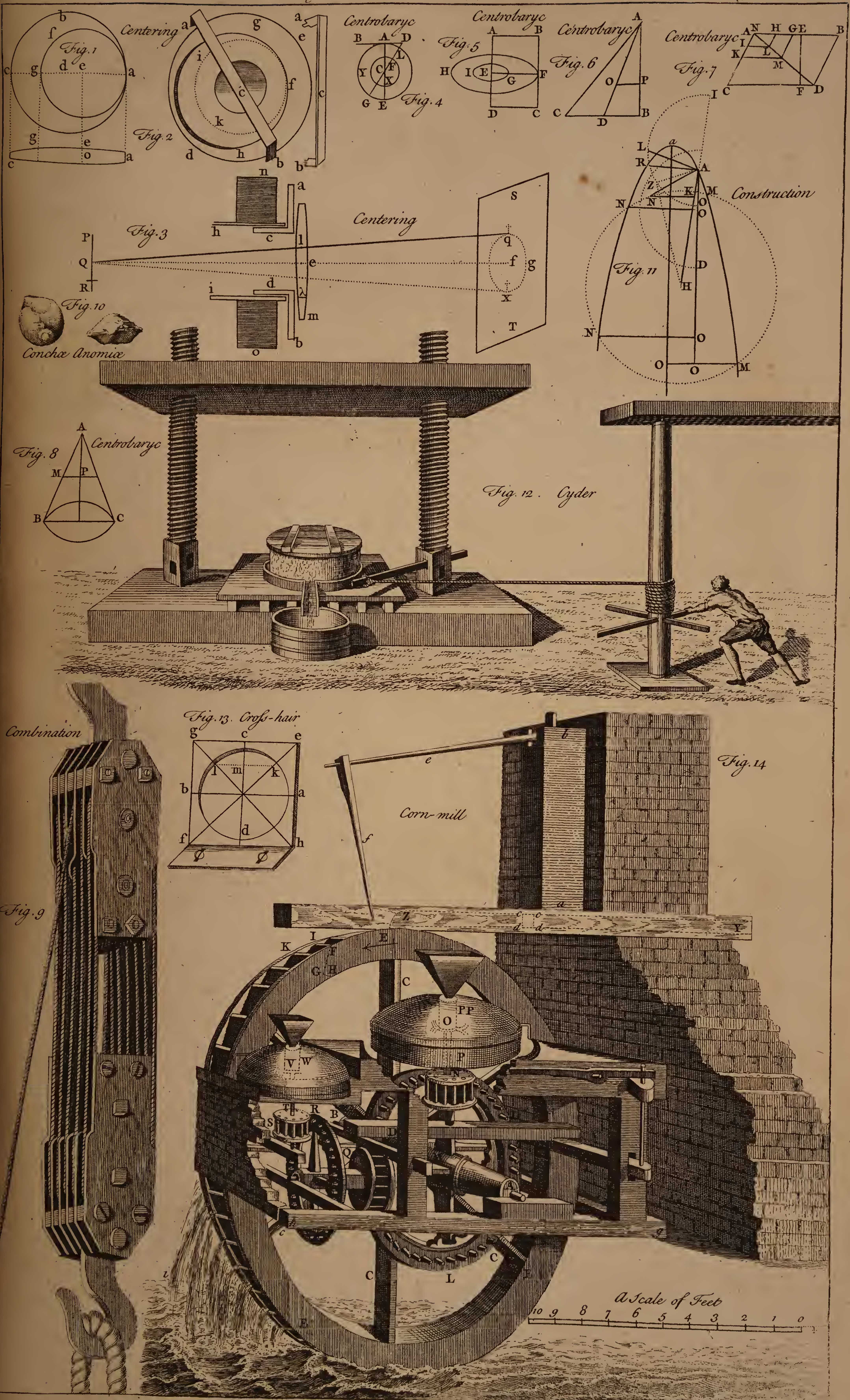
They commonly make theſe ſort of wheels from 12 to 18 feet in diameter, the float boards about $2\frac{1}{2}$, or three feet broad in their length, with an height of 10 or 12 inches. The ſhaft is 15 or 18 inches diameter.

The cog-wheel is generally eight feet diameter, meaſuring from the middle of the ſole (that is, where the cogs are put in to take the rounds of the trundle) on one ſide, to the ſame on the other. The ſole or rim of this wheel muſt be made of two pieces eight inches thick, croſſed one over the other, ſo as to have a breadth of eight inches. This wheel has 48 cogs four inches high, and $3\frac{1}{2}$ inches wide, 2 inches thick at the end, and $2\frac{3}{4}$ inches at bottom, becauſe of the heel. Their root is twelve inches long, and $2\frac{1}{4}$ thick, ſquare at top, and reduced to an inch and $\frac{1}{2}$ at bottom.

The lantern or trundle is made of two round pieces or flat heads of 22 inches diameter, and four inches thick, in which are ſet nine rounds of two inches and an half diameter, and 18 inches high; the center of theſe rounds is placed upon the circumference of a circle of nine inches radius, which muſt be taken for the diameter of the trundle. The rounds muſt be made of hard wood, as wild pear-tree, or crab-tree. Through the trundle goes an iron axis $2\frac{1}{2}$ inches ſquare, and of an height proportionable to the ſituation of the mill-ſtones, in reſpect to the poſition of the cog-wheel; it muſt be well faſtened to the upper mill-ſtone, and its bottom muſt be reduced to a pivot of about half an inch diameter, which turns in a ſocket let into the thickneſs of the horizontal ſupporting piece H. The ſame dimenſions are given to the parts of a wind-mill.

Here follow the names and the meaſures of all the parts of ſuch a mill, neceſſary when we would calculate its effect, which may be eaſily done by thoſe who underſtand algebra.

PLATE XV. *Engraved for the Supplement.* *Facing* Corn-mill.



Printed for J. Hinton in Newgate Street.

a = 8 feet, radius of the water-wheel.
b = 4 feet, radius of the cog-wheel.
c = 9 inches, radius of the trundle.
d = 2 feet, mean radius of the mill-ſtone.
f = $\frac{3}{4}$ of an inch, radius of the gudgeons of the wheel.
h = $\frac{1}{4}$ of an inch, mean radius of the end of the pivot of the mill-ſtone, or of the trundle.
p = 200 pounds, the force of the power that turns the wheel.
q = 1305 pounds, the friction of the centers.
r = 4348 pounds, the weight of the mill-ſtone, and the trundle and its axis.
x = the weight equivalent to the reſiſtance that the mill-ſtone meets with in grinding the corn.

Such a mill as this having its upper mill-ſtone of 6 feet diameter, and of about 4348 pounds weight, and which goes round about 53 times in an hour, may grind in 24 hours about 120 ſeptiers of corn, each weighing 75 pounds, when the ſtone is newly chipped or pecked, and is of a good quality; the hard and ſpongy ones being the beſt, &c. *Belidor's Hydraul.*

The following is a curious over-ſhot mill for grinding corn, at the Bar Pool, by the abbey in Nuneaton, in Warwickſhire.

In the perſpective drawing all care has been taken, to ſee as much as is neceſſary to ſhew the whole ſtructure of all the uſeful or moving parts of the mill; for which it is laid open or cut in ſuch ſections, as I judged beſt ſuited the purpoſe. The ſcale fits the orthography or fore right ſide of the frame or building; the other parts perpetually diminiſhing.

A B, (*Plate* XV. *fig.* 14.) The axle-tree or ſhaft of the water-wheel 13 feet long, and 17 inches diameter.

C C C. Having ſix arms fixed in it at D, 9 inches broad and 3 thick.

E E E. The ſole of the wheel is fixed, being 18 inches broad, and the ſhrouds 14 inches deep; having 30 buckets. Their breadth F I 17 $\frac{1}{2}$ inches. F G, depth 19. G H, the elbow to the ſide 4 inches.

I K. Their diſtance from one to another 17 inches and an half. The whole height or diameter of the wheel 16 feet.

L L. A cog-wheel placed on the ſame ſhaft by 4 arms at M, 7 feet diameter, having 48 cogs or teeth, which turns,

N. A wallower, pinion, or trundle 19 inches diameter, of 9 rounds or leaves, in which is fixed an iron ſpindle

N O. Going through the middle of the lower mill-ſtone P, moving in a collar, to which is fixed the rind O laid into the upper ſtone P P, which it bears up and turns about. That upper ſtone

P P. Whoſe diam. is 5. 8.
Thickneſs at the edge 0. 5.
Middle 1. 4.
And between the edge and the middle the convexity is about 1 inch $\frac{1}{4}$.

Q. A wallower 2. 4 diam. of 15 rounds, which is at pleaſure applied to the cog-wheel L L. On the ſame axis is

R. A cog wheel 5. 4 diam. of 40 cogs, turning

S. A wallower of 9 rounds, whoſe axis

T. Has a rind V at its top bearing and turning the upper mill-ſtone,

W. Which ſtones are uſed for grinding wheat for fine flower. They are 4 feet diam. 5 $\frac{1}{2}$ thick at the edge, 15 in the middle, with the convexity between 1 $\frac{1}{4}$.

X. The ſurface of the water in the pool lying 7 $\frac{1}{2}$ feet above the level or the top of the wheel.

Y Z. A trough or lander conveying the water from the pool at Y, and delivering it into the buckets of the wheel at Z. This trough is 12 inches ſquare within, having

a b. A penſtock upon it, whoſe cavity is the ſame, and

c d. An orifice 10 $\frac{1}{2}$ broad and 12 high, with a ſhuttle or ſluice to open and ſhut it, which lets the water upon the wheel, and is (generally) raiſed about two inches, by means of

e. A lever or balance fixed to its ſhank, by the handle *f.*

This mill will grind 30 buſhels in 12 hours.

The velocity of the { wheel 8, large ſtone 40 } per minute.

But as its force, power, action, &c. that are moſt wanting to be known, have, as yet, been but little conſidered: I ſhall here ſubjoin the calculus in ſuch a plain manner, as may be underſtood by any who are a little verſed in numbers; though to have done the ſame in an algebraic, or (ſome parts) in a fluxionary proceſs, would have been more elegant, but not ſo generally underſtood and examined.

For the velocity of the water and the wheel.

The water falls 7, 5 feet = 90 inches, which ſpace a heavy body falls in 41‴, and a double column of water iſſues forth, viz. 15 feet. Then in one minute there will be expended at the orifice 1350 feet = 16200 inches; and, the opening of that ſluice being 10. 5 × 2 = 21 inches area, there will be 1206 ale gallons fall on the wheel in a minute = 19 hogſheads 9 gallons, or 1148 hogſheads per hour.

2. The diameter of the wheel being 16 feet, the circumference is 50,3 feet;
Which multiplied by the revolution it makes in a minute — — — — — — — } = 8
The wheel goes in a minute, or its velocity 402,4 feet.

Then as 402 : 1350 :: 1 : 3,35; ſo the velocity of the water to the velocity of the wheel is as 3,35 is to 1.

3. The adjutage, as above, gives 1206 gallons, which, divided by 8, gives 150,7 ale gallons, which ÷ by 30, the number of buckets, gives 5,02 gallons to each bucket, that is, nearly 50lb. wt. of water in each bucket.

4. But, as only one bucket, viz. that horizontal with the axis, can act by a force of 50lb. on the longer end of the lever, the radius of the wheel E E (the ſhorter end being the radius of the cog-wheel L L) their forces in proportion to their centers of gravity will be different; which calculated, and from thence their ſtatical weights (as I call them) their forces will be (in a leſs number than half the buckets) as in the margin. The ſum of the weights in the laſt column will be 3 hundred and 66 pounds.

Buck	lb.	hun. lb.	Stat. Wt. lb.
1	50	1.0	6.8
2	50	2.6	17.6
3	40	4.3	29.2
4	50	5.6	38.
5	50	6.3	42.8
6	50	6.8	46.2
7	50	7.3	50.
8	50	7.2	49.5
9	42	6.8	38.
10	40	6.3	33
11	36	4.4	27
12	31	4.0	17
13	22	2.5	7

402,1 = 3 hund. 66lb.

5. But as a cubic inch of water weighs 58 ounces, and there are always falling 3780 cubic inches, the force impreſſed, were it on the tangent of the wheel, will amount to 137 lb. but the diſtance of the penſtock from the pool 6 feet. The force is in it and by the ſhuttle, as alſo its ſtriking obliquely on the paddles or buckets nearly to an angle of 45 degrees; from which conſiderations (and experiments I have made) its velocity, and conſequently force, is leſſened about one half: therefore I add only 60lb. to the ſum of ſtatical weights, and it makes 4 hund. 0q. 14lb. = 462 pounds.

6. Rad. wheel 8
Rad. cog-wheel 35)3696(1056 force at the cogs or trundle of the ſtone equal to 9 hund. 48lb. for the reſiſtance of the ſtones, the grinding, and the great friction of the ſtones and corn. Or 1056
× by rad. wall ,75
Rad. of the ſtone 2.8) 729(282,8lb. force at the periphery of the ſtone = 2 hund. 2q. 2lb.

7. The force on the wallower rounds (Q) 1056
The rad. of that wallower × 1.2
The rad. of the next cog-wheel 2.4)1261,2(526lb. force on the trundle (S) that carries the wheat mill, and 526 × rad. wall. 7 is = 3682 ÷ 24 rad. of the ſtone gives 153lb. force at the periphery thereof.

8. The great ſtone makes 5, 33 revolutions for the wheels 1, and 42, 4 times per minute.
Rounds, cogs (3.2
15 48 (× 8 times the wheel.
25,6
9)40(4,4 × 4,4
112,6 per min.

The velocity of the periphery of the great ſtone.
Its circumference 3136
× 42.4
754,72 feet in a minute.
Alſo the velocity of the ſmaller is 1407,5 feet per minute.

9. The weight of the mill-ſtones.
The great one contains 22,5 cubic feet = 1912 lb. = 17 hund. 0 q. 4 lb.

This water-mill is by moſt people accounted as good a one, as any the country affords, for diſpatching as much buſineſs in the time, and doing it well, though perhaps among the curious there may be ſome objections againſt its train (as the movement-makers call it) for they generally ſay that the pinion ſhould divide the wheel exactly, or be ſome aliquot part of it, which here it is not; for 9)4.8(5.33. but, had it been
4.5
40
9)54(6, it then had been ſuch. 27
0

However, this goes well, it is a very agreeable height 16 feet, the fall conſiderable 7 $\frac{1}{2}$ feet; for, the wheel being made 20 feet higher in the place it ſtands, it could not have been capable of doing ſo much buſineſs: of ſo much more ſervice is the impulſe, ſtroke, or momentum of the water, than is its bare ſtatical weight.

N. B. Our buſhel here generally holds $\frac{1}{32}$ parts more than the Wincheſter. *Beighton.*

M. Belidor, by the particular account he ſeems to give of under-ſhot mills, and their ſeveral parts; and the calculations concerning the operations of the parts ſingly, and the whole together; ſhewed that he had well examined thoſe mills: but he knew very little of over-ſhot mills, which he ſpeaks very ſlightly of, ſaying, that the millers value them very little; but it muſt be ſuch millers as live in a flat country, and are only uſed to mills upon rivers and large brooks; for, in hilly countries, the over-ſhot mills are of vaſt ſervice, and uſe of little water, as often to do good work by the water of ponds ſupplied by ſprings. As in this Nuneaton mill, with the expence of only 1148 hogſheads, or 287 tons per hour, thirty buſhels or 1800 pounds of corn are ground in twelve hours. The under-ſhot mill deſcribed by M. Belidor does indeed grind about twice and an half more corn, viz. 4500 pounds, in twelve hours; but it is with the expence of twenty-four times more water. For, if the ladle-boards of this under-ſhot mill be three feet long, and go twelve inches in water, and the adjutage, or paſſage of the water againſt them, be in the ſame proportion with an height of water ſeven feet and an half above the center of the adjutage, as in the over-ſhot mill; the expence of water will be 6820 tons per hour in the under-ſhot mill: whereas the expence of water in the over-ſhot, through an adjutage ten inches and an half wide, and two inches deep, is only 287 tons per hour.

I have had occaſion to examine many under-ſhot and over-ſhot mills, and generally found, that a well made over-ſhot mill ground as much corn in the ſame time as an under-ſhot mill, with ten times leſs water: ſuppoſing the fall of water at the over-ſhot to be twenty feet, and at the under-ſhot to be about ſix or ſeven feet. I generally obſerved, that the wheel of the over-ſhot mill was of fifteen or ſixteen feet diameter, with an head of water of four or five feet, to drive the water into the buckets with ſome momentum.

It is a difficult thing, and requires ſome experiments to determine, whether there ſhould be any impulſe given in an over-ſhot mill; or rather a wheel made of ſuch a large diameter as to receive the water without any percuſſion, by which means it may go with leſs water; and thoſe who are for this method alledge, that, beſides the obliquity of the impulſe when a fall is made uſe of, there is only the firſt beginning of the jet that can do any thing, the ſpouting water daſhing in the water that is already in the bucket, and making a froth. For my part, I can determine nothing certain in this for want of ſufficient experiments; but I think, that there might be ſome fall allowed, that the momentum might be uſeful at firſt, while the water ſtrikes againſt the wood of the bucket, before the bucket is ſo full that the water daſhes againſt water. The determining this, to know what part of the height of the fall muſt be taken for the diameter of an over-ſhot wheel, would be a uſeful maximum. Too great an impulſe might make the wheel go ſo faſt, that it might, as it were, withdraw itſelf from the action of the ſtatical weight.

The velocity that M. Parent determines, in his maximum, for the under-ſhot wheel, may perhaps be the beſt here; though it has not been demonſtrated to be ſo. But here it is ſo, the velocity of the wheel is the third of that of the water; and the goodneſs of this mill ſhews it to be right.

The objection which Mr. Brighton thinks may be made, as to the train, is of no force here; for though, in clock work, the number of the pinion ſhould equally divide the wheel, leſt a leaf of the pinion ſhould fall foul upon the edge of a tooth; it is an excellency in mill work, not to have the number of the trundle to be an aliquot part of the number of the ſpur wheel, becauſe, that way, the rounds are worn out too faſt, when the ſame cogs too often take the ſame rounds: and very likely this was done on purpoſe.

CORNUS, *the cornelian cherry*, in botany, a genus of plants, whoſe characters are:

The calyx, or flower cup, conſiſts of four ſmall rigid leaves, which are expanded in form of a croſs: from the center of which are produced many ſmall flowers, each conſiſting of four leaves, which are diſpoſed almoſt in form of an umbrella: theſe flowers are ſucceeded by fruit, which are oblong, or of a cylindrical form, ſomewhat like an olive, containing an hard ſtone, which is divided into two cells, each containing a ſingle ſeed. See *Plate* XVI. *fig.* 1. where *a* is the flower, *b* the flower ſeparate, *c* the fruit.

All the ſorts of Cornus may be propagated by their ſeeds, which, if ſown in the autumn ſoon after they are ripe, will moſt of them come up the following ſpring; but, if the ſeeds are not ſown in autumn, they will lie a year in the ground before the plants will appear; and, when the year proves dry, they will ſometimes remain two years in the ground; therefore, the place ſhould not be diſturbed, where theſe ſeeds are ſown, under two years, if the plants ſhould not come up ſooner: when the plants are come up, they ſhould be duly watered in dry weather, and kept clean from weeds; and, the autumn following, they may be removed, and planted in beds in the nurſery, where they may remain two years; by which time they will be fit to tranſplant, where they are to remain for good.

They are alſo propagated by ſuckers, and laying down of the branches; moſt of the ſorts produce plenty of ſuckers, eſpecially when they are planted on a moiſt light ſoil, which may be taken off from the old plants in autumn, and planted into a nurſery for a year or two, and then may be tranſplanted into the places where they are to remain; but thoſe plants which are propagated by ſuckers, rarely have ſo good roots as thoſe which are propagated by layers, and, being much more inclinable to ſhoot out ſuckers, whereby they will fill the ground round them with their ſpawn, they are not near ſo valuable as thoſe plants which are raiſed from layers.

CORO'LLA, among botaniſts, is the moſt conſpicuous part of a flower. It expreſſes the coloured tender part which ſurrounds the organs of generation. The parts it is compoſed of are called petals; if it conſiſt only of one piece, it is called monopetalous; if of more, it is ſaid to be dipetalous, tripetalous, and ſo on, as it conſiſts of two, three, four, or more parts.

CORO'LLARY, or CONSECTARY, in mathematics, is uſed for a conſequence drawn from one propoſition already advanced or demonſtrated: as if from this theorem, That a triangle, which has two equal ſides, has alſo two equal angles, this conſequence ſhould be drawn, that a triangle, which hath the three ſides equal, has alſo its three angles equal. *Ozanam, Dict. Math.*

CORO'NA, in anatomy, is that edge of the glans of the penis where the preputium begins.

CORONA, among botaniſts, expreſſes any thing growing on the head of the ſeed. The Coronæ of ſeeds are of various kinds; ſometimes ſimple, conſiſting only of a dentated membrane; ſometimes pappoſe, conſiſting of downy matter, which in ſome caſes is immediately fixed to the ſeeds; in others, its has a pedicle growing from it. Sometimes the Coronæ are compoſed of ſimple filaments, and ſometimes they are ramoſe.

CORONA *imperialis*, crown imperial, in botany, the name of a genus of plants, the characters of which are theſe: the flowers are collected into a ſort of crown near the top of the ſtalk, and have over them a large tuft of leaves. The flowers are of the liliaceous kind, being each compoſed of ſix petals. This piſtil ſtands in the center of the flower, and finally becomes an oblong fruit, edged with a ſort of membranaceous wings. This is divided into three cells, which contain a large number of ſeeds, of a flatted ſhape, lying cloſely upon one another. To this it is to be added, that the root is tunicated, and has a number of fibres iſſuing from its baſe.

There are ſeveral diſtinct ſpecies of this plant preſerved in the gardens of the curious, all which make a very elegant appearance; there are alſo a great number of varieties which are propagated from the ſeeds of one or other of the ſpecies, in the ſame manner with thoſe of the tulip.

When they are thus raiſed, the beſt time for tranſplanting them is in July or Auguſt, before they puſh forth new fibres; or they may be taken up out of the ground in June, after their green leaves are decayed, and kept till Auguſt, and then planted out into beds of rich earth, with ſome rotten dung buried deep in them. The moſt pleaſing method of planting them is at eight or ten feet diſtance, in the middle of long flower beds; a hole of ſix inches deep ſhould be opened with a ſpade, and the root put into it, and the earth put in with the hand upon it, and all the ſtones picked out, and the lumps broke. They now require no farther care, but in February will ſhoot up, and grow ſo quick, if the weather be mild, as to flower in March. As this is uſually a windy ſeaſon, it is proper to plant ſtakes in the earth, to tie theſe plants to, to prevent their being blown down; and it is a good caution never to gather the flowers, which much weakens the roots; they ſhould, therefore, always be ſuffered to die upon the ſtalks. The roots ſhould be removed once in three years, and their off-ſets ſeparated, and planted in beds. *Miller's Gard. Dict.*

CORONA *imperialis*, in conchyliology, a name given by authors to a kind of voluta, differing from the other ſhells of that family, by having its head ornamented with a number of points, forming a ſort of crown.

CORONI'LLA, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind, and the piſtil which ariſes from the cup, finally becomes a pod compoſed of many parts joined together by a ſort of articulation, each containing an oblong ſeed.

There have been pieces of amber found, with the pennated leaves of Coronilla included in them, and as elegantly expanded as the moſt curious botaniſt could have expected it, for preſerving them in his Hortus ſiccus. Breynius gives us an account of one of theſe pieces of amber, in which the middle part of one of theſe leaves was thus elegantly preſerved; he examined the ſpecimen with the greateſt accuracy, but could not find the leaſt fraud or deceit in it, and is very particular in the deſcription of the piece, and in the diſpoſition of the leaf in it.

C'ORPUS *Chriſti-day*, a feaſt held always on the next Thurſday after Trinity Sunday. It was inſtituted in the year 1264, in honour of the bleſſed ſacrament, to which alſo a college in Oxford is dedicated. We find it mentioned in 32 Hen. VIII, c. 21. By which ſtatute Trinity term is appointed for ever to begin the morrow after this feaſt.

CO'RTEX, the rind or bark of trees. The wounds of the bark, and its ſeparation from this wood, whether natural, or experimentally made, are eaſily cured, and made to unite again, by proper care. If ſections be made in the rinds of the aſh and ſycamore, of a ſquare figure, three ſides cut, and the fourth uncut, and the whole be afterwards bound round with a packthread, it will all unite again, only leaving a ſcar in each of the ſides where it was cut. If ſeveral parts of the bark of either of theſe trees be cut off, and intirely ſeparated from the tree, ſome ſhallower, leaving a part of the bark on, and others deeper, to the wood itſelf; theſe pieces being again put into their places, and bound on with packthread, will not indeed unite, but a freſh bark will grow in their places, and thruſt them away; but, if they be firſt carefully laid on in the exact direction, in which they originally grew, and then the whole part beyond the wound on every ſide covered with a large plaiſter of diachylon, or the like, and this bound over with packthread to keep all firmly in their places, the pieces of bark, whether cut off ſhallower, or deep down to the very wood of the tree, will firmly unite themſelves to the places where they originally grew. This cure will be performed in the ſpace of about three weeks; but the outer rind of the ſeparated pieces will not be plump, but ſomewhat ſhrivelled; the edges alſo will recede ſomewhat from their original place, ſo that there remains a ſort of ſcar all round. Theſe experiments are beſt made in the ſpring ſeaſon, for, in the autumn and winter, the ſap ariſing but weakly, the parts that ſhould unite wither before that is brought about. The ſucceſs of theſe experiments has made ſome think, that the whole branch of a tree, ſeparated and bound on again, might grow on again; but the experiments that have been made in the moſt favourable manner for ſuch a trial, have all proved vain, the branch cut off withering always in a few days, however well united, and carefully kept on. *Phil. Tranſ.* N°. 25.

CO'TINUS, *Venice ſumach*, in botany, a genus of plants, whoſe characters are:

It hath round leaves, with long foot-ſtalks: the flowers are ſmall, conſiſting of five leaves, which expand in form of a roſe; are diſpoſed in capillary branches of very ſlender and ſtiff filaments or hairs, which are widely diffuſed after the manner of plumes, and ſpring out of the top branches: in the center of the flower is ſituated the pointal, attended by five minute ſtamina: the pointal afterwards turns to an oval berry, incloſing one triangular ſeed.

The wood of this ſhrub is greatly uſed in the ſouthern parts of France, where it grows in great plenty, to dye their woollen cloths of a yellow colour, or feuillemorte; and the tanners uſe the leaves to prepare their ſkins; from whence it was called Coti coriaria.

CO'RVUS, *the raven*, is particularly uſed for a large bird of the crow kind, well known throughout the world, as being found in all climates, and all regions. The ravens build in high trees, or upon the ruins of old lofty buildings; they lay four, five, or ſix eggs, of a bluiſh green, variegated with ſpots and ſtreaks of black. There are many fabulous ſtories of the longævity of the raven, but birds are in general long-lived, and the crow kind not leſs ſo than the reſt. *Ray's Ornithol.*

Corvus, in antiquity, a machine, invented by the Romans, at the time of their wars in Sicily, when they firſt engaged the Carthaginian fleet. According to Polybius, the Corvus was framed after this manner: On the prow of their ſhips they erected a round piece of timber about one foot and a half diameter, and twelve feet in length, on the top of which was a block, or pulley; round this piece of timber was a platform of boards four feet in breadth, which was about eighteen feet long, and well framed and faſtened with iron; the entrance was longways, and it was moveable round the aforeſaid upright piece of timber, and could alſo be hoiſted up and down within ſix feet of the top: about this frame was a ſort of parapet knee high, which was defended with upright bars of iron, ſharp at the ends, and towards the top there was a riſing, by the help of which, and a pulley, or tackle, it was hoiſted and lowered at pleaſure; with this moveable gallery, they boarded the enemy's ſhips, when they did not lie ſide by ſide, ſometimes on their bow, and ſometimes in the after part of the ſhip; the ſoldiers, keeping the boſs of their bucklers level with the top of the parapet, &c. and by means of this new engine, got a victory over the Carthaginians in their firſt ſea fight with them, though the enemy were long before well ſkilled in naval affairs, and the Romans raw and ignorant.

Corvus *aquaticus*, in zoology, the name given by authors to the bird commonly known by the name of the cormorant. It is of the ſize of a gooſe, and is of a very deep duſky brown on the back, with ſome admixture of a greyiſh gloſs, and white on the belly and breaſt; its long wing feathers are greyiſh; its tail is a hand's-breadth and a half long, and when expanded, looks roundiſh at the end; its beak is between three and four fingers-breadths long, and is a little hooked at the end; its legs are very ſhort, but very thick and ſtrong, and, which is a very peculiar thing, are flat, or compreſſed, eſpecially while the creature is young; and another ſingularity is, that the baſe of the lower chap is covered by a naked yellow membrane, in the manner of the wild ſwan's beak; its legs are black, and covered with a ſeries of cancellated ſcales; the toes are all joined by one membrane. It builds not only among the rocks, but often alſo on trees. *Ray's Ornithol.*

CORY'ZA (*Dict.*)— This is a diſeaſe which few people trouble a phyſician about, being uſually left to nature; but it is, however, in the power of medicine to do great ſervice, and, uſually, wholly to remove the complaint; which, even where it is not attended with danger, is ſo far troubleſome, as that any one would wiſh to be rid of it. In caſes of a gravedo, a juſt and neceſſary excretion of the congeſted matter muſt be provided for; and this may eaſily be contrived to be made, by leſs troubleſome evacuations than thoſe to which nature ſeems to point, and by more convenient outlets; and, by continuing this method, the future diſtempers of this kind may be anticipated and prevented. For the ready diſcharge of the matter, according to the intent of nature, errhines are to be uſed; the powders of the cephalic herbs, as thyme, betony, lavender, and the like, may be ſnuffed up the noſe, and, by the volatile pungent ſalts, may be ſmelled to: by theſe means the mucid humour, which cauſed the infarction, will be rendered thin, and fitted to diſcharge itſelf. After this, it will be proper to give a gentle purge. And, when the cure is perfected, the return may be prevented by bleeding and purging in ſpring and autumn. When the defluxion is very violent, Stahl recommends the uſe of gentle diaphoretics, and of a powder compoſed of cinnabar, and a gentle opiate. In caſes where the matter of a Coryza is very acrid, and there is a violent pain in the head, the external uſe of camphor is of great ſervice; it is in this caſe to be applied to the temples; and the patient ſhould at the ſame time take, internally, powders compoſed of nitre and the common abſorbents, and diaphoretic antimony, and afterwards ſhould take ſome gentle purges, and frequently bathe the feet in warm water. *Junker's Conſp. Med.*

COSMO'LOGY, the ſcience of the world in general. This Wolfius calls general, or tranſcendental Coſmology, and has written a treatiſe on the ſubject, wherein he endeavours to explain how the world ariſes from ſimple ſubſtances; and treats of the general principles of the modifications of material things, of the elements of bodies, of the laws of motion, of the perfection of the world, and of the order and courſe of nature.

CO'STAR's *Engine*, an invention for raiſing water from mines. Devonſhire and Cornwall, where there are a great many mines of copper and tin, is a very mountainous country, which gives an opportunity in many places to make adits, as they call them, or ſubterraneous channels, or ſought from the bottom of the mine where the miners are at work, to ſome valley at a diſtance, a little lower at the bottom of the mountain, to carry off the water from the mine, which otherwiſe would drown them out from getting the ore. Theſe adits are ſometimes carried a mile or two, and dug at a vaſt expence, as of two, three, or four thouſand pounds, eſpecially where the ground is rocky. And yet they find this much cheaper than to draw up the water out of the mine quite to the top, when the water runs in plenty, and the mine is deep. Sometimes they cannot find a level near enough proper to carry to it an adit from the bottom: ſuppoſe the mine be 50 yards deep, and they can only find a level 25 yards above the bottom; yet they find it worth while to make an adit to ſave half the height to which the water is to be raiſed, thereby ſaving half the expence, and delivering the water into the trough L Z (*Plate* XIV. *fig.* 13.) where it runs off under ground without bringing it up to the graſs.

The late Mr. Coſtar, conſidering that ſometimes from a ſmall ſtream, and ſometimes from little ſtreams or collections of rain water, one might have a pretty deal of water above ground, though not a ſufficient quantity to turn an over-ſhot wheel; thought that, if a ſufficient fall might be had, that water might be made uſeful in raiſing the water from the bottom of the mine to the adit, and thereby ſave the expence of men and horſes uſed for that purpoſe: the fall to be had appeared to him to be C L; that is, from the graſs or mouth of the pit down to the adit, which here we will ſuppoſe 25 yards. Then he contrived to place a rag-wheel R R, with its chain or bucket pump at the mouth of the pit at C *c*, much after the manner of Francini, receiving the ſuperior waters brought into a collective ciſtern W, through a pipe A, leading it into the buckets B, making them go the reverſe way, becauſe in the common chain-pump the rag-wheel carries the buckets, but here the buckets carry the rag-wheel, down as far as the adit, into which they diſcharge themſelves at *b b*; and there turning another rag-wheel *r r*, whoſe axis works an engine bringing the water from the bottom, which is alſo delivered into the adit which carries away both the waters to the delivery at the bottom of the mountain at Z, which we ſuppoſe at a great diſtance from the mine. Any kind of engine may be worked by this lower rag-wheel, whoſe axis is H I; as, for example, a common chain pump, by making the rag-wheel ſufficiently deep; or cranks, as I have repreſented it at G *g* in the figure, working two pump-rods K K moving in the barrels M M, and delivering their water into the trough leading to the adit.

N. B. There muſt be a wheel fixed to the axis of the upper rag-wheel at C, to carry a pinion or ſmaller wheel D, having a fly E F, in order to regulate the motion of the whole machine, and prevent jerks.

CO'STUS *dulcis*, in the materia medica, the name of a root, which, being apt to contract a bitterneſs in growing old, is called in that ſtate, by many authors, bitter Coſtus, and ſuppoſed a different drug.

It is the root of the Coſtus Indicus violæ martis odore, called by the Indians tſianocua. It grows to ſix or ſeven feet high; the leaves are of a lively green, but ſomething paler on the upper ſide than the lower; the flowers are four-leaved, white, and ſhaped like a bell; the fruit is three-cornered, and divided into three cells, containing a number of triangular ſeeds. The root always contracts a bitterneſs, and grows darker-coloured in keeping, though, when freſh, it was pale and ſweet; and hence the ſuppoſed difference, the deſcriptions of authors agreeing alike to each, in all but theſe accidents.

The leaves of the common garden coſtmary are ſtomachic and detergent. They are given with ſucceſs againſt crudities of the ſtomach, belchings and vomitings after meals. They have alſo great reputation in curing an offenſive breath, heart-burns, and many of the moſt obſtinate and inveterate head-aches, the cauſes of which lie in the ſtomach.

COTE'SIAN *Theorem*, in geometry, an appellation uſed for an elegant property of the circle diſcovered by Mr. Cotes. The theorem is:

If the factors of the binomial $a^{\lambda} \pm x^{\lambda}$ be required, the index λ being an integer: let the circumference A B C D (*Plate* XVII. *fig.* 1.) the center of which is O, be divided into as many equal parts as there are units in 2λ; and from all the diviſions let there be drawn to any point P in the radius O A, produced if neceſſary, the right-lines A P, B P, C P, D P, E P, F P, &c. then ſuppoſing $OA = a$, $OP = x$, the product of all the lines A P, C P, E P, &c. taken from the alternate diviſions throughout the whole circumference, will be equal to $a^{\lambda} - x^{\lambda}$, or $x^{\lambda} - a^{\lambda}$, according as the point P is within or without the circle; and the product of the reſt of the lines B P, D P, F P, in the remaining alternate places, will be equal to $a^{\lambda} + x^{\lambda}$.

For inſtance, if $\lambda = 5$, let the circumference be divided into ten equal parts, and the point P be within the circle; then will $AP \times CP \times EP \times GP \times IP$ be equal to $\overline{OA}^5 - \overline{OP}^5$, and $BP \times DP \times FP \times HP \times KP = \overline{OA}^5 + \overline{OP}^5$. In like manner if λ be $= 6$, having divided the circumference into twelve equal parts, $AP \times CP \times EP \times GP \times IP \times LP$ will be equal to $\overline{OA}^6 - \overline{OP}^6$, and $BP \times DP \times FP \times HP \times KP \times MP = \overline{OA}^6 + \overline{OP}^6$.

The demonſtration of this theorem may be ſeen in Dr. Pemberton's Epiſt. de Coteſii Inventis.

By means of this theorem, the acute and elegant author was enabled to make a farther progreſs in the inverſe method of fluxions, than had been done before. But in the application of his diſcovery there ſtill remained a limitation, which was removed by Mr. de Moivre. See *Dr. Smith's Theoremata logometrica & trigonometrica, added to Cotes's Harmonia Menſurarum, p.* 114, 115. *De Moivre, Miſcel. Analyt. p.* 17, *& ſeq.*

COTESIAN *Theorem*, in dioptrics, a beautiful theorem invented by Mr. Cotes.

Prop. To find the apparent magnitude, ſituation, apparent place and degree of diſtinctneſs with which an object is ſeen through any number of glaſſes of any ſort, at any diſtances from each other, and from the eye and object.

Let P M (*Plate* XVII. *fig.* 2.) be an object viewed by the eye at O through any number of glaſſes at A, B, C, whoſe focal diſtances are the lines a, b, c. The diſtance O P may be conſidered as divided by the glaſſes A, B, C, into two parts, ſuch as P A, A O; P B, B O; P C, C O; or into three parts, ſuch as P A, A B, B O; P A, A C, C O; P B, B C, C O; or into four parts, ſuch as P A, A B, B C, C O; and ſo on as far as the number of glaſſes permits. All the ſeveral products of ſuch correſponding parts, applied reſpectively to the focal diſtance, or to the product of the focal diſtances of the glaſſes which are placed at the point or points of diviſion, will give ſo many ſeveral lines, which muſt be looked upon as negative, if there be an odd number of convex glaſſes at the points of diviſion, otherwiſe as affirmative. Let $P\Omega$ be the ſum of P O and thoſe ſeveral lines according to their ſigns, and let $P\Omega$ and P O lie the ſame way, if the ſum be affirmative, but contrary ways, if the ſum be negative; and Ω will be the point, at which the naked eye being placed, ſhall ſee the object under the ſame magnitude with which it appears through all the glaſſes, the eye being at O; and, therefore, the apparent magnitude of the object will bear the ſame proportion to the true magnitude, as the diſtance P O bears to the diſtance $P\Omega$.

The apparent ſituation of the object is alſo determined by the point Ω. For, if Ω and O be placed on the ſame ſide of the object, it will appear erect, otherwiſe inverted.

Imagine, now, the eye to be removed from O to C, ſo that its diſtance from the laſt glaſs may vaniſh; at the ſame time the point Ω will move to another place ω, which may be found as above. Let $O\gamma$ bear the ſame proportion to O C, which ΩP bears to $\Omega\omega$, and let the order of the points O, C, γ, be the ſame as the order of the points Ω, ω, P; then will γ be the apparent place of the object viewed at O, through all the glaſſes.

And, from the ſituation of this point γ, a judgment may be formed of the degree of diſtinctneſs with which the object appears. For the rays flowing from the point P, by paſſing through the glaſſes, are diſpoſed to fall upon the eye in the ſame manner, as if, the glaſſes being removed, they tended from the point γ when it is before the eye, or towards the point γ when it is behind the eye.

For let $a\,r$ (*Plate* XVII. *fig.* 3.) be the firſt image of the object made by the glaſs A; $\beta\,s$ its ſecond image made by the glaſs B; $\gamma\,t$ its third image made by the glaſs C. It is evident that the object P M and its image $a\,r$ will be terminated by the ſame lines PAa, MAr; that the image $a\,r$ and its image $\beta\,s$ will be terminated by the ſame lines $aB\beta$, rBs; that the image $\beta\,s$ and its image $\gamma\,t$ will be terminated by the ſame lines $\beta C\gamma$, sCt. Now, if the eye be placed at O, and $\gamma\,t$ be the laſt image, it is manifeſt, that the object ſeen through all the glaſſes will appear under the ſame angle which is really ſubtended by the image $\gamma\,t$. Draw therefore $M\Omega$ parallel to $t\,O$, making the angle $P\Omega M$ equal to $\gamma O t$, and the naked eye, being placed at Ω, ſhall ſee the object P M under the ſame magnitude with which it appears through all the glaſſes, the eye being at O. And, conſequently, the apparent magnitude ſhall be to the true magnitude, as the angle $P\Omega M$ to the angle P O M, or as the diſtance P O to the diſtance $P\Omega$. Let us at firſt ſuppoſe all the glaſſes to be concaves. The diſtance $P\Omega$ will be to P A, as the angle P A M to the angle $P\Omega M$, or, as aAr to $\gamma O t$; or in the compound ratio of aAr to aBr, $\beta B s$ to $\beta C s$, $\gamma C t$ to $\gamma O t$, that is, in the compounded ratio of $aA + AB$ to aA, $\beta B + BC$ to βB, $\gamma C + CO$ to γC. Therefore $P\Omega = PA \times \frac{aA + AB}{aA} \times \frac{\beta B + BC}{\beta B} \times \frac{\gamma C + CO}{\gamma C}$ &c. by which theorem the diſtance $P\Omega$ is given ſo ſoon as aA, βB, γC, can be found. Theſe are found as follows, $\alpha A = \frac{PA \times a}{PA + a}$ $\beta B = \frac{\alpha A + AB \times b}{\alpha A + AB + b}$, $\gamma C = \frac{\beta B + BC \times c}{\beta B + BC + c}$.

Whence it is eaſy to conclude, that, if the eye at B views the object P M through one glaſs at A, $P\Omega$ will be equal to $PB + \frac{PAB}{a}$; that, if the eye at C views the object P M through two glaſſes A and B, $P\Omega$ will be equal to $PC + \frac{PAC}{a} + \frac{PBC}{b} + \frac{PABC}{ab}$; that, if the eye at O views the object P M through three glaſſes A, B, and C, $P\Omega$ will be equal to $PO + \frac{PAO}{a} + \frac{PBO}{b} + \frac{PCO}{c} + \frac{PABO}{ab} + \frac{PACO}{ac} + \frac{PBCO}{bc} + \frac{PABCO}{abc}$; and ſo forwards continually as the ſolution of the problem directs. Now, if any of the glaſſes be convex, the focal diſtances of ſuch glaſſes muſt be looked upon as negative, ſince they are contrary to thoſe of concave glaſſes; and, therefore, the terms which involve an odd number of convex glaſſes at the points of diviſion, muſt be taken as negative. Q. E. D. 1°.

The point M is ſeen immediately through the glaſſes by the ray $t\,O$, which enters the eye at O in a direction parallel to $M\Omega$ by conſtruction. If therefore Ω fall on the ſame ſide of the object as O, the ray $t\,O$ muſt advance towards the eye, from the ſame ſide of the common axis O P as the point M; and, conſequently, the object will appear through the glaſſes erect. But, if Ω falls on the contrary ſide of the object to the point O, the ray $t\,O$ which advances towards the eye in a direction parallel to ΩM, muſt appear to come from the contrary ſide of the axis to the point M; and, conſequently, the object will appear through the glaſſes inverted. Q. E. D. 2°.

By conſtruction the lines $M\Omega$, $M\omega$, MP, $P\Omega$, are reſpectively parallel to the lines tO, tC, $t\gamma$, γO; and, therefore, the figure $M\Omega\omega P$ is ſimilar to the figure $tOC\gamma$. Hence it follows, that $O\gamma$ the diſtance of the laſt image from the eye, or the diſtance of the apparent place of the object from the eye, is to O C as ΩP is to $\Omega\omega$; and that the order of the point O, C, γ, will be the ſame as the order of the points Ω, ω, P. Q. E D. 3°.

The point γ being the laſt image of the point P, the rays which flow from P, after they have paſſed through all the glaſſes, will flow from or towards the point γ. Q. E. D.

COUCH, in heraldry, a term uſed to expreſs the ſhield of a coat of arms, when it does not ſtand erect, but hangs downward. The origin of this poſition of ſhield ſeems to have been, that the perſons who were to fight in tournaments were compelled, from the time that proclamation was made till the day of fighting, to hang up their ſhields, by one corner, from the windows or balconies of the neighbouring houſes, or on the trees or barriers of the ground, if the exerciſe was performed in the field. The horſe combatants hung up their ſhields by the left corner, and the foot combatants by the right. Hence the left corner, hanging, became the moſt honourable, and we ſee, in all the ſons of the royal blood of England and Scotland, that the ſhields with their arms all hang that way. Some writers on heraldry expreſs this diſpoſition by the word pendant. *Niſbet's Heraldry.*

COU'LTER, in heraldry, that part of the plough which forms the edge, ſtanding before the ſhare of the plough, and cutting the clods, as the ſhare tears them up. The Coulter is an inſtrument of two feet eight inches in length, of near two inches breadth, and near one inch thick. It is driven through the beam of the plough, and fixed in its proper direction by a wedge. See PLOUGH.

The modern improvement of the plough by Mr. Tull gives it four Coulters; the conſequence of which is, that the earth, ploughed up, is cut four times as ſmall as by the common plough, which has only one.

In all Coulters, the length and direction are to be nicely regulated. The cutting the hole and driving the wedge, regulate the direction, and its length is altered from the beam by the driving it farther down, as its point wears away. The firſt Coulter in all ploughs ought to be laid in the beam, in the following manner: its back is to bear againſt the back of the Coulter-hole, its right ſide above, to bear againſt the upper edge of the Coulter hole, and its left ſide to bear againſt its lower edge; ſo that there ſhould always be at leaſt three wedges to hold the Coulter; the pole wedge before it, another on the left ſide of it above, and a third on the right ſide underneath; and the hole muſt be ſo made, that, the Coulter ſtanding thus acroſs the hole, its point may incline ſo much towards the left, as to be about two inches and a half farther to the left than the point of the ſhare, if it were driven down ſo low as it. But it never ought to be ſo low in any plough. As to its bearing forward, the point of the Coulter ſhould never be before the middle of the point of the ſhare; but, if it be ſet too obliquely, it will, in the working, have greater power to move up the pole wedge and get looſe.

In the four-coultered plough, the three additional Coulters muſt all ſtand in the ſame poſition with this, in regard to the inclination of their points one to another. This is a vaſt advantage to them; for by this means, when the fin of the plough is raiſed up, by turning the handles towards the left, their points do not riſe out of the ground, as they would do, were it not for this inclination. In regard to their pointing forward, experience ſhews, that it is beſt that every one of the three ſhould be a little more perpendicular than that next behind it; by this means there is a greater ſpace left between them above than below, and the roots of weeds can never clog them up as they otherwiſe would do, and by that means raiſe the plough out of the ground, if not picked clean by a man at times.

None of theſe Coulters ought to deſcend ſo low as the ſhare, except when the land is to be ploughed very ſhallow; it is always ſufficient for them to cut through the turf, let the plough go as deep as it will; in ploughing ſhallow, the fin of the ſhare muſt alſo be broad enough to cut off the fourth piece or furrow; elſe that, lying very faſt, will be apt to raiſe up the groundwriſt, and throw out the plough; but, when the land is plowed deeper, the groundwriſt will break off this fourth furrow, though the fin be not broad enough to reach it. *Tull's Huſbandry.*

COU'NCIL (*Dict.*)—The firſt general Council ever ſince the time of our Saviour was the Nicene, ſo called from the place where it was held, viz. Nice, a city of Bithynia, a province in Aſia Minor, formerly called Bebrycia and Mygdonia, and now, by ſome, Burſia, by others, Beſcangial, and, by the Turks, Oſmanili.

But, though the place in which this moſt renowned Council was convened is univerſally agreed upon, the preciſe time of its celebration is not ſo certainly determined. That it was held in the reign of Conſtantine the Great, the firſt Chriſtian emperor, as it had been ſummoned by his honourable letters, is very evident from Euſebius, an eye-witneſs, and a very ſignificant party in it; from Socrates, and other hiſtorians; beſides the concurring teſtimony of the whole Council itſelf to atteſt it. But then, about the time, authors are not ſo unanimous. For, whereas ſome place it under the year of our Lord 324, others make it in 325; ſome again in 328, and others in 330. But our modern writers, in general, place it in the year 325: which ſeems to be the truer account, eſpecially if we follow the authority of the forenamed Euſebius; who ſays that Conſtantine made a royal entertainment at the concluſion of that Council, for the fathers of it, in the 20th year of his reign; which began immediately upon the demiſe of his father Conſtantius, in the year 306.

However, what gave occaſion for calling this holy and œcumenical or general Council, we have more certain knowledge of, viz. The hereſy of Arius, a preſbyter of the church of Alexandria; who began to vent his pernicious doctrines againſt the divinity of our bleſſed Saviour, about the year of our Lord 317.

The place appointed for the meeting of this Council being the city of Nice, all neceſſary preparations were made for the reception of ſo venerable a body; and indeed, not only venerable, but numerous; for there came to this aſſembly, beſides a very great appearance of biſhops from all parts, of preſbyters, deacons, acolyths, &c. an innumerable company: all whoſe expences were liberally ſupplied out of the emperor's treaſure. But, beſides thoſe of the clergy, there were many others, diſputants and orators, who likewiſe attended.

After having determined the differences which troubled the church, they proceeded to make ſome rules for the diſcipline of it, which were called canons. Of theſe there were only twenty, according to Theodoret, though Ruffinus makes twenty-two; but that is by dividing two of them to make up that number; ſo that, in truth, he owned no more than twenty; of which the reader may ſee an account in *Du Pin's Eccleſiaſtical Hiſtory.*

The ſecond general Council, ſince the times of Chriſtianity, was held at Conſtantinople, under the reign, and by the command of Theodoſius the Great, though, the year is not certainly agreed among hiſtorians; ſome aſſerting that it was in the year 313, while others place it in 385: but Mr. Du Pin differs from them all; for he ſeems to make it a year earlier than the earlieſt of them, viz. 312: but this admits of ſome doubt.

The occaſion of calling this Council was much the ſame with that for calling the Nicene, viz. to curb the inſolence of the Arians, by a ratification of the Nicene confeſſion, and to ordain a biſhop into the ſee of Conſtantinople from whence Gregory of Nazianzen was reſolved to depart.

In this Council Proſper ſays there were 180 biſhops preſent, though Socrates and ſome others mention but 150. But, when Proſper reckons 180, it is not improbable that he includes the Macedonian biſhops in that number, becauſe they were ſummoned as well as the Catholics, and thirty-ſix of them appeared. And what very much favours this conjecture is this, that we find afterwards, that 150 biſhops were preſent at the election of Nectarius, when the Macedonian biſhops were departed from Conſtantinople.

The canons which Mr. Du Pin aſcribes to this general Council, are ſeven.

The third general Council was that of Epheſus, convened by Theodoſius junior, at the ſuit of Neſtorius himſelf; and promoted by pope Celeſtine, the firſt of that name, about the year of our Lord 434, according to Proſper's computation; though ſome others make it a year later: but the difference is not very material.

That this Council alſo was aſſembled by the imperial mandate, beſides the authority of Evagrius, we have the words of the Council itſelf, in an epiſtle to the emperors: 'The holy Council, which was gathered together by the grace of God, and by the authority of your dominion, in the chief city of the Epheſians, &c.'

There are, as biſhop Prideaux obſerves, two copies of this Council; the firſt containing eight, the ſecond thirteen canons; all which are comprehended in the anathema's of St. Cyril, to which we refer the reader.

The fourth general Council was the general Council of Chalcedon, a city in Bithynia, lying directly over-againſt Conſtantinople. This Council alſo, as the former, was convened by the authority of the emperor.

The preciſe year in which this Council was celebrated, is no more certain than any of the former: ſome placing it in 454, others in 455, and Mr. Du Pin, according to cuſtom, three or four years before the reſt, viz. in 451: though, if it be true, that this Council was convened in the third year of Martianus, which Mr. Sympſon aſſerts, and Martianus came to the throne in the year 450, as biſhop Prideaux ſays he did, it is evident that neither of the former computations are to be depended upon. However that be, this Council was held in the great church of St. Euphemia in the city of Chalcedon, in the preſence of the commiſſioners, officers of the emperor, and counſellors of State, who regulated every motion of it, and were ſeated in the middle of the aſſembly. Some writers ſay, that the emperor himſelf was there in perſon, and that he intreated all the fathers not to attribute it to oſtentation of his power that he ſat there, but to his earneſt deſire that the true faith ſhould be confirmed and eſtabliſhed.

Concerning the preſident of this Council there is no certainty, unleſs perhaps the emperor himſelf preſided: neither is the number of biſhops, &c. any better determined; for ſome ſay there were about 600, others 630; but Mr. Du Pin ſays, there are but 350 in the ſubſcriptions: however, it is moſt generally received, that the number was 600 or upwards, and that this was the moſt numerous Council that had ever been.

Several very great men were preſent at this Council, and even ſome who had been inſtrumental in the condemnation of Neſtorius. Notwithſtanding, by ſome ſtrange infatuation, the wicked opinion of Eutyches was approved by this Council; Eutyches himſelf, with 300 monks, all involved in this hereſy, and excommunicated by Flavianus, were abſolved, and the tables were turned upon Flavianus, for they excommunicated him; and not only ſo, but the faction of Eutyches moſt barbarouſly treated him, trod him under foot, and ſo wounded him, that he died in three days time. In this ſynod alſo were condemned ſeveral pious and learned men, Ibas of Edeſſa, and Theodoret of Cyrus in particular, beſides Euſebius of Doryleum, &c.

During the whole time of the ſitting of this Council, the place was environed with very ſtrong guards, which Chryſaphius brought with him, to compel thoſe biſhops who would not comply to favour the Eutychian hereſy: from hence this ſecond Council of Epheſus was by the antients called ληϛρικὴ, as if it had been nothing elſe but a convention of robbers.

The tranſactions of this Council are ſet down at large in Mr. Du Pin's Eccleſiaſtical Hiſtory, Cent. 5. to which we refer the curious reader.

Beſides this, there are thirty canons aſcribed to the Council of Chalcedon; though Mr. Du Pin is of opinion, that the collection of them was not made in any ſeſſion of the Council; but that they were compoſed ſince, and taken out of the ſeveral actions: however, he ſet them down in order. The firſt of them commands, that the canons made by preceding Councils be obſerved. The ſixth forbids the ordination of any clergyman, abſolutely, and without a church title. The eighth enjoins the clergy that belong to monaſteries and chapels of martyrs, to be ſubject to their biſhop. And the twenty-eighth grants to the church of the city of Conſtantinople, which is called new Rome, the ſame privileges with old Rome, becauſe this city is the ſecond city in the world. It alſo adjudges to it, beſides this, the juriſdiction over the dioceſes of Pontus, Aſia, and Thrace, and over the churches which are out of the bounds of the emperor, and a right to ordain metropolitans in the provinces of their dioceſes. Theſe are the moſt material canons of this Council: the reſt, which principally concern only clerks and monks, are of leſſer moment, and for that reaſon we ſhall not trouble the reader with them.

The fifth general Council was held again at Conſtantinople, and is therefore called the ſecond of that place. It was gathered by the emperor Juſtinian: for Evagrius ſays thus: Euſtachius being biſhop of Jeruſalem, Juſtinian gathered together the fifth Council. And ſo Nicephorus: The emperor Juſtinian gathered together the fifth holy general Council, the biſhops of all churches being called together.

The time in which this Council was held is as uncertain as the reſt, ſome placing it in the year 551, others in 552, and Mr. Du Pin in 553.

The number of biſhops aſſembled at this Council was 165, according to ſome; though Mr. Du Pin ſays, there were but 147, beſides the eaſtern patriarchs; and that all the biſhops preſent at it belonged to their patriarchates.

In the meetings of this Council, what they did, principally was, they condemned the three chapters; having firſt diſcuſſed that great queſtion, whether it was lawful to anathematize the dead? and paſſed it in the affirmative. Mr. Du Pin ſays, When the extracts taken out of the books of Theodorus of Mopſueſtia, and the creed attributed to him, were read, the biſhops, without any further examination, cried out anathema againſt the writings, againſt the creed, and againſt the perſon of Theodoſius; an anathema to thoſe who did not anathemize him.

Mr. Du Pin ſeems to think, that this buſineſs of the three chapters was the whole employment, and took up all the time of this Council. But ſome other authors tell us, that the ſeveral errors of Origen about the trinity, the plurality of worlds, and the pre-exiſtence of ſouls, were condemned by it: and that his whimſical opinions, that the heavens and the ſtars are animated; that the glorified bodies ſhall be of a round figure; and that the torments of the damned ſhall have an end, were utterly exploded.

There are extant eight collations of this Council, and fourteen canons, which are all contained in their anathema's, according to biſhop Prideaux; though Mr. Collier ſays, that neither this nor the following Councils made any canons, and that the Quiniſex Council, or the Council in Trullo, was called afterwards to ſupply the defect.

The ſixth general Council, being the third of Conſtantinople, was held in that city, by the command of Conſtantinus Pogonatus the emperor, ſo called from his bringing home with him a long beard from the wars, whereas he went forth without one. This Council was aſſembled in the twelfth year of that emperor, and of our Lord 781, according to ſome; though Mr. Du Pin ſays it was a year ſooner, and yet makes it the thirteenth of that emperor, notwithſtanding he began his reign in 769.

The moſt remarkable tranſactions of this Council were theſe: the patriarchs of Conſtantinople and Antioch were accuſed of teaching that there was but one will in Jeſus Chriſt; which Macarius of Antioch publicly and ſtrenuouſly maintained in the Council; but the patriarch of Conſtantinople retracted, with all the biſhops of his patriarchate, except Theodoret of Meletinum.

In the ſeventeenth ſeſſion they alſo received the definitions of the five firſt general Councils, and particularly that of the fifth general Council againſt Origen, againſt Theodorus of Mopſueſtia, &c. They recited the creeds of Nice and Conſtantinople, and approved the definition of the Council held at Rome by Agatho, againſt the Monothelites.

As for the canons of this Council, the reader is to expect no more from it, than were made by the former, according to Mr. Collier, i. e. juſt none: though there are who make the ſubſequent Council in Trullo, as it were, an appendix to it; and, if ſo, there are more canons of this Council, than of all the general Councils before it.

But, before we diſmiſs this ſixth general Council, it will be neceſſary to obſerve, that, though this Council under Conſtantinus Pogonatus is commonly reckoned one of the Councils acknowledged by the ancients to be general, there are ſome writers of great authority, who rather give that title to the next ſucceeding Council, held at Conſtantinople, under the reign of Juſtinian the Second: and this, they ſay, was the ſixth general Council, not that in the reign of Pogonatus. Among the writers who are of this opinion, is the right reverend and judicious biſhop Beveridge; for he ſays thus: 'The ſixth general Council is that which is commonly called the Tertullian Council, gathered together by Juſtinian, the ſon of Conſtantinus Pogonatus.'

In this Council 102 canons of diſcipline were ratified according to Mr. Du Pin and others; ſeveral of which are in direct oppoſition to the practice of the modern Latin church, tho' they were ſo agreeable to the ſentiments of the ancients, that Gratian ſays this ſynod was received by the fathers of the ſecond Nicene Council.

The ſecond Nicene Council is generally allowed to be the ſeventh general Council; though Mr. Sympſon reckons another before it, viz. a fourth Council held at Conſtantinople, under Conſtantinus Copronymus, or Conſtantine the fourth of that name: and this Council, conſiſting of 338 biſhops, he ſays, was aſſembled by the command of that prince, in the year 755 (Mr. Du Pin ſays in 750) in order to aboliſh the worſhip of images, which for ſome time before had prevailed mightily in the Eaſt. What Copronymus deſigned he alſo effected by the means of this Council; for in it ſeveral defenders and champions of image-worſhip were condemned, and a decree made againſt the uſe and worſhip of them. However, as Mr. Sympſon obſerves, though they aboliſhed one, they introduced another ſuperſtition, not leſs dangerous in the conſequence than the former; for in the fifteenth and ſeventeenth canons of this Council, which are nineteen in number, they allow of the invocation of ſaints. But this Council was not received in the church of Rome, though a great part of the Eaſtern churches received it, by the emperor's authority, and put the decree againſt images in execution; till at laſt the reins of the government came into the hands of Irene the empreſs, widow to Leo III; ſhe aſſembled another Council, to diſannul the decree againſt images, in the reign of Copronymus. To this Council ſhe invited pope Adrian, who ſent two prieſts, as his deputies, to Conſtantinople, where this Council was deſigned to meet; and did meet in the year 786, according to Mr. Du Pin, others ſay in 788, till the ſoldiers beſieged the biſhops, and required with threatenings, that no Council ſhould be held. Hereupon they were forced to ſeparate for that time: but in the latter part of the next year they were aſſembled again at Nice, by the ſame authority, when the pope's legates held the firſt place, the patriarch of Conſtantinople held the ſecond, the deputies of the eaſtern biſhops the third, and after them the biſhops of Cæſarea, Epheſus, and Cyprus, with 250 archbiſhops or biſhops, and above 100 prieſts or monks.

There are twenty-two canons of this Council yet extant.

We come now to ſpeak ſomething of the eighth general Council, which, properly ſpeaking, was the fourth of Conſtantinople: biſhop Beveridge ſays, the eighth general Council was gathered together at Conſtantinople by the emperor Baſil; and he cites the authority of the acts of that Council to prove it. And, if this be ſufficient to prove this one of the famous general Councils of the Greeks (and we are giving an account of thoſe Councils only) this was one of thoſe famous Councils. But biſhop Prideaux, though he ſays this fourth Council at Conſtantinople was aſſembled under Baſil; he alſo ſays it was aſſembled under Baſil, the murderer of the Greek emperors, and Adrian the Second, uſurping the Roman ſee, notwithſtanding the oppoſition of the Roman emperor. And for this reaſon it is, as may be conceived, that he places this Council in the number of the controverted general Councils.

However, as the learned biſhop Beveridge, and ſome others, give this Council a place among the œcumenical or general Councils, and hold none to have been general after this; it cannot be a fault to enliſt this Council, upon that great authority, in the number of the more famous general Councils.

This eighth general Council aſſembled at Conſtantinople in the year 869, as Mr. Du Pin ſays, though others ſay in 871, when Lewis II. (the Weſtern empire being now entirely divided from the Eaſtern) was emperor of the Weſt.

The regulations made by this Council are contained in 27 canons, the heads of which are ſet down by Mr. Du Pin in his account of this Council; to which the reader is referred.

Theſe, as biſhop Beveridge obſerves, are all the Councils allowed by the Greek church, or any other, except the papiſts. The famous Bullinger, in his treatiſe De Conciliis, it muſt be owned, allows but the ſix firſt of theſe Councils to be properly called œcumenical, or general: but Dr. Prideaux reckons the ſeventh among them; and biſhop Beveridge has increaſed their number to eight, which he ſays are all the general Councils which have ever been held ſince the time of the firſt Chriſtian emperor.

COUNTER-GUARD *(Dict.)* — *To conſtruct a* COUNTER-GUARD. — Having deſcribed the ravelins and drawn their foſſes, then in the counter-ſcarp of the ravelin take *a b* (*plate* VI. *fig.* 21.) equal to about twenty-four yards, and draw the face *b c* parallel to the counter-ſcarp of the foſs before the baſtion; and the out-line of the Counter-guard will be determined, the inner boundary being the counter-ſcarp of the grand foſs.

In this work put a rampart of about ſixteen or eighteen yards broad, with a parapet of ſix yards, and annex the ramps and a barbet, a barbet, if neceſſary: alſo make a foſs of twenty-four yards broad, the counter-ſcarp being parallel to the faces.

The Counter-guard ſeems to be, next to the ravelin, one of the moſt uſeful outworks; for it occupies but little ground, is of no great expence, covers the faces of the baſtion ſo effectually, that they cannot be battered in breach until the enemy has made himſelf maſter of this work; and, when he has it, he will meet with difficulties enough in finding earth to cover himſelf and erect batterries; and muſt, therefore, be at a conſiderable trouble in bringing it from beyond the foſs, while he is expoſed to the fire of the faces of the neighbouring ravelins; which, with the flanks of the baſtions, are the defences of the Counter-guard.

COU′NTER-*drawing*, in painting, &c. the copying a deſign or painting, by means of a fine linen cloth, an oiled paper, or other tranſparent matter; whereon the ſtrokes, appearing thro', are followed and traced with a pencil, with or without colour.

COUNTER-*mark*, a ſecond or third mark, put on any thing marked before.

The word is applied, in commerce, to the ſeveral marks put on a bale of goods belonging to merchants, that it may not be opened but in the preſence of them all, or their agents.

In goldſmiths works, &c. the Counter-mark is the mark or punchion of the hall, or company, to ſhew the metal is ſtandard, added to that of the artificer who made it.

COUNTER-mark of a horſe, is an artificial cavity, which the jockies make in the teeth of horſes that have outgrown the natural mark, to diſguiſe their age, and make them appear as if they were not above eight years old.

COUNTER-mark of a medal, is a mark added to a medal, a long time after its being ſtruck.

Counter-marks appear to be faults or flaws in medals, diſfiguring the ground, ſometimes on the ſide of the head, and ſometimes on the reverſe; particularly in the large and middle-ſized braſs: yet are they eſteemed as beauties among the curious, who ſet a particular value upon ſuch medals, in regard they know the ſeveral changes in value they have undergone; which are expreſſed by thoſe Counter-marks.

Antiquaries, however, are not well agreed about the ſignification of the characters they find on them. On ſome, N. PROB. on others, N. CAPR. on others, CASR. RM. NT. AVG. SC. Some have, for their Counter-mark, an emperor's head; ſome ſeveral; ſome a cornucopia.

Care muſt be taken not to confound the monograms with the Counter-marks; the method of diſtinguiſhing them is eaſy. The Counter-marks, being ſtruck after the medal, are dented or ſunk in; whereas the monograms, being ſtruck at the ſame time, with the medals, have rather a little relievo.

COU′RIER (*Dict.*)—The ancients alſo had their Couriers: we meet with two kinds, viz. thoſe who ran on foot, called by the Greeks hemerodromi, q. d. Couriers of a day. Pliny, Corn. Nepos, and Cæſar, mention ſome of theſe, who would run 20, 30, 36, and, in the circus, even forty leagues per day.—And riding Couriers, curſores equitantes, who changed horſes, as the modern Couriers do.

Xenophon attributes the firſt Couriers to Cyrus. Herodotus ſays, they were very common among the Perſians, and that there was nothing in the world more ſwift than theſe kind of meſſengers. 'That prince, ſays Xenophon, examined how far a horſe would go in a day; and built ſtables, at ſuch diſtances from each other, where he lodged horſes, and perſons to take care of them; and at each place kept a perſon always ready to take the packet, mount a freſh horſe, and forward it to the next ſtage: and this quite through his empire.'

But it does not appear, that either the Greeks or Romans had any regular fixed Couriers, till the time of Auguſtus: under that prince they travelled in cars; though it appears from Socrates, they afterwards went on horſeback.

Under the Weſtern empire, they were called viatores; and, under that of Conſtantinople, curſores: whence the modern name.

COU′RSING.—There are three ſeveral courſes with greyhounds. 1. At the hare, 2. At the fox, and 3. At the deer. For the deer there are two ſorts of Courſes, the one in the paddock, the other either in the foreſt or purlieu. For the paddock Courſe, there muſt be the greyhound and the terrier, and the mungril greyhound, whoſe buſineſs it is to drive away the deer before the greyhounds are ſlipped; a brace, or a leaſh, are the uſual number ſlipped at a time, ſeldom at the utmoſt more than two brace.

In the Courſing the deer in the foreſt or purlieu, there are two ways in uſe; the one is Courſing from wood to wood, and the other upon the lawns by the keeper's lodge. In the Courſing from wood to wood, the way is to throw in ſome young hounds into the wood, to bring out the deer; and, if any deer come out that is not weighty, or a deer or antler, which is buck, ſore, or ſorrel, then you are not to ſlip your greyhounds, which are held at the end of the wood, where the keepers, who can gueſs very well on theſe occaſions, expect that the deer will come out. If a proper deer come out, and it is ſuſpected that the brace or leaſh of greyhounds, ſlipped after him, will not be able to kill him, it is proper to way-lay him with a couple of freſh greyhounds.

The Courſing upon the lawn is the moſt agreeable of all other ways. When the keeper has notice of this, he will lodge a deer for the courſe, and then, by coming under the wind, the greyhounds may be brought near enough to be ſlipped for a fair courſe.

The beſt method of Courſing a hair, is to go out and find a hair ſitting, which is eaſily done in the ſummer, by walking a-croſs the lands, either ſtubble, fallow, or corn grounds, and caſting the eye up and down; for in ſummer they frequent theſe places for fear of the ticks, which are common in the woods at that ſeaſon; and, in the autumn, the rain falling from the trees offends them. The reſt of the year there requires more trouble, as the buſhes and thickets muſt be beat to rouſe them, and often they will lie ſo cloſe, that they will not ſtir till the pole almoſt touches them: the ſportſmen are always pleaſed with this, as it promiſes a good Courſe.

If a hare lies near any cloſe or covert, and with her head that way, it is always to be expected that ſhe will make to that immediately on being put up: all the company are therefore to ride up, and place themſelves between her and the covert before ſhe is put up, that ſhe may take the other way, and run on an open ground. When a hare is put up, it is always proper to give her ground or law, as it is called, that is, to let her run twelve-ſcore yards or thereabouts, before the greyhounds are ſlipped at her; otherwiſe ſhe is killed too ſoon, and the greater part of the ſport thrown away, and the pleaſure of the ſeveral windings and turnings that the creature will make to get away, is all loſt. A good ſportſman had rather ſee a hare ſave herſelf, after a fair Courſe, than ſee her murdered by the greyhounds, as ſoon as ſhe is up.

In Courſing the fox, no other art is required than ſtanding cloſe, and on a clear wind, on the outſide of ſome grove, where it is expected he will come out; and, when he is come out, he muſt have head enough allowed him, or elſe he will turn back to the covert. The ſloweſt greyhound will be able to overtake him after all the odds of diſtance neceſſary; and the only danger is, the ſpoiling the dog by the fox, which too often happens; for this reaſon, no greyhound of any value ſhould be run at this Courſe, but the ſtrong, hard-bitten dogs, that will ſeize any thing.

COW, *bos*, in zoology, a quadruped too well known to need a deſcription.

The uſe of the Cow is either for the dairy, or for the breed. The red Cow is generally ſuppoſed to give the beſt milk, and the black Cow to bring the beſt calves. The Cow that gives the milk longeſt is the beſt both for the breed and dairy; and, for the latter uſe, it is moſt convenient that the Cow ſhould calve in the ſpring. Either in the month of March or April, when a Cow is near calving, ſhe ſhould be put into good graſs three or four weeks before the time; or, if it happens in winter, ſhe is to be fed well with hay. The day and night after ſhe has calved, ſhe ſhould be kept in the houſe, and the water that ſhe drinks ſhould be a little warmed. The next day, at noon, ſhe may be turned out; but ſhe ſhould be taken in at night, for three or four days afterwards, and then ſhe may be left to herſelf. Every night that ſhe is taken in, ſhe ſhould be kept till the cold of the morning is over, and a drink of warm water given her before ſhe goes out.

CRAB, in zoology, a ſpecies of ſquilla. See SQUILLA.

The cancer major, or common large Crab-fiſh, has its abode from twenty to forty fathom water. Theſe animals herd together in diſtinct tribes, and have their ſeparate haunts for feeding and breeding, and will not aſſociate with their neighbours. This has been carefully tried, by marking the ſhell of a Crab, and carrying it two or three miles diſtance, and there leaving it among the ſame ſpecies: this Crab has, after this, found its way home, and been caught in its old abode by the ſame fiſhermen.

The fiſhermen find the Crabs of this ſpecies from the ſize of a cheſnut to twelve pound weight. Nothing, in the hiſtory of this creature, is ſo ſingular, as its breaking off its own limbs, which it occaſionally does, in the following manner: the creature is able to do this in any poſition, but the moſt advantageous way of making the experiment is the laying it on its back; then, with a pair of iron pincers, break the ſhell, and bruiſe the fleſh of one of the outer joints of a ſmall leg; the wound will bleed, and the creature ſhew ſigns of pain, by moving it about; afterwards, it holds it quite ſtill, in a direct and natural poſition, without touching any part of its body, or other legs with it; then, on a ſudden, with a gentle crack, the wounded part of the leg drops off, at the internodium of the ſecond joint, from the body. If a hole be pierced in the great claws, or legs, and an iron put in to lacerate the muſcle, the effect is the ſame, and this large limb is thrown off in the ſame manner, only with more violence.

When the leg is off, a muſcus overſpreads the wound, and ſtops the bleeding; and a ſmall leg is, by degrees, produced, which afterwards attains to the ſize of the former. Nature ſeems to have given this ſingular power to this creature for the preſervation of its life, in the mutual quarrels it very frequently has with others of its own ſpecies: in theſe, one Crab lays hold of the claws of another, and cruſhes it in ſuch a manner, that it would bleed to death, had it not this power of giving up the limb, and healing the wound. *Philoſophical Tranſactions*, N°. 478.

Crab, or *gin*, in mechanics, an engine uſed for mounting guns on their carriages. It is made of three pieces of oak, aſh, or other ſtrong wood, of about fourteen feet long, two of which are joined by tranſoms; ſo that they are wide aſunder at bottom, and join at top, on a ſtrong piece of wood, crooking forwards, called the head, in which are three braſs pullies. Over theſe comes a rope called the gin rope, which likewiſe goes through other pullies in a block, and returns through the head, down the back of the gin, and then goes round a windlace. The third piece of the Crab is round; one end of it goes into the head, and the other ſtands on the ground; ſo that all three make a triangle called a pye. When a gun is to be mounted, a ſtrong rope is rived through the block and the trunnions; and then, the windlace being turned round, the gun is lifted up, and placed in her carriage with eaſe. *Guillet*. The Crab is uſed alſo to launch ſhips, or heave them into the dock, or off the key. *Manwayring*.

CRA'CKER, in zoology, the name of a freſh water fowl, of the duck kind, known by authors under the title of anas cauda acuta, and cauda lancea, and called in ſome parts of England the ſea pheaſant. It is of the ſize of the common widgeon; its head is all over of a ferrugineous brown, but behind the ears there is a ſlight tinge of purple; its neck is ſomewhat longer than in the widgeon, and its beak of a bluiſh colour; its head is ſmall, and there is a white ſtreak on each ſide of it, which reaches down to the throat; the throat is grey, variegated with tranſverſe lines, as is alſo the back, but the ſhoulder feathers are, in a great meaſure, black. The tail is grey, with a mixture of white about the edges of the feathers, and is of a very different ſhape from that of all the other ſpecies of the duck kind, having two feathers much longer than the reſt, and running out into narrow points, whence the fowl has the name of the pheaſant. The female differs much in colour from the male, and much reſembles the common tame duck; ſhe has the ſame long feathers, however, in the tail. *Ray's Ornithol.*

CRA'DLE, in ſhip-building, a frame of timber raiſed along the outſide of a ſhip, by the bildge, for the more commodious and ſecure launching of the veſſel. The cradle is much uſed in Italy, Spain, and Turkey, where they alſo trim great ſhips in the cradle.

CRA'MBE, wild ſea cabbage, in botany, the name of a genus of plants, the characters of which are theſe: the flowers conſiſt of four leaves, and are of the cruciform kind: the piſtil ariſes from the cup, and finally becomes an unicapſular fruit, containing one oblong ſeed.

This plant may be propagated in a garden, by ſowing the ſeeds, ſoon after it is ripe, in a ſandy or gravelly ſoil, where it will thrive exceedingly, and increaſe greatly by its creeping roots, which will ſoon overſpread a large ſpot of ground, if encouraged; but the heads will not be fit to cut until the plants have had one year's growth; and, in order to have it good, the bed in which the plants grow, ſhould, at Michaelmas, be covered over with ſand or gravel about four or five inches thick, which will allow a proper depth for the ſhoots to be cut before they appear above ground; and, if this is repeated every autumn, in the ſame manner as is practiſed in earthing of aſparagus beds, the plants will require no other culture. This may be cut for uſe in April and May, while it is young; but, if the ſhoots are ſuffered to remain, they will produce fine regular heads of white flowers, which appear very handſome, and will perfect thin ſeeds, by which they may be propagated. *Miller's Gard. Dict.*

CRANE, in mechanics *(Dict.)* — Mr. Padmore has made a very good improvement in Cranes, in a machine of that kind erected on the bank of the river at Bath, whereby Mr. Allen lets down his ſtone in the veſſels that come for it.

The Crane itſelf is not of the uncommon ſort, but a rat-tailed Crane, with a double axis in peritrochio and two handles, whereby four men may raiſe very great weights; and then, turning the whole Crane about upon its upright ſhaft, can fix it in any poſition, and let down the weights ſpeedily into the boats or barges, which come near the wharf to receive them. See a view of this Crane *(plate* XI. *fig.* 5.) But this conſtruction is not new. Neither is it a new invention to let down goods after they have been raiſed by a Crane, by preſſing the arch of a circle ſtrongly upon a wheel fixed to the principal axis, in order to retard and regulate the deſcent by a friction increaſed or diminiſhed at pleaſure, as is done in ſtopping windmills. The catch alſo, that hinders a Crane or capſtane from going back, is of common uſe; but I do not know that any one has applied them both together in the ſame Crane, ſo as to depend upon one another, before Mr. Padmore did it, though many have done it ſince. Therefore I ſhall give a particular deſcription of this contrivance, whoſe chief intent is to prevent the great miſchiefs which often happen by the careleſneſs of the men employed to raiſe and let down heavy burthens by the uſe of the Crane. The *ſixth figure* repreſents an upright ſection of ſo much of the Crane as the contrivance abovementioned is applied to.

A B is the great wheel, whoſe large axis A, moving on two iron center pins ſuch as *a*, receives the rope, or lets it run down, according as it is turned, by the means of the handles faſtened at C to the leſſer wheel or pinion C, or as it is ſuffered to turn the other way by the gravity of the deſcending weight, when all obſtacles are removed. Upon the axis of the pinion is the ratchet wheel D, whoſe teeth ſucceſſively receive the iron catch *f* F (moveable on a pin at F on the iron ſtandard G, and to be raiſed up occaſionally by the upright iron H *h)* to hinder the weight from going back, when the handles are looſed. Upon the ſame axis behind the wheel D is a wooden wheel E *p*, over which hangs the half-ring of iron O P *o* with a groove or hollow made in it to fit the circumference of the ſaid wheel, ſo as to retard, or ſtop, or any way regulate the motion of the wheel (and conſequently of the axis and pinion C, and the great wheel and axis A B which has the rope V A) according as it is more or leſs ſtrongly preſſed down to make a friction on the wood, as it moves after the catch is raiſed out of the teeth of the ratchet. The horizontal lever K L governs all theſe motions in the following manner, viz. When the ſtring Q *q* K, faſtened to the ſaid lever at K, is pulled, the lever, moving on its center M, does, by an horizontal pin fixed at right angles to its ſide at I, raiſe the piece H, and conſequently releaſe the ratchet by raiſing the catch at *f* out of the teeth: then the weight deſcends ſwiftly, moving the wheel and pinion round by its force; but, to prevent the two ſwift deſcent, the lever is pulled up a little more ſtrongly by the guider who holds the ſtring Q *q* K, which brings down the contrary end of the lever L, and conſequently the iron N, ſo low as to make the ſemicircular ring O P *o* preſs hard upon the wheel E *p*, which it did not do when the catch was raiſed but juſt out of the ratchet. N. B. A ſtrong pull ſtops the whole motion, and a more gentle one regulates the deſcent. And, if the guider ſhould be careleſs and let go the ſtring, then immediately the ſpring S *s*, whoſe end *s* had been depreſſed by the end L of the lever, will raiſe it up again (by its lateral pin X) and, reſtoring the whole lever to its firſt horizontal poſition, the other lateral pin I, in the long arm M K of the lever, will, through the notch H, preſs upon I the lower end of the upright piece H, and ſo bring down the catch F *f* into the ratchet wheel at *f*, the curved piece O P *p* at the ſame time flying up and no longer preſſing the wooden wheel E *p*. Thus will miſchief never be the conſequence of careleſneſs, becauſe of the catch; nor will the weight go down by jerks, which would have been the conſequence of the catch uſed without the half-ring, becauſe the catch is lifted quite out of the way, when the half-ring is brought down and applied by pulling the ſtring at Q. N. B. T, *t* 1, *t* 2, is part of the upright ſection of the timber of the frame.

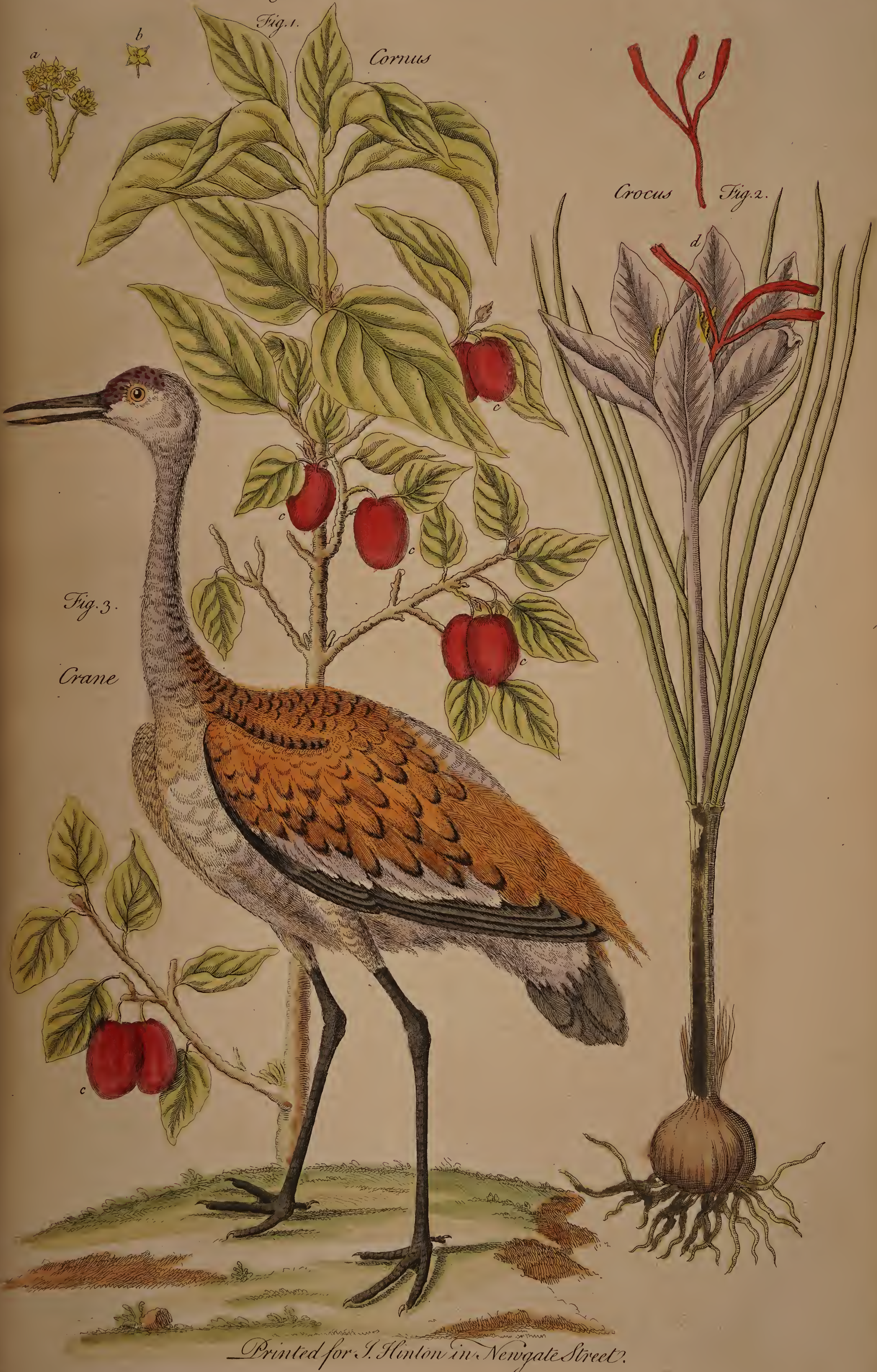
To make this the plainer, let us examine the *ſeventh figure* of *plate* XI. where we have an horizontal ſection of the parts above-mentioned. T *t* T is part of the timber of the frame. B B is the great wheel, whoſe axle that holds the rope is marked A A A, and its iron axis goes through bell-metal boxes at *a a*. C C is the ſmall wheel or pinion, whoſe axis is *c c*. D *d* is the ſection of the ratchet wheel made of iron. Between the pricked lines A *p* and E *i* is ſuppoſed the wooden wheel upon the axis of the pinion (not drawn here to avoid confuſion, no more than the ſemicircular preſſing piece marked O P *o* in the laſt figure) the baſis of whoſe upright fixed ſupporter is repreſented by R, and the end of the piece which brings it down upon occaſion is ſhewn at N. K L is the horizontal lever, whoſe center is at M, moving vertically by a pull of the ſtring faſtened to it at K. I *i* is the firſt lateral pin of the lever, which at I goes through the bottom of the piece H, raiſer of the catch F *f*, already deſcribed with its ſupporter G, on whoſe top the catch moves by a center pin. A *p* A is the ſecond lateral pin of the lever, whoſe office is to preſs upon the end *s* of the crooked ſpring S *s* faſtened to the bottom of the frame at the farther end S. So that, when the end K of the lever is pulled up, the end L which is depreſſed, muſt be lifted up again into its place by the force of the ſpring reſtoring itſelf.

N. B. The crooked figure of the ſpring, and the manner of its lifting the pin, is beſt ſhewn in *fig.* 6.

Crane, *grus*, in zoology, the name of a genus of birds very tall, and remarkable for the length of their legs and neck. It is ſuppoſed by many, that this bird eats fiſh, but erroneouſly; the ſtructure of its ſtomach plainly ſhews it to be a carnivorous bird, and its fleſh is very delicate, and much valued in the Italian markets.

The ingenious Mr. Edwards, in his curious Hiſtory of Birds, has figured different ſorts of Cranes; one of which we ſhall give our readers. See *plate* XVI. *fig.* 3. It is called the brown and aſh-coloured Crane. The bill of this bird has a channel on each ſide, with the noſtrils placed therein; of a black or duſky colour, except the point of the lower mandible, which is light fleſh-coloured. The top of the head from the bill to the ear-holes is covered with a bare ſkin of a reddiſh colour, thinly beſet with black hairs; the ſides of the head beneath the eyes, and the under ſide or throat, are white; the hinder-part of the head and the neck all round are aſh-coloured; the bottom of the neck, or beginning of the breaſt, from aſh-colour gradually becomes brown; the beginning of the back and covert-feathers of the wings are alſo of a light-reddiſh brown, their

PLATE XVI. *Engraved for the* SUPPLEMENT. *Facing* Crane.



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tips being ſomething darker, which forms an agreeable variety; the greater quills are of a blackiſh brown with white ſhafts; thoſe that fall next the back are brown, and of a looſe, ſoft texture, whoſe points extend beyond the prime quills, when the wings are cloſed. In the lower part of the wing, there paſſes obliquely above the black quills a whitiſh aſh-coloured plat of feathers; the inner coverts of the wings are aſh-colour. The tail-feathers are of a browniſh aſh-colour. The breaſt from brown becomes of an aſh-colour, which reaches to the covert-feathers of the tail incluſive, growing lighter in its advance backwards, ſo that the under coverts of the tail are whitiſh; the lower part of the back, the rump, and upper coverts of the tail are of a light aſh-colour; the legs are bare of feathers above the knees, the outer toe is joined a little way to the middle one; the legs, feet, and nails, or claws, are all of a black-colour. *Edwards's Hiſtory of Birds.*

CRANE-*fly*, a name given by ſome to the creature we commonly call father long-legs, and the authors of hiſtories of inſects, tipula terreſtris. This creature affords the microſcopic obſerver many curious particulars; but the moſt remarkable is, the ſurprizing contraction of the muſcular fibres in the legs. Theſe being diſſected in a drop of water, and placed before the microſcope, the fleſhy fibres contract and diſtend themſelves in a manner not to be imagined, and continue this motion for ſeveral minutes; and this is conſtantly to be obſerved in this inſect, and never in any other, ſo far as has been yet obſerved. *Lewenhoek, Arcan. Nat.*

The inteſtines of this creature are alſo very wonderful, conſiſting of numberleſs veſſels and organs, which may be ſeen as plainly by the microſcope, as the bowels of larger animals can by the naked eye. The tails both of the male and female are alſo of an amazing ſtructure; the female's end in a ſharp point, with which ſhe perforates the ground, and depoſits her eggs under the graſs in meadows. *Baker's Microſcope.*

CRA'NNY, in the glaſs trade, a round iron, whereon the workmen in the glaſs-houſes roll the glaſs, to make the neck of it ſmall. *Neri's Art of Glaſs, Append.*

CRASSIRO'STRÆ, in zoology, the names of a genus of ſmall birds, diſtinguiſhed by the thickneſs of their beaks, as the ſparrow, green-fiſh, and the like. *Ray's Ornithol.*

CRAY-*fiſhes.* — The delicate flavour of theſe fiſh ſeems to be in a great meaſure owing to their food. When they have well taſted food, their fleſh preſerves the reliſh of it: but, when they feed on other things, they are often rendered of no value, by the flavour communicated to their fleſh by them. There are great quantities of theſe fiſh in the river Obra, on the borders of Sileſia; but the people find them ſcarce eatable, becauſe of a bitter aromatic flavour, very diſagreeable in food. It has been ſince obſerved, that the calamus aromaticus grows in vaſt abundance on the banks of that river, and that theſe creatures feed very greedily upon its roots. Theſe have a very remarkable bitterneſs mixed with their aromatic flavour, while freſh, which goes off very much in the drying; and, on comparing the taſte of theſe roots with that of the Cray-fiſh, there remains no doubt of the one being owing to the other. *Act. Leipſ.* 1690.

CREE'NGLES, in a ſhip, are ſmall ropes ſpliced into the bolt-ropes of the ſails of the main-maſt and fore-maſt, into which the bowling-bridles are made faſt; and are alſo to hold by when a bonnet is ſhaken off. *Manwayring.*

Indian CRESS.—The ſeveral kinds of this plant are eaſily propagated, by ſowing their ſeeds in March or April, in a good ſoil, and warm ſituation, and ſhould be planted near a hedge or wall, being great climbers, and their lying on the ground being ſubject to rot them. They flower in June, and continue flowering till October, when the froſts ſoon deſtroy the whole plant.

The double-flowered kind produces no ſeeds, and muſt therefore be propagated by cuttings of it. This may be done in any of the ſummer months; but the plants muſt be carefully preſerved in winter, being very ſubject to rot. If this be confined in pots, and thoſe filled with a poor ſoil, it will ramble leſs in the branches, and will produce more flowers. The flowers of this kind, though very beautiful, are not nearly ſo well taſted in ſallads as thoſe of the ſingle kind, which are very warm and agreeable. *Miller's Gard. Dict.*

CRIB, in the Engliſh ſalt works, the name given to a ſort of caſe uſed in ſome places inſtead of the drab, to put the ſalt into, as it is taken out of the boiling-pan.

Theſe Cribs are like hay racks, wide at the top, and tapering to a narrow bottom, with wooden ribs on each ſide, placed ſo cloſe, that the ſalt cannot eaſily fall through them. Through theſe apertures, however, the ſuperfluous ſaline liquor drains out, and leaves the ſalt, after a few days, dry enough to be added to the heaps that ſtand ready for ſale. At Limington, and ſome other places, they uſe, inſtead of theſe Cribs, a ſort of wooden troughs with holes in the bottom, through which the ſaline liquor drains from the ſalt, and falls into veſſels placed underneath to receive it; and in other places they uſe barrows or wicker baſkets, out of which the liquor runs, with great eaſe, on all ſides at once. See DRAB.

CRI'THE, in medicine, a ſmall tubercle, hard, red, and immoveable, ſeated upon the eye-lid above the cilia, or range of hairs. It is always included in a kind of cyſt, and by inflammation degenerates into a thickiſh matter, from whence frequently proceed intenſe pains, and various diſorders of the ſight. It is ſometimes ſeated immediately under the ſkin of the eye-lid; ſometimes it is within, under the muſcle. When this tubercle is moveable, it is generally called chalazium, or in Engliſh ſtye, or ſtithe. *Heiſter's Surgery.*

CRI'THMUM, *ſamphire*, in botany, a genus of plants whoſe characters are: the leaves are thick, ſucculent, narrow, branchy, and trifid: the flowers grow in an umbel, each conſiſting of five leaves, which expand in form of a roſe: the empalement of the flower becomes a fruit, conſiſting of two plain and gently ſtriated ſeeds.

We have but one ſpecies of this plant common in England. This plant grows in great plenty upon the rocks near the ſea-ſhore, where it is waſhed by the ſalt water; but will not grow to any ſtrength in a garden, though it may be preſerved ſeveral years, and propagated by parting its creeping roots in the ſpring. This ſhould be planted in pots filled with gravelly coarſe ſoil, and, in ſummer, plentifully watered: in this management it will grow tolerably well, and produce flowers; but rarely perfects its ſeeds in a garden, nor is the herb near ſo good for uſe as that gathered from the rocks. This plant is greatly eſteemed for pickling, and is ſometimes uſed in medicine.

CRI'ZZELLING, in the glaſs trade, a kind of roughneſs ariſing on the ſurface of ſome kinds of glaſs. This was the fault of a peculiar kind of glaſs made in Oxfordſhire, and ſome other places, of black flints, a cryſtallized ſand, and a large quantity of nitre, tartar, and borax. The glaſs thus made is very beautiful, but, from the too great quantities of the ſalts in the mixture, is ſubject to crizzel; that is, the ſalts in the mixture, from their too great proportion, are ſubject, either from the adventitious nitre of the air from without, or from warm liquors put in them, to be either increaſed in quantity, or diſſolved, and thereby induce a ſcabrities, or roughneſs, irrecoverably clouding the tranſparency of the glaſs. This was what was called Crizzelling; but by uſing an Italian white pebble, and abating the proportions of the ſalts, the manufacture is now carried on with advantage, and the glaſs made with theſe ſalts is whiter than the fineſt Venetian, and is ſubject to no faults. *Plot's Oxfordſhire.*

CRO'CODILE, *crocodilus*, a very large and terrible animal; its head is broad; its noſe like that of a hog; the opening of its mouth monſtrouſly large, reaching even to the ears, and the upper jaw moving in the opening it, which gives it a very terrible aſpect. The teeth are large, white, and very numerous, and ſet by one another, like the teeth of a comb; the legs ſtand ſideways; and the feet are armed with extremely ſharp claws. The length of the tail is equal to that of the whole body; the ſkin of the belly is ſoft and eaſily wounded, but that of the reſt of the body ſo hard as to be impenetrable to ſpears or darts, and is covered with ſtrong prickly ſcales. The colour is in ſome a duſky reddiſh yellow, but in moſt a diſagreeable brown, with a mixture of grey; and even thoſe which, when alive, had much yellowneſs, always acquire this duſky colour in drying.

It is a very ſlow and unweildy animal, turning ſideways with difficulty; it has an agreeable ſmell, but is a very terrible creature, tearing to pieces and devouring every living thing that is ſo unhappy to come in its way.

Its eggs are about the ſize of a gooſe egg, and it lays ſixty of theſe for one brood, burying them in the ſands, and leaving them for the ſun to hatch them. The Crocodile is found in the great rivers of the Nile, the Niger, and the Ganges, and in ſome other places. *Ray's Syn. Quad. Worm. Muſc.*

CRO'CUS, *ſaffron (Dict.)*— See *Plate* XVI. *fig.* 2, which repreſents the whole plant with its root, *d*, the flower, *c*, the ſtamina, or ſaffron of the ſhops.—In the Philoſophical Tranſactions, N°. 405, we have the following method of cultivating ſaffron.

As ſaffron grows at preſent moſt plentifully in Cambridgeſhire, and has grown formerly in ſeveral other counties of England, the method of culture does not, I believe, vary much in any of them; and therefore I judge it ſufficient to ſet down here the obſervations which I employed proper perſons, in different ſeaſons, to make, in the years 1723, 1724, 1725, and 1728, up and down all that large tract of ground that lies between Saffron Walden and Cambridge, in a circle about ten miles diameter.

In that county ſaffron has been cultivated; and therefore it may reaſonably be expected, that the inhabitants thereof are more thoroughly acquainted with it than they are any where elſe.

I ſhall begin with the choice and preparation of the ground: the greateſt part of the tract already mentioned is an open level country, with few incloſures; and the cuſtom there is, as in moſt other places, to crop two years, and let the land be fallow the third. Saffron is always planted upon fallow ground, and, all other things being alike, they prefer that which has borne barely the year before.

The Saffron grounds are ſeldom above three acres, or leſs than one; and, in chuſing, the principal thing they have regard to, is, that they be well expoſed, the ſoil not poor, nor a very ſtiff clay, but a temperate dry mould, ſuch as commonly lies upon chalk, and is of an hazel-colour; though, if every thing elſe anſwers, the colour of the mould is pretty much neglected.

The ground being made choice of, about Lady-day, or the beginning of April, it muſt be carefully plowed, the furrows being drawn much cloſer together, and deeper, if the ſoil will allow it, than is done for any kind of corn; and, accordingly, the charge is better.

About five weeks after, during any time in the month of May, they lay between twenty and thirty loads of dung upon each acre; and, having ſpread it with great care, they plow it in as before; the ſhorteſt rotten dung is the beſt; and the farmers, who have the conveniency of making it, ſpare no pains to make it good, being ſure of a proportionable price for it. About Midſummer they plow a third time, and, between every ſixteen feet and a half or pole in breadth, they leave a broad furrow or trench, which ſerves both as a boundary to the ſeveral parcels, when there are ſeveral proprietors to one incloſure, and to throw the weeds in at the proper ſeaſon.

To this head likewiſe belongs the fencing of the grounds, becauſe moſt commonly, though not always, that is done before they plant. The fences conſiſt of what they call dead hedges, or hurdles, to keep out not only cattle of all ſorts, but eſpecially hares, which would otherwiſe feed on the ſaffron leaves during the winter.

About the weather we need only obſerve, that the hotteſt ſummers are certainly the beſt: and therewith, if there be gentle ſhowers from time to time, they can hardly miſs of a plentiful crop, if the extreme cold, ſnow, or rain of the foregoing winter have not prejudiced the heads.

The next general part of the culture of ſaffron, is planting or ſetting the roots: the only inſtrument uſed for which is a narrow ſpade, commonly termed a ſpit-ſhovel.

The time of planting is commonly in July, a little ſooner or later, according as the weather anſwers. The method is this: one man with his ſpit-ſhovel raiſes between three and four inches of earth, and throws it before him about ſix or more inches; two perſons, generally women, following with heads, place them in the fartheſt edge of the trench he makes, at three inches diſtance from each other, or thereabouts: as ſoon as the digger or ſpitter has gone once the breadth of the ridge, he begins again at the other ſide, and digging, as before, covers the roots laſt ſet, and makes the ſame room for the ſetters to place a new row, at the ſame diſtance from the firſt as they are from one another: thus they go on, till a whole ridge, containing commonly one rod, is planted; and the only nicety in digging is, to leave ſome part of the firſt ſtratum of earth untouched, to lie under the roots; and, in ſetting, to place the roots directly upon their bottom.

What ſort of roots are to be preferred, ſhall be ſhewn under the fourth head; but it muſt be obſerved in this place, that formerly, when roots were very dear, they did not plant them ſo thick as they do now; and that they have always ſome regard to the ſize of the roots, placing the largeſt at a greater diſtance than the ſmaller ones.

The quantity of roots, planted in an acre, is generally about ſixteen quarters, or 128 buſhels, which, according to the diſtances left between them, as before aſſigned, and ſuppoſing all to be an inch in diameter one with another, ought to amount to 392,040 in number.

From the time that the roots are planted, till about the beginning of September, or ſometimes later, there is no more labour about them; but as they then begin to ſpire, and are ready to ſhew themſelves above ground (which is known by digging a few out of the earth) the ground muſt be carefully pared with a ſharp hoe, and the weeds, &c. raked into the furrows, otherwiſe they would hinder the growth of the plants.

In ſome time after appear the ſaffron flowers; and this leads us to the third branch of our preſent method. The flowers are gathered as well before as after they are full blown; and the moſt proper time for this is early in the morning. The owners of the ſaffron get together a ſufficient number of hands, who place themſelves in different parts of the field, pull off the whole flowers, and throw handful by handful into a baſket, and ſo continue till all the flowers are gathered, which happens commonly about ten or eleven o'clock.

Having then carried home all they have got, they immediately ſpread them upon a large table, and fall to picking out the filamenta ſtyli, or chives, and together with them a pretty long proportion of the ſtylus itſelf, or ſtring to which they are joined; the reſt of the flower they throw away as uſeleſs. The next morning they return into the field again, whether it be wet or dry, weather; and ſo on daily, even on Sundays, till the whole crop be gathered.

The chives being all picked out of the flowers, the next labour about them is to dry them on the kiln. The kiln is built upon a thick plank (that it may be removed from place to place) ſupported by four ſhort legs: the outſide of eight pieces of wood about three inches thick, in form of a quadrangular frame, about twelve inches ſquare at the bottom on the inſide, and twenty-two inches at top; which is likewiſe equal to the perpendicular height of it. On the foreſide is left a hole about eight inches ſquare, and four inches above the plank, through which the fire is put in. Over all the reſt laths are laid pretty thick, cloſe to one another, and nailed to the frame already mentioned; and then are plaiſtered over on both ſides, as are alſo the planks at bottom very thick, to ſerve for an hearth. Over the mouth or wideſt part goes an hair-cloth, fixed to the ſides of the kiln; and likewiſe to two rollers, or moveable pieces of wood, which are turned by wedges or ſcrews, in order to ſtretch the cloth. Inſtead of the hair-cloth, many people now uſe a net work, or iron wire, with which it is obſerved that the ſaffron dries ſooner, and with a leſs quantity of fuel: but the difficulty in preſerving the ſaffron from burning makes the hair-cloth be preferred by the niceſt judges in drying.

The kiln is placed in a light part of the houſe; and they begin by laying five or ſix ſheets of white paper on the hair-cloth, upon which they ſpread the wet ſaffron, between two and three inches thick; this they cover with other ſheets of paper, and over theſe lay a coarſe blanket five or ſix times doubled; or, inſtead thereof, a canvas pillow filled with ſtraw; and, after the fire has been lighted for ſome time, the whole is covered with a board, having a large weight upon it.

At firſt they give it a pretty ſtrong heat, to make the chives ſweat (as their expreſſion is;) and in this, if they do not uſe a great deal of care, they are in danger of ſcorching, and ſo of ſpoiling all that is on the kiln.

When it has been thus dried about an hour, they take off the board, blanket, and upper papers, and take the ſaffron off from that which lies next it; raiſing, at the ſame time, the edges of the cake with a knife; then, laying on the paper again, they ſlide in another board between the hair-cloth and under papers, and turn both papers and ſaffron upſide down; afterwards, covering them (as above.)

This ſame heat is continued for an hour longer; then they look on the cake again, free it from the papers, and turn it: then they cover it, and lay on the weight, as before. If nothing happens amiſs during theſe firſt two hours, they reckon the danger to be over: for they have nothing more to do, but to keep a gentle fire, and to turn their cakes every half-hour, till thoroughly dry: for the doing of which as it ought, there are required full twenty-four hours.

In drying the layer plump chives they uſe nothing more, but towards the latter end of the crop, when theſe come to be ſmaller, they ſprinkle the cake with a little ſmall beer, to make it ſweat as it ought; and they begin now to think, that uſing two linen cloths next the cake, inſtead of two innermoſt papers, may be of ſome advantage in drying: but this practice is followed as yet but by few.

Their fire may be made of any kind of fuel; but that which ſmokes the leaſt is beſt; and charcoal, for that reaſon, is preferred to any other.

What quantity of ſaffron a firſt crop will produce, is very uncertain; ſometimes five or ſix pounds of wet chives are got from one root; ſometimes not above one or two; and ſometimes not enough to make it worth while to gather and dry it. But this is always to be obſerved, that about five pounds of wet ſaffron go to make one pound of dry, for the firſt three weeks of the crop; and ſix pounds during the laſt week; and, now the heads are planted very thick, two pounds of dried ſaffron may, at a medium, be allowed to an acre for the firſt crop, and twenty-four pounds for the two remaining; the third being conſiderably larger than the ſecond.

In order to obtain theſe, there is only a repetition to be made every year of the labour of hoeing, gathering, picking, and drying, in the ſame manner as before ſet down, without the addition of any thing new; except that they let cattle into the field, after the leaves are decayed, to feed upon the weeds; or, perhaps, mow them for the ſame uſe.

About the Midſummer after the third crop is gathered, the roots muſt be all taken up and tranſplanted: the management requiſite for which is the fourth thing to be treated of. To take up the ſaffron heads, or break up the ground (as the term is) they ſometimes plow it, ſometimes uſe a forked kind of hoe, called a pattock, and then the ground is harrowed once or twice over; during all which time of plowing or digging, and harrowing, fifteen or more people will find work enough to follow and gather the heads, as they are turned up.

They are next to be carried to the houſe in ſacks, and there cleaned and raiſed: this labour conſiſts in cleaning the roots thoroughly from earth, and from the remains of old roots, old involucra, and excreſcences; and thus they become fit to be planted in new ground immediately, or to be kept for ſome time, without danger of ſpoiling.

The quantity of roots taken up, in proportion to thoſe which were planted, is uncertain; but, at a medium, it may be ſaid, that, allowing for all the accidents which happen to them in the ground, and in breaking up from each acre, may be had twenty-four quarters of clean roots, all fit to be planted.

The owners are ſure to chuſe for their own uſe the largeſt, plumpeſt, and fatteſt roots; but do leaſt of all approve the longeſt-pointed ones, which they call ſpickets, or ſpickards; for very ſmall round or flat roots are ſometimes obſerved to flower.

This is the whole culture of ſaffron in the country abovementioned; and we have only now to conſider the charges and profits which may be ſuppoſed, one year with another, to attend that branch of agriculture; and of theſe I have drawn up the following computation for one acre of ground, according to the price of labour in this country.

	l.	s.	d.
Rent for three years	3	00	0
Plowing for three years	0	18	0
Dunging	3	12	0
Hedging	1	16	0
Spitting and ſetting the heads	1	12	0
Weeding or pairing the ground	1	04	0
Gathering and picking the flowers	6	10	0
Drying the flowers	1	06	0
Inſtruments of labour for three years, with the kiln, about	0	10	0
Plowing the ground once, and harrowing twice	0	12	0
Gathering the ſaffron heads	1	00	0
Raiſing the heads	1	12	0
Total charge	23	12	0

This calculation is made upon ſuppoſition, that an acre of ground yields twenty-ſix pounds of net ſaffron in three years; which I ſtated only as a mean quantity between the greateſt and the leaſt; and therefore the price of ſaffron muſt be judged accordingly; which I think cannot be done better than by fixing it at thirty ſhillings per pound; ſince, in plentiful years, it is ſold at twenty, and is ſometimes worth three or four pounds: at this rate, twenty-ſix pounds of ſaffron are worth thirty-nine pounds; and the net profits of an acre of ground, producing ſaffron, will, in three years, amount to fifteen pounds thirteen ſhillings, or about five pounds four ſhillings yearly.

This, I ſay, may be reckoned the net profit of an acre of ſaffron, ſuppoſing that all the labour were to be hired for ready money: but, as the planter and family do a conſiderable part of the work themſelves, ſome of this expence is ſaved: that is, by planting ſaffron, he may not only reaſonably expect clear about five pounds yearly per acre, but alſo to maintain himſelf and family for ſome part of each year: and it is upon this ſuppoſition only, that the reſult of other computations can be ſaid to have any tolerable degree of exactneſs; but the calculations themſelves are undoubtedly very inaccurate.

I have ſaid nothing here concerning the charge in buying, or profits in ſelling the ſaffron heads; becauſe, in many large tracts of ground, theſe muſt at length balance one another, while the quantity of ground planted yearly continues the ſame; which has been pretty much the caſe for ſeveral years paſt.

Crocus *antimonii*, the name given, in the late London Diſpenſatory, to the preparation of antimony and nitre, commonly known by the name of Crocus metallorum. It is made of equal parts of antimony and nitre, powdered fine, and thrown, at times, into a red-hot crucible, and, when thoroughly melted, poured out, and ſeparated from its ſcoriæ. This looks more yellow, the longer it has been melted: it is but little uſed, except among horſes; but, when intended for internal uſe among men, ſhould be procured, faithfully prepared in this manner: for our chemiſts generally abate of the nitre to ſave charges, and render the medicine of a very different effect. *Pemberton's Lond. Diſ.*

Crocus *martis*, ſignifies alſo a chemical preparation, uſed by the glaſs-makers, to give a red-colour to glaſs. The glaſs-makers prepare this themſelves, and have four ways of doing it. The firſt is this: take filings of iron, mix them with three parts of powdered brimſtone, and keep them in a melting-pot, in a furnace, to calcine, and burn off the ſulphur; let them ſtand four hours in this ſtate, then take them out, and, when cold, powder and ſift them, and put the powder into a crucible, which lute over, and ſet in the leer of the furnace for fifteen days, or more; it will then be of a reddiſh purple, and muſt be kept for uſe. *Neri's Art of Glaſs.*

The ſecond way of making this, is by ſprinkling filings of iron with ſtrong vinegar, and ſetting them in the ſun to dry; when dry, powder and ſift them, and wet them again with vinegar, and, when dry, powder them again. Repeat this eight times, and then powder the whole, and ſift it fine for uſe.

The third way is to uſe aqua-fortis, inſtead of vinegar, in the ſame manner.

The fourth way, which is the beſt of all, is this: diſſolve filings of iron in aqua-regia, and let the ſolution ſtand three days in a veſſel cloſe ſtopped, ſhaking it about at times; then evaporate the liquor gently, and there will remain a moſt valuable Crocus martis. *Neri's Art of Glaſs.*

CRO'PPER, or *Dutch* Cropper, the name of a particular ſpecies of pigeon, called the columba gutturoſa Batavia, by Moore. It is naturally thick, and has its name from its large crop, or bag of wind, which it carries under its beak, and can, at pleaſure, either raiſe, or depreſs. Theſe are thick-bodied and ſhort; their legs are alſo thick and ſhort, and are feathered down to the feet; the crop is large, and hangs low; the feathers on the thighs hang looſe; and their legs ſtand wide; they are gravel-eyed, and are generally very bad breeders.

There are of theſe pigeons of all colours, and thoſe who are careful of them, generally take them away from their proper parents, while young, and breed them under the females of other ſpecies. *Moore's Columbarium.*

CROPS *of corn.* The great buſineſs of the farmer is to produce the largeſt Crops he can, and, at the ſame time, to injure his land the leaſt. The common way of ſowing exhauſts the whole land, without giving half the nouriſhment it might give to the corn. Inſtead of the ſcattering way of ſowing corn by the hand, if it be let in with the drill, in ſingle, double, treble, or quadruple rows, and an interval of five feet of naked ground be left between theſe ſeries of rows, the uſe of horſe-hoeing in theſe intervals will be found to give all that the farmer requires: the Crop will be larger, though ſo great a quantity of ground is left vacant, than if all were ſoon over, as the plants will ſtand vaſtly thicker in the rows, and will have twenty or thirty ſtalks a-piece; and the more the ſucceſſive Crops are planted, and the oftener the ground is hoed in this manner, the better will the plants be maintained, and every Crop will be larger and larger from the ſame ground, without dunging, or without changing the ſort of plant, as is uſually neceſſary in other caſes. See A'GRICULTURE.

This is very evident in ſeveral parts of the ſame field, where this ſort of huſbandry has been entered upon at different times; and ſome have a firſt crop, others a ſecond, and others a third, all growing up at the ſame time, the older worked land always invariably ſhewing the beſt crop. Dunging and fallowing are both neceſſary to recover land to its virtue, in the common way, after a few Crops. Theſe are both of them expences to the farmer; but the horſe-hoeing, when the corn is ſown in rows, anſwers all the intent of them, and is much leſs expenſive. It has, in ſhort, every year, the good effect of a ſummer fallow, though it every year produces a good crop, and no time, or uſe of it, is loſt to the farmer. *Tull's Horſe-hoeing Huſbandry.*

CROSS *Hairs*, in a teleſcope, are hairs drawn a-croſs the focus, for making more accurate obſervations.—In order to determine the right aſcenſions, &c. of the ſtars, it is requiſite to have four Croſs hairs in the focus of the teleſcope; of which *a b* (*Plate* XV. *fig.* 13.) and *c d* croſs at right angles, as alſo *e f* and *g h*; which are inclined to the two former in half right angles; and all croſs one another at the point *i*. Then having directed the teleſcope to make the preceding ſtar appear upon the hair *a b*, and having turned the teleſcope about its axis till the ſtar moves along *a b*, let it remain fixed; and obſerve by a pendulum clock the time of this ſtar's appulſe to the center *i*; and alſo the time of the ſubſequent ſtar's appulſe to the perpendicular hair *c d*. The interval of time between theſe appulſes to the hair *c d*, which coincides with part of an hour circle, being turned into degrees and minutes, gives the number of them contained in the correſponding arch of the equator that paſſed over the ſaid hour circle; which arch is the difference of the right aſcenſions of the ſtars. To find the difference of their declinations, the times of the ſubſequent ſtar's appulſes at *k* and *l* to the oblique hairs *e f*, *g h*, muſt alſo be obſerved; half of which is the time it ſpends in deſcribing half the line *k l*, that is, *m k* or *m l*. This half, being converted into minutes of an arch, gives the number of them contained in the correſponding arch of the equator that paſſed by the fixed hour circle *c d* in that time; and this number, being diminiſhed in the ratio of the radius to the ſine complement of the given ſtar's declination, gives the difference of their declinations, or the number of minutes in the arch *m i*.

This rule may be eaſily demonſtrated, and is ſufficiently accurate, though the ſine complement of the given ſtar's declination is uſed inſtead of the ſine complement of the unknown ſtar's declination, becauſe their difference is but ſmall, in compariſon to the whole.

Signor Caſſini who firſt introduced this uſeful and accurate method of obſerving by 4 hairs, has ſhewn us how he applies it to determine all the particulars obſervable in eclipſes. See Phil. Tranſ. Numb. 236. It has one great advantage, that the obſervations are not liable to the uncertainty of the air's refraction. For, the teleſcope being fixed, all objects that appear in it, having nearly the ſame altitudes, are equally refracted very nearly; it is therefore the beſt method of obſerving the places of Mercury and Venus, or any other of the planets and comets, when near the ſun, and by conſequence but little elevated in the night time, as Dr. Halley has obſerved, Phil. Tranſ. Numb. 366. Where ſpeaking of the accuracy of this way of obſerving, he tells us, 'that he himſelf was preſent when Dr. Pound and his nephew Mr. Bradley did this way demonſtrate the extreme minuteneſs of the ſun's parallax ſo exactly, that, upon many repeated trials, it was not more than 12″ nor leſs than 9″. Theſe obſervations may be ſeen in the Phil. Tranſ. Numb. 363; from which Dr. Halley calculated the parallax by Caſſini's method (deſcribed in his book upon the Comet in 1680) which is very well explained in the 7th of Mr. Whiſton's aſtronomical Lectures.

The only trouble, in this way of obſerving, lies in turning the teleſcope about its axis in ſuch a poſition, that the ſtars ſhall move parallel to one of the hairs. But this difficulty is entirely removed, though the teleſcope be never ſo long, by a very pretty contrivance, invented by that ingenious and accurate aſtronomer the reverend Mr. James Bradley, Savilian profeſſor at Oxford. As near as I can remember, it is this: Let ABC (*Plate* XVII. *fig.* 4.) repreſent a flat ring of braſs fixed in the focus of the teleſcope; and *a b c* a ſmaller concentric ring lodged in a circular groove turned within the larger, and kept in the groove by three ſmall plates of braſs fixed to the outward ring and extended over the edge of the inner one. Upon the inner ring is fixed a concentric arch of a wheel $d e$, having teeth cut in its convexity, which are driven round by the threads of an endleſs ſkrew, whoſe axis D E F turns in a collar at E and upon a point at F, both fixed to the outward ring. The hairs $g h$, $i k$, croſs at right angles in f the center of the rings, and, when the teleſcope is ſo fixed that the image of a ſtar falls upon f, let it move along any line $f q$, and by turning the ſkrew D E F and by conſequence the hair $f k$ about the fixed point f, till it touches the ſtar at q, it will then coincide with the tract of the ſtar's motion; and then all other ſtars will move parallel to it, as was required.

To find the difference of declination of two ſtars, he obſerves the times of their appulſes to the edges of two ſlender braſs bars $g i o$, $g k p$, fixed to the inner ring, and equally inclined to its diameter $g h$ in ſuch angles that the perpendiculars $f i$, $f k$, on each ſide of $f g$, ſhall be ſeverally equal to half $f g$; and conſequently that the whole baſe $i k$, of the equicrural triangle $i g k$, ſhall be equal to its perpendicular height $f g$; and by conſequence that the difference of any two baſes $i f k$, $l m n$, ſhall be equal to $f m$, the difference of their height; ſo that the difference of the times of the tranſits of two ſtars over theſe baſes may give the difference of their declinations. *Smith's Optics.*

Cross-*trees*, in a ſhip, croſs pieces of timber ſet on the head of the maſt, and bolted, and let into another very ſtrongly. They are four in number, and are generally called Croſs-trees, but, ſtrictly ſpeaking, only thoſe which go thwart ſhips, are Croſs-trees; the other, in the largeſt ſhips, are called treiſsle-trees. Their uſe is to keep and bear the top-maſt up; for the foot of the top-maſt is always faſtened into them, ſo that they bear all the ſtreſs. They alſo bear the tops, and are neceſſary to all maſts which carry any other top or flag-ſtaff. *Manwayring.*

CRU'CIBLE (*Dict.*)—Theſe veſſels, ſo much uſed by aſſayers, &c. are beſt made of a pure and well waſhed clay, with an admixture of the pureſt ſand, powder of flint, or the powder of other broken Crucibles, which have already ſuſtained a great fire, and are very clear. They are formed in wooden, or braſs moulds, divided longitudinally into two parts, and to be disjointed or put together again at pleaſure: for this purpoſe alſo a broad iron ring is adapted to the outſide of the mould, in ſuch manner, that the two ſides are kept firmly together, while this ring is on, and fall aſunder, as ſoon as it is taken off. This mould, however, gives only the outer ſhape of the Crucible; its cavity muſt be made by a peſtle, or other ſimilar inſtrument. See *plate* XVII. *fig.* 7.

When the veſſels are to be made, the ring is put upon the mould, and the whole ſet upon a ſtrong ſupport: then the cavity of the mould is to be filled with the matter very ſtiff; this is to be preſſed down firſt with the fingers, or with a ſtick, making a hollow in the middle, and leaving the edges of the matter above the ſides of the mould; then apply to this hollow the peſtle, rubbed over with the fat of bacon, and drive it in with ſeveral ſtrong ſtrokes of a mallet: then take away the peſtle, and, taking the ring off from the mould, the Crucible is taken out perfect, and finiſhed, and is to be dried, and baked in a potter's kiln. See Sections of theſe moulds, *plate* XVII. *fig.* 5, 6.

If, from the too great moiſture of the matter, when put into the mould, or from any inequalities or roughneſſes in the mould, the Crucible will not readily ſeparate from its ſides, as ſoon as made, place the mould, in a dry warm place, for a few minutes, and the veſſel will, after that, come out eaſily.

In the making theſe veſſels, a ſufficient quantity of the matter muſt always be put at once into the mould; for, if you add to the matter once compreſſed a new lump of the ſame, it will not cohere with the firſt. If the matter be put into the mould in ſmall maſſes, not moulded thoroughly together firſt by handling, theſe never cohere neither; but the veſſel, when finiſhed, will be full of chinks and pores, which, though not to be diſcovered either by the eye, or by the ſound of the veſſel when ſtruck, yet let the ſalts in fuſion paſs through them.

If theſe veſſels are not made with a large bottom, the concave mould muſt not be greaſed; for, if it be, the veſſel comes out of it with the peſtle, and ſticks ſo firmly to it, as not to be got off without breaking. *Cramer's Art of Aſſ.*

CRU'CIFORM *Flowers*, in botany, a term for ſuch flowers as are compoſed of four leaves, diſpoſed in form of a croſs. Some of theſe flowers have a cup, others have not; thoſe which have cups, uſually have them compoſed of four leaves, and placed in the ſame order and direction with thoſe of the flower. Of this claſs of plants are the cabbage, rocket, wall-flower, &c. *Tourn. Inſt.*

CRU'ISERS, in the navy, are ſmall men of war, made uſe of to and fro in the channel, and elſewhere, to ſecure our merchant-ſhips, and veſſels, from the enemy's ſmall frigates and privateers. They are generally ſuch as ſail well, and are commonly well manned: and, indeed, the ſafety of the trade in the channel, and up and down the ſoundings, and other places, abſolutely requires the conſtant keeping out of ſuch ſhips at ſea.

CRU'STA, *cruſta lactea*, in ſurgery, ſignifies a cruſt of ſcabby ulcers, apt to affect the faces of children. The cure of it depends principally on regulating the diet of the nurſe, and giving her gentle purges, and ſweating powders; the infant ought alſo to take at times a few gentle doſes of phyſic, and, in the intervals, between the purges, to take powder of crude, or diaphoretic antimony, with flour of brimſtone, and crab's claws, and other of the teſtaceous powders. When this method has been purſued for ſome time, the parts may be anointed with cream, with a ſmall quantity of chalk, or cerus, mixed in it, or with a mixture of oil of eggs, with a ſmall quantity of oil of bricks. Ointments of mercury, or ſulphur, are very dangerous in the beginning of this diſorder, or to weakly infants; and, when ſuch have been uſed by ignorant perſons, the beſt method to be taken is the endeavouring to throw out the humour again by ſudorifics. *Heiſter's Surgery.*

CRY'STALS, (*Dict.*)—The original coaleſcence and formation of thoſe bodies of which ſpar is the baſis, we well know may have been but of yeſterday, ſince we have evident proofs, that ſpar is concreting to this day, and that ſparry bodies are forming every moment. This is evident, from the ſparry ſtalactitæ in the arches of modern buildings, particularly in one ſo lately built as the new bridge at Weſtminſter, the roofs of the arches of which were filled with theſe ſpars, within a year after the arches were built; and there are evident proofs, that ſpars are not made of matter educed from ſtone, ſince brick arches equally abound with them; and the brick vault which ſupports part of the ground terrace at Windſor, has been of late ſo full of them, that there was not room to walk for them.

From theſe obſervations, as alſo thoſe of the ſparry incruſtations round vegetable and other bodies in ſpring, and at the bottoms of our tea-kettles being all incruſted with it; we have evident proof, that ſparry bodies are formed to this day, but we have no ſuch clear evidence of the preſent growth of Cryſtal. Whether or not it is ſo, however, we may be led by a few propoſitions to prove, by the only ſure teſt, experiments,

1. If cryſtallized ſpar can be at this day diſſolved in water, or ſuſpended in it, in their minima or ultimate particles, and again ſeparated from it, theſe ſtony or other foſſils, compoſed of Cryſtal and ſpar, may be formed at this day; if theſe bodies are not thus diſſolved, they cannot.

2. If Cryſtal and ſpar can be raiſed in vapour, or ſuſpended in effluvia, then cryſtalline and ſparry concretions may at this day be formed in places where water cannot be ſuppoſed to have come: if they cannot be thus ſuſpended, then the Cryſtals and ſpars found in ſuch places cannot have been formed at this day, but muſt have been there from ſome diſtant time.

The ſubject of enquiry is by theſe propoſitions reduced to a narrow compaſs; and all that experiments have to determine is: 1. Whether Cryſtal or ſpar are at this time found ſuſpended in water, in imperceptible particles, or whether they are not; and 2. If they are thus ſuſpended, whether they are or are not capable of being raiſed in vapour?

Theſe things Dr. Hill has been at the pains to determine, by a great number of experiments.

The bottom of every tea-kettle, as has been before obſerved, informs us, that ſome ſolid foſſil body is ſuſpended in imperceptible particles in all, even the cleareſt water, and is eaſily ſeparated from it by no other agent than heat; as heat therefore is found capable of ſeparating this ſubſtance, and no other agent that we know of is ſo, that is the natural means to be uſed in the inveſtigation of the ſubject.

The ſubſtance incruſting tea-kettles, &c. is found to be a genuine ſpar, with a greater or leſſer admixture of earth, and is wholly the ſame with the incruſtation on vegetables in ſprings, &c. Here, therefore, is a proof of ſpar and earth being ſuſpended in common water, but none of Cryſtal. This was alone to be determined by repeated and cautious diſtillations. In diſtilling the water of the ſame ſpring, with different degrees of fire, a different quantity of matter was found at the bottom of the veſſel. It appeared hence, that, in a greater degree of heat, a great part of the matter had been raiſed in vapour, and the remainder, on trial, always proved to be only ſpar and earth. Here, were therefore, both the queſtions anſwered in the affirmative, in regard to ſpar, viz. that it is continually ſuſpended in water, and may be raiſed in vapour. The water of theſe diſtillations being returned into the cucurbit, and re-diſtilled, leaves a ſecond ſediment in ſmall quantity, and of a white colour. This, being examined according to the known laws of foſſils, proves to be part ſpar, and part Cryſtal, and undiſſolved powder remaining from it, after pouring on aqua-fortis to take up the ſpar; and this in all teſts appearing to be true and perfectly pure Cryſtal. A third diſtillation of the ſame water produced not the leaſt reſiduum. Hence, therefore, it is evident, that Cryſtal, as well as ſpar, is continually ſuſpended in water, and may be raiſed in vapour, and ſeparated by no other agent than heat. And hence the concluſion is plain, that cryſtalline as well as ſparry bodies may be, and doubtleſs are, continually formed in the earth to

PLATE XVII. *Engraved for the Supplement.* *Facing* Crucible.

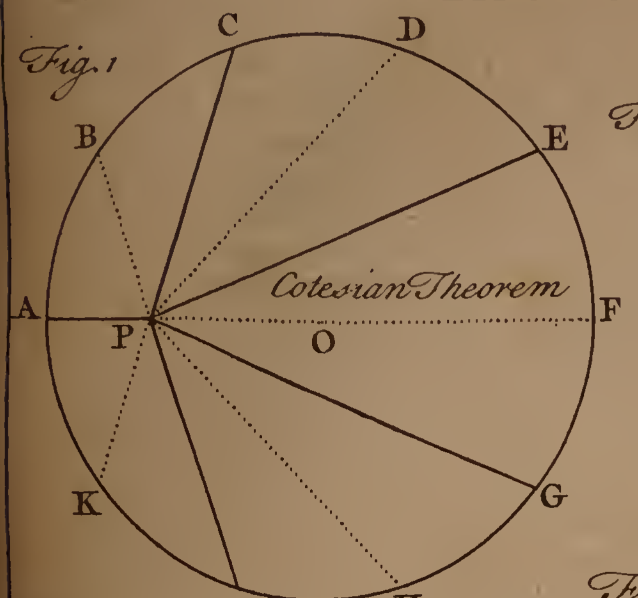


Fig. 1

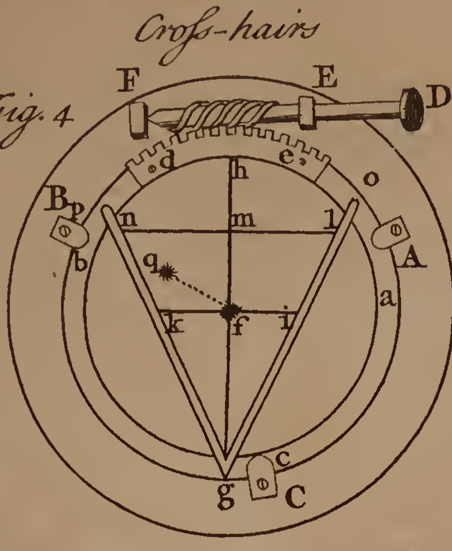


Fig. 4

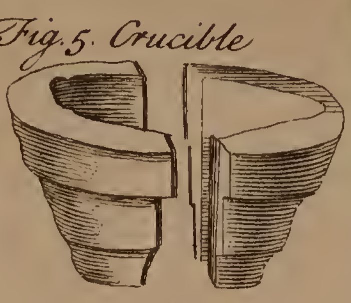


Fig. 5. Crucible

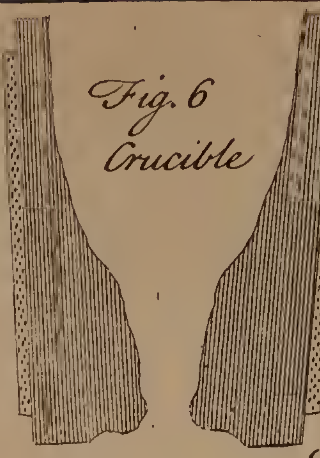


Fig. 6 Crucible

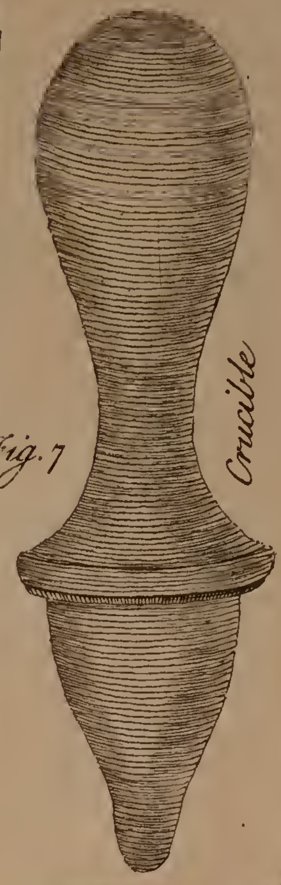


Fig. 7

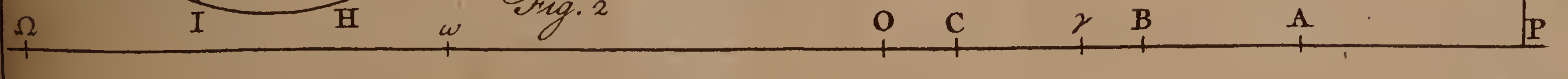


Fig. 2

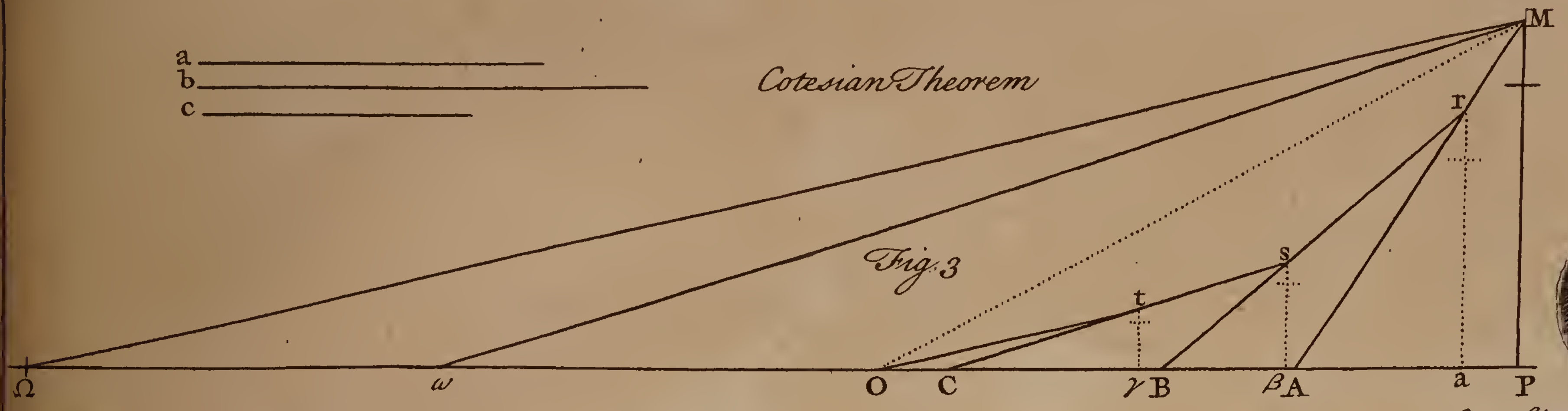
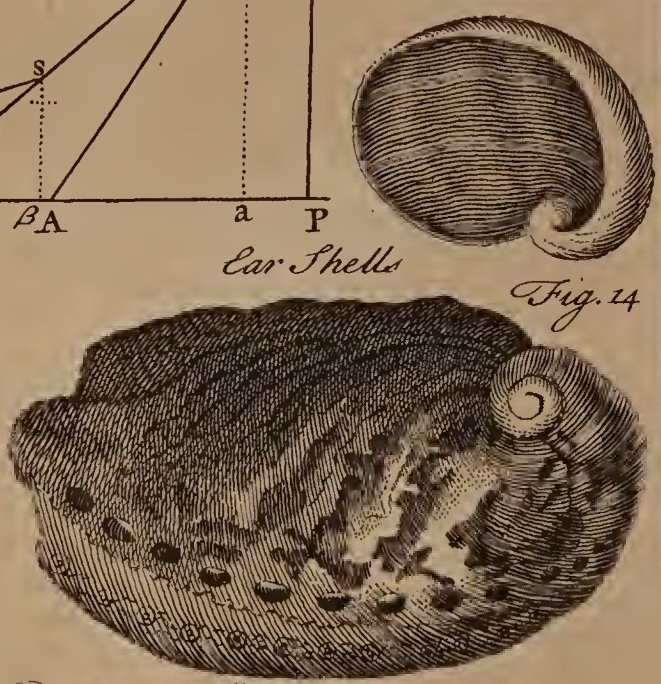


Fig. 3


Ear Shells
Fig. 14

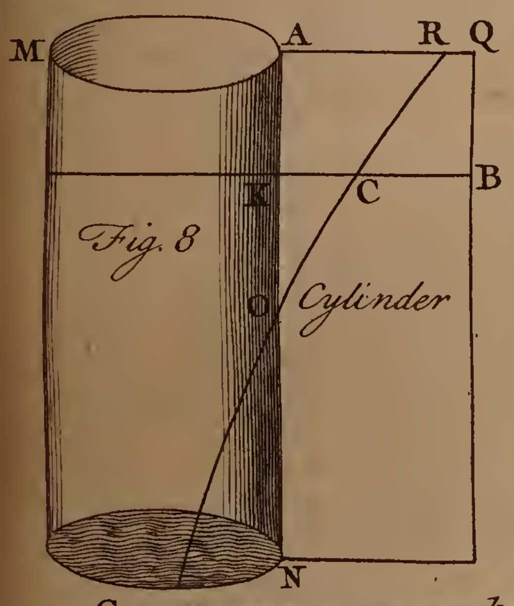


Fig. 8

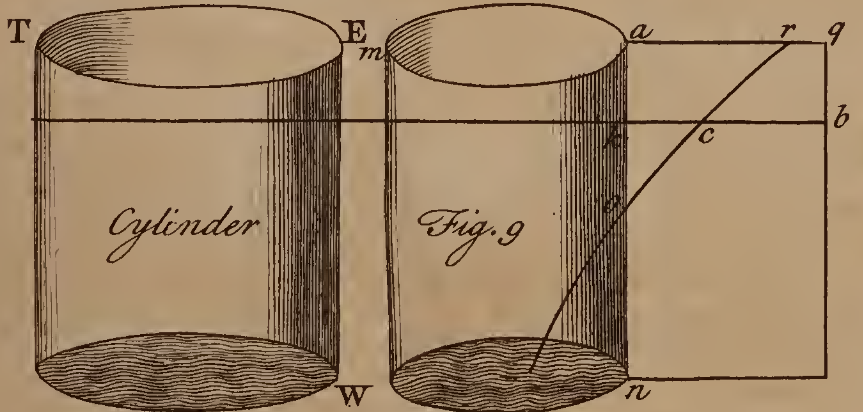


Fig. 9

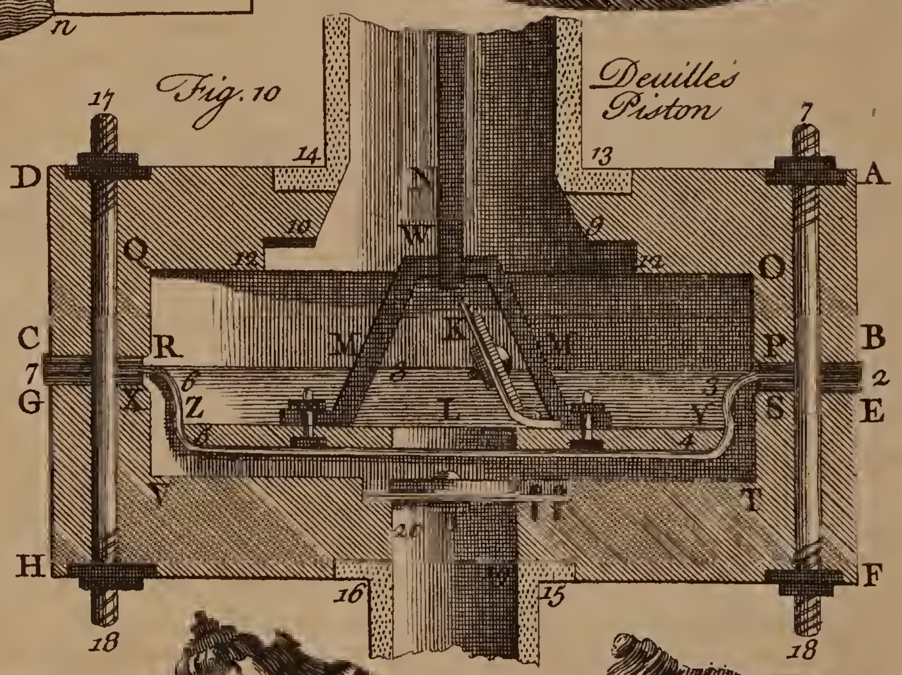


Fig. 10

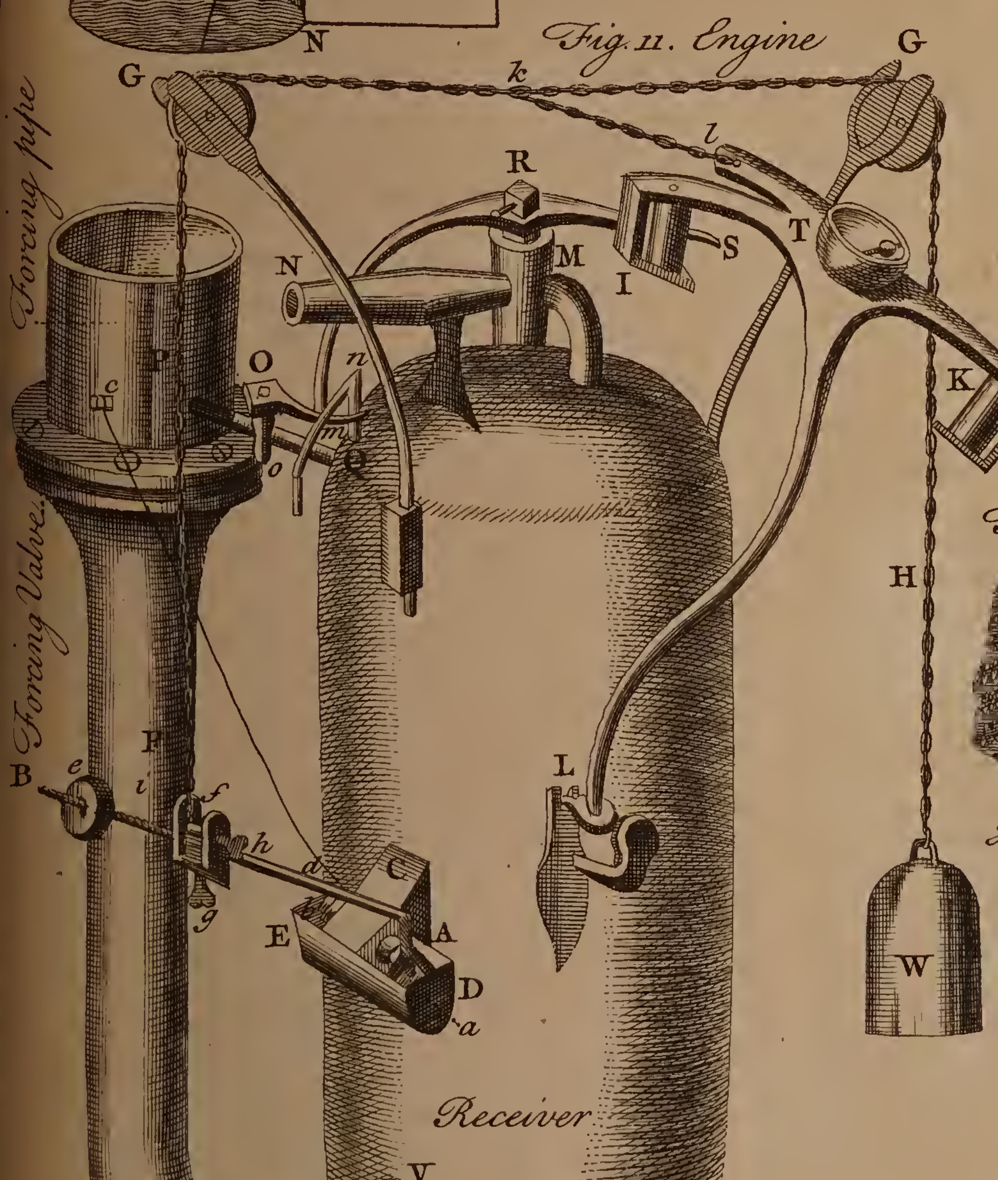


Fig. 11. Engine

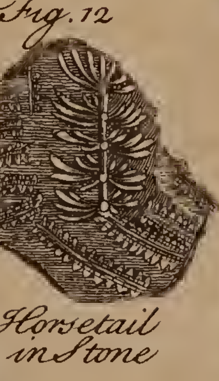
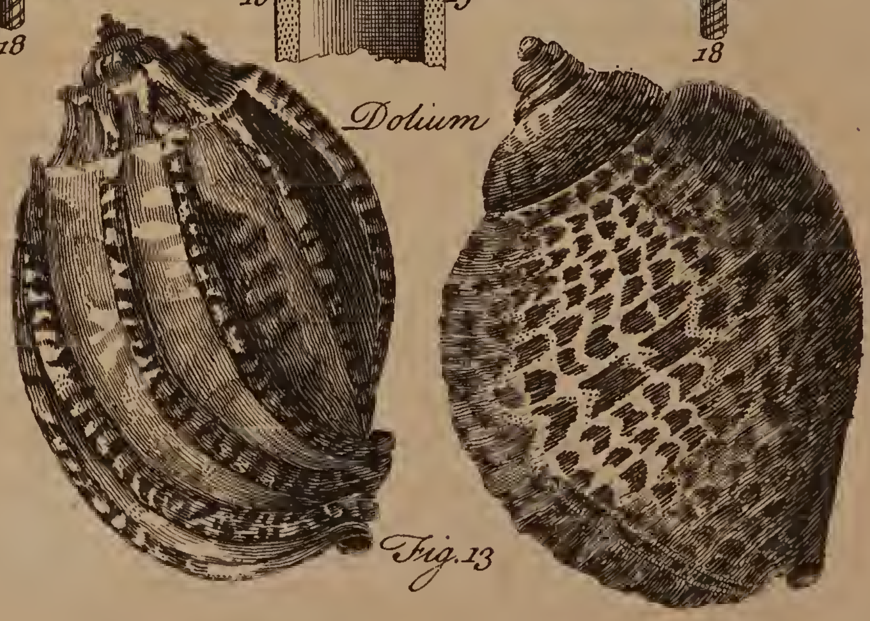


Fig. 12
Horsetail in Stone


Dolium
Fig. 13

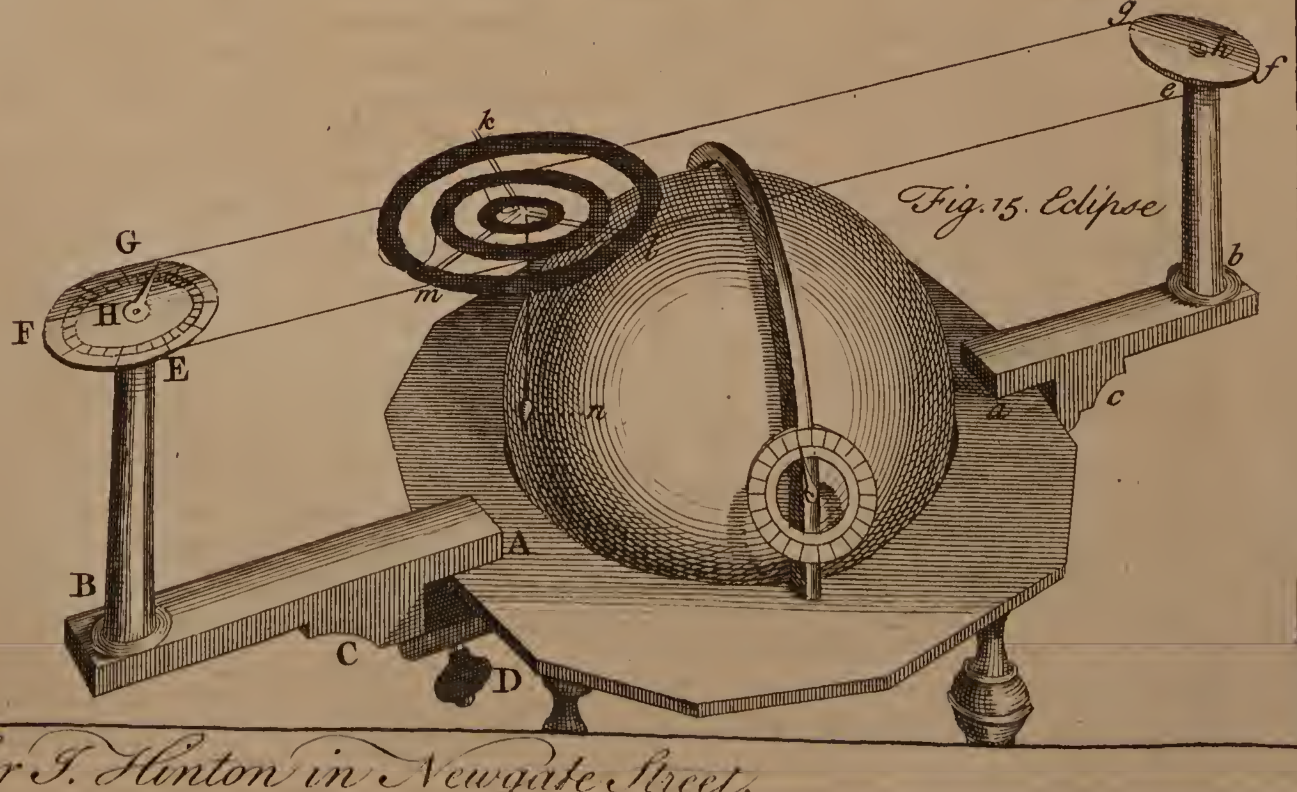


Fig. 15. Eclipse

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this day, and need not be ſuppoſed all of as old a date as the creation or deluge. *Hill's Hiſt. of Foſſ.*

Having thus from experiments gone through the hiſtory of what may be the origin of many of the cryſtalline bodies we daily meet with, it remains to ſay ſomething of their form.

The perfect regularity of the figures of Cryſtals cannot but be the effect of ſome fixed, permanent, and invariable cauſe; theſe being ever, unleſs altered by accidents, which rarely happens, the very ſame in the ſame genus. The antients eſteemed Cryſtal a congelation of water, and thought it only ice harder than ordinary. Signior Lana, who had an opportunity, in the Valſabbia, of ſeeing many of the perfect double kinds, imagined, that they owed their origin to dews congealed by nitrous exhalations. Rohault imagines the figure of common Cryſtal the effect of ſix drops of water thrown together.

Others are for its being formed of radiations, others from all its parts being like the whole; and others from the mutual tendency of the parts of it towards the ſame center. But all theſe the laws of action in matter, and the ſtructure of Cryſtal in the ſeveral ſpecies, eaſily ſhew to be erroneous.

Many think they have ſolved all difficulties, when they ſay, that Cryſtals are ſalts; but we know no more of the true figures of ſalts, than we do of thoſe of Cryſtals. And it is to be added, that, if Cryſtals are ſalts, then ſalts are ſomething elſe from what we have been taught to think they are, Cryſtals by no means anſwering to the definitions given us of them by authors. As we yet know ſo little of the cauſes of the regular cryſtallizations of ſalts, why are we to ſuppoſe no other bodies but ſalts capable of ſuch cryſtallizations; and why may not the ſame almighty agent, who has implanted, in the minima of ſaline bodies, a tendency to theſe their ſeveral appropriated forms, have allowed the ſame tendency to other bodies?

How it is, that Cryſtal, in its ſmalleſt concretions, obtains its determinate figure, according to the genus it is of, is aſſuredly yet to us unknown; but how it is enlarged afterwards, yet ſtill kept in its ſame form, ſeems not ſo difficult to be accounted for, and may indeed be traced from obſervations of the ſeveral bodies in their preſent ſtate.

We are not to doubt, but that the ſmalleſt concretions are regularly formed in all Cryſtals, according to their kinds, and we ſee the ſmalleſt that even the microſcope can diſcover to us, regularly are ſo. Theſe are formed, among water or vapour, ſolid with the ſame particles, and only wanting a ſlow evaporation to part them from the water or vapour.

Theſe particles, though, when collected in a body, they be more than twice the ſpecific gravity of water, yet, while ſuſpended in a vaſt proportion of water, attract the particles of the water more ſtrongly than they do one another, and hence give way to that repulſive power ſo well known in nature, which is properly the effect of another attraction, by which all things are made to aſcend in water, which are leſs than water attracted by the gravitating power of the earth: the particles of Cryſtal therefore, attracting the particles of water more ſtrongly than one another, recede from one another, as far as the quantity of water they are ſuſpended in will permit. When this quantity of water is ſo far evaporated, that the particles of Cryſtal are nearer to one another, and brought within the verge of one another's attraction, they become more attracted by one another, than by the particles of water, and thence form concretions. This they uſually do in many parts of the ſame fluid at once; and hence it is, that we uſually find many ſhoots in the ſame place. The whole cryſtalline matter might now be expected to form itſelf into theſe ſmall concretions: but there is now a new law or power eſtabliſhed in the evaporating fluid; for theſe ſmall aggregates of bodies, now formed in ſeparate concretions, attract the particles yet ſuſpended in the fluid, more than they do one another: hence they naturally become applied to theſe, and, being every way equally extended over them by the ambient fluid, they no way alter their firſt figure, while they ever ſo much increaſe their bulk. And it is evident, from examining the columns of Cryſtals, which are ridged and ſtriated acroſs, while their pyramids are all ſmooth, that this new matter has ever been added to the pyramidal planes, and thence extended down the ſides of the columns. *Hill's Hiſt. of Foſſ.*

When any piece of workmanſhip in Cryſtal is become foul and dark, the method of recovering its luſtre, without hurting its poliſh, is this: mix together ſix parts of common water, and one part brandy; boil theſe over a briſk fire, and let the Cryſtal be kept in it, in a boiling ſtate, a quarter of an hour, then take it out, and rub it carefully over, with a bruſh dipped in the ſame liquor; after this, it is not to be left to dry of itſelf, but to be wiped with a clean napkin, and its ſurface will by this means be perfectly cleanſed, and rendered as bright as at firſt, without that injury to the points of the cutting, or to the ſurfaces of the planes or facets, which would naturally have been the conſequence of doing it by mere rubbing or wiping. Natural Cryſtal may be reduced, by calcination, into the ſtate of the bodies proper for making glaſs with alkaline ſalts, and makes a moſt fine and valuable fritt. The method of doing it is this: calcine natural Cryſtal in a crucible; when it is red-hot, throw it into cold water to quench it; repeat this eight times, covering the crucible, that no duſt or aſhes may get in and mix with the Cryſtal; dry this calcined maſs, and reduce it to an impalpable powder; mix this powder with the pure ſalts of polverine, and with theſe make fritt, in the uſual proportions, and with the common quantity of manganeſe; waſh this often in cold water, and, after a proper time, work it; it will yield a moſt beautiful glaſs. *Neri's Art of Glaſs.* See FRITT.

Natural Cryſtal may be coloured of ſeveral colours, without melting or running it into glaſs, in the following manner: take a number of pieces of fine, clear, and pure Cryſtal of various ſizes, of crude antimony and crude orpiment in powder, of each two ounces; ſal armoniac one ounce; powder this alſo, and mix them well together; put this powder into a ſtrong crucible, and lay upon it the pieces of Cryſtal in their natural ſtate; then cover this crucible with another, mouth to mouth: lute them well, and, when the lute is dry, ſet them in coals, which kindle by little and little; and, when they begin to fire, let them kindle of themſelves, and, they will then ſmoke very much. Let this be done in a large chimney, taking care to avoid the fumes. When it fumes no more, let the fire go out of itſelf, and all ſtand till cool; then unlute the crucible, and take out the Cryſtals; thoſe at top will be coloured to a fine yellow, with a deep and pale red, the colours of the common fine and balaſs ruby, with beautiful ſpots; and thoſe which be at the bottom upon the powder, will be of a watery colour, mottled like that of the viper. This Cryſtal comes out ſo fair from this proceſs, that it may be cut as a gem, and, though many are ſpoiled, yet in making a large quantity, there are always ſome fair and perfect. *Neri's Art of Glaſs.*

Prepared CRYSTAL, a term among the makers of counterfeit gems, for a powder of natural Cryſtal, made for their purpoſe. The manner of preparing it is as follows: take the pureſt and cleareſt natural Cryſtal, put it into a crucible covered at the top; ſet it among burning coals; let the Cryſtal be made red-hot, then plunge it into a large veſſel of cold water. When the Cryſtal is cold, put it into the fire again, heat it red-hot, and quench it again; and repeat this operation twelve times, carefully keeping aſhes or any other foulneſs out of the crucible. When the calcination is finiſhed, the Cryſtal will be brittle and crumbly; powder it, and levigate it on a porphyry to an impalpable powder. This powder muſt be made perfectly fine, otherwiſe the gems made with it will be all foul and coarſe; and no braſs or copper veſſels muſt be uſed about the operation. If the Cryſtal ſhould be powdered in a braſs or bell-metal mortar, there could be nothing but an emerald be made of it, from the quantity of copper it would take up in the powdering. When carefully prepared, it receives all the colours of the gems, by proper additions, and affords a maſs ſofter indeed, but not leſs bright and pellucid, or not leſs beautifully tinged than the fineſt of the oriental gems. *Neri's Art of Glaſs.*

CRYPTOGA'MIA, in botany, a claſs of plants whoſe flowers are either wholly inviſible, or ſcarce diſcernable by the eye.

CU'BITUS, (*Dict.*) — *Fractured* CUBITUS. The lower part of the arm, which is called the Cubitus, contains two bones, the radius and ulna: fractures of this part, therefore, ſometimes happen only to one, ſometimes to both thoſe bones, and that ſometimes near their extremities, but oftener toward their middle: but, when they are both broke together, the bones are not only very eaſily diſtorted from each other, but they are not to be replaced without a great difficulty alſo: if one ſhould, on the contrary, be broken while the other remains whole, the fractured parts do not much recede out of their places, nor are they very difficult to reduce and retain; for the bone, remaining ſound, is found, in this caſe, to be a better direction and ſupport than either ſplinters or bandages. When the fracture happens towards the lower head, near the pronator quadratus muſcle, the fractured part is ſtrongly drawn by that muſcle, and the intervening ligament that is extended between the radius and ulna, toward the ſound bone; and this makes it more difficult to replace. If the radius is to be replaced, whoſe fragment is contracted towards the ulna, an aſſiſtant muſt hold the arm, while the ſurgeon inclines the patient's hand towards the ulna, to draw back the contracted parts of the radius. When this is done, he muſt carefully reduce them by compreſſion on both ſides with his hands, ſo as to reſtore the compreſſed muſcle between the radius and ulna, and the fragments of the radius, to their proper places. The arm is then to be bound up with the proper bandage, and the limb muſt afterwards be placed in a ſort of caſe made of paſte-board, or light wood, to be ſuſpended in a ſling put about the neck.

In ſetting a fracture of the ulna, the whole method muſt be the ſame with this of the radius, except that, in the extenſion, the hand muſt be bent toward the thumb, and radius, before the diſtorted part of the ulna can be compreſſed into its proper place. When both bones of the Cubitus are broken, the method of cure is much the ſame with that uſed to each of them, when broken ſingly; but there is required more ſtrength and circumſpection, both in the replacing them, and a great deal of caution in applying the bandage to retain them. Care muſt alſo be taken, that, while the arm continues in this caſe a great while, without motion, the mucilage of the joint does not harden, or the ligament become ſtiff, and the arm, or Cubitus, be thereby rendered immoveable. To guard againſt this, it will be proper to unbend the arm once in two or three days, and to move it a little carefully and gently, backwards and forwards, and ſometimes to foment it with warm water or oil; by which means its motion will be preſerved. *Heiſter.*

Luxated CUBITUS. The Cubitus conſiſting of two bones, the ulna and radius, is articulated by a gynglymus; and the connection of theſe bones is ſuch, that the ulna, or Cubitus, as being the largeſt bone, and ſeated in the lower part of the arm, does of itſelf perform the whole flexion, and extenſion of the arm, yet it cannot perform thoſe motions without carrying the radius along with it; but, on the other hand, the radius may be turned along with the hand both inward and outward, without at all moving or bending the ulna, as when the pronation and ſupination of the hand are made thereby. Both theſe bones of the Cubitus are ſo articulated with the lower head of the os humeri, that large protuberances are received into deep cavities, or grooves, and the whole inveſted and faſtened with exceeding ſtrong ligaments; ſo that, notwithſtanding the Cubitus may be luxated in all four directions, outward or inward, backward or forward, yet it is but ſeldom that it ſuffers a perfect or intire diſlocation, unleſs the upper part of the ulna be broken, or the ligaments of the Cubitus much weakened by ſome great external violence. The ſlighter and more recent luxations of this kind are, the more eaſy is the reduction of them. Be the caſe better or worſe, however, the patient muſt be placed in a chair, and both parts of the limb, the humerus and the Cubitus, muſt be extended in oppoſite or contrary directions, by two ſtrong aſſiſtants, till the muſcles are found pretty tight, with a free ſpace between the bones: then the luxated bone muſt be replaced, either with the ſurgeon's hands alone, or with the aſſiſtance of bandages, that the proceſſes may fall into their ſinuſes; and, when this is done, the Cubitus muſt be ſuddenly bent. But, if the tendons and ligaments are ſo violently ſtrained that they can ſcarce perform their office, it will be proper to anoint them with emollient oils, ointments, and the fat of animals; or to apply emollient cataplaſms and fomentations. As ſoon as the reduction has been effected, the articulation muſt be bound up with a proper bandage, and the arm afterwards ſuſpended in a ſling hung about the neck. But care muſt be taken that the bandage is not kept on too long, nor the arm kept intirely without motion all the time, but the mucilage of the joint ſhould become inſpiſſated, and the articulation rendered, by that means, ſtiff, or the motion of the part be intirely loſt. To prevent this, it will be proper to undo the bandage every other day, and gently to bend and extend the limb: afterwards, compreſſes dipped in warm wine may be applied, and held on with the bandage. *Heiſter's Surg.*

CUCU'RBITA, *the gourd*, in botany, a genus of plants whoſe characters are:

It hath a flower conſiſting of one leaf, which is of the expanded bell-ſhape, for the moſt part ſo deeply cut, that it ſeems to conſiſt of five diſtinct leaves: this, like the cucumber, has male and female flowers upon the ſame plant: the fruit of ſome ſpecies is long, of others round or bottle-ſhaped, and is commonly divided into ſix cells, in which are contained many flat oblong ſeeds, which have ſometimes a border round them.

There are ſeveral varieties of this plant, which are annually brought from America, where are numberleſs varieties of theſe, and of pumpkins and calabaſhes: but theſe ſorts are ſo apt to ſport, that there is no certainty of their producing the ſame ſhaped fruit for two years together, unleſs it is that with the long fruit, which I do not remember to have ſeen change or alter; but all the others will run from one ſhape to another, ſo as rarely to produce the ſame as thoſe which the ſeeds were ſaved from.

They may be all propagated by ſowing their ſeeds in March, on an hot bed; and, when the plants come up, they ſhould be tranſplanted on another moderate bed, where they ſhould have a great deal of air to ſtrengthen them; and, when they have got four or five leaves, they ſhould be tranſplanted into holes made upon an old dunghil, or ſome ſuch place, allowing them a great deal of room to run; for ſome of the ſorts will ſpread to a great diſtance. I have meaſured a ſingle plant, which had run upwards of forty feet from the hole, and had produced a great number of ſide branches; ſo that if the plant had been encouraged, and all the ſide branches permitted to remain, I dare ſay it would have fairly overſpread twenty rods of ground: which, to ſome people, may ſeem like a romance; yet I can affirm it to be fact. But what is this to the account printed in the Tranſactions of the Royal Society, which was communicated to them by Paul Dudley, Eſq; from New England, wherein mention is made of a ſingle plant of this kind, which, without any culture, ſpread over a large ſpot of ground, and from which plant were gathered two hundred and ſixty fruits, each, one with another, as big as an half peck. *Miller's Gard. Dict.*

CU'CULUS, *the cuckow*, in ornithology, a bird well known in England, by the ſingularity of its note; its beak is long and ſtrait, only it is a little hooked at the end, of a blackiſh brown above, and of a yellowiſh white below; its mouth is yellow within, and the iris of its eyes of a hazel colour; its noſtrils round, open, and ſtanding out beyond the ſurface of the bill, by which mark alone, it is to be diſtinguiſhed from all other birds; its throat, breaſt, and belly, are white, variegated with tranſverſe ſtreaks of brown; the feathers of its head are brown, with white edges, and its rump is grey; its back, neck, and wings, are of a browniſh hue; its long wing feathers have white tips, and are variegated with black, brown, and white; and the tail feathers are beautifully variegated with white. Its feet and legs are yellow. Its food is caterpillars, and other inſects. *Ray's Ornith.*

It never builds itſelf a neſt, but ſeizes upon that of any other ſmall bird, and, deſtroying its eggs, leaves its own in their place.

Whether it hides in hollow trees, &c. during the winter, with us, or whether it leaves us for a warmer climate, is not certainly known. It is pretended that many have been found in hollow trees, but the truth of it has never been well atteſted.

CU'CUMBER, *cucumis*, in botany, a genus of plants whoſe characters are:

It hath a flower conſiſting of one ſingle leaf, which is bell-ſhaped and expanded towards the top, and cut into many ſegments; of which ſome are male or barren, having no embryo, but only a large ſtyle in the middle, which is charged with the farina: others are female or fruitful, being faſtened to an embryo, which is afterwards changed into a fleſhy fruit, for the moſt part oblong and turbinated, which is divided into three or four cells incloſing many oblong ſeeds.

To raiſe Cucumbers you muſt provide in January a quantity of new horſe-dung, with the litter mixed together, in proportion to the number of plants you intend to raiſe, which, if for a private family, two loads will be full enough: this ſhould be thrown into an heap, mixing a few ſea coal aſhes therewith; in about four or five days after, the dung will begin to heat, at which time you may draw a little part of the heap on the outſide flat, laying thereon a little good earth, about two inches thick; this you ſhould cover with a bell-glaſs, laying a little dry litter thereon: and in a day or two after, when you perceive the earth to be warm, you muſt put your ſeeds therein, covering them, about a quarter of an inch, with the ſame earth; then put the glaſs on again: and alſo at night, or in bad weather, obſerve to cover the glaſs with dry litter or mats, &c. and in three or four days time, if the dung be in a good temper of heat, the plants will appear above ground; which when you firſt obſerve, you muſt immediately with the adjoining heap of dung make a bed for one ſingle light, being careful not to take the dung away too cloſe to the bell-glaſs, but obſerving to lay a little dung round about it, as alſo to keep it covered, that the young plants may not receive a check thereby. This hot bed will require to be three feet thick in dung at leaſt, which, in the making, ſhould be carefully mixed, and beat pretty cloſe with the fork, to prevent the heat from being too ſudden and violent: then lay ſome freſh earth upon the dung, about three inches thick, levelling it very even, and put on the frame, covering it over in the night, or in bad weather, with a mat, &c. as before, in order to excite an heat in the bed; and, as ſoon as you perceive the bed to be in a good kindly temper of heat, you ſhould prick your young plants thereon, at about two inches diſtance each way, obſerving to put them into the earth almoſt up to their ſeed leaves.

If the bed is of a good temper of heat, your plants will take root in leſs than twenty-four hours; after which time you muſt be careful to let in a little air, at ſuch times when the weather will permit, as alſo to turn the glaſs upſide downwards every day to dry; for the ſteam of the bed, condenſing on the glaſſes, will fall down upon the plants, and be very injurious to them; and, therefore, whenever the weather is ſo bad as not to permit the glaſſes to lie turned long, you ſhould at leaſt turn them once or twice a day, and wipe off the moiſture with a woollen cloth; but you muſt alſo be very careful how you let in too much cold air, which is equally deſtructive to the tender plants; therefore, to avoid this, it is a very good method to faſten before the upper ſide of the frame, where the air is ſuffered to enter the bed, a piece of a coarſe cloth, or a mat, ſo that the air which enters, may paſs through that, which will render it leſs injurious to your plants.

You muſt alſo be very cautious in giving water to the plants, while young; and, whenever this is done, it ſhould be ſparingly, and the water ſhould be placed either in the heap of dung, or in ſome other warm place, for ſome time before it is uſed, ſo as to be nearly of a temperature for warmth with the incloſed air of the hot bed; and, as the plants advance in height, you ſhould have a little dry ſifted earth always ready, to earth up their ſhanks, which will greatly ſtrengthen them.

Theſe directions, if carefully attended to, will be ſufficient for raiſing the plants in the firſt bed: you muſt therefore, when you perceive the third or rough leaf begin to appear, prepare another heap of freſh dung, which ſhould be mixed with aſhes, as was before directed: this ſhould be in quantity according to the number of holes you intend to make. The common allowance for ridging out the earlieſt plants is, one load to each light or hole, ſo that the bed will be near three feet thick in dung; but, for ſuch as are not ridged out till March, two loads of dung will be ſufficient for three holes; for I could never obſerve any advantage in making theſe beds ſo thick with dung as ſome people do: their crops are ſeldom better, if ſo good, as thoſe which are of a moderate ſubſtance; nor are they forwarder, and the fruit is rarely ſo fair; nor do the vines continue ſo long in health.

In four or five days time your bed will be in fit order to receive your plants; of which you may eaſily judge, by pulling out one of the ſticks which was put in the middle of the holes, and feeling the lower part of it, which will ſatisfy you what condition your bed is in: then you muſt ſtir up the earth in the middle of the hole with your hand, breaking all clods, and removing all large ſtones, making the earth hollow, in form of a baſon. Into each of theſe holes you muſt plant four plants; in doing of which, obſerve to make the holes a little ſlanting towards the middle of the baſon, eſpecially if your plants are long-ſhanked: this is intended to place the roots of the plants as far as poſſible from the dung, to which, if they approach too near, the lower part of their roots is ſubject to be burned off: then ſettle the earth gently to each plant; and, if the earth is dry, it will be proper to give them a little water, which ſhould be warmed to the temper of the bed, as was before directed; and, if the ſun ſhould appear in the middle of the day, they ſhould be ſhaded therefrom with mats until the plants have taken root, which will be in two or three days; after which, you muſt let them enjoy as much of the ſun as poſſible, obſerving to turn the lights in the day-time to dry, as alſo to give a little air, whenever the weather will permit.

You muſt alſo obſerve to keep the glaſſes covered every night, and in bad weather; but be very careful not to keep them covered too cloſe, eſpecially while the bed has a great ſteam in it, which will cauſe a damp to ſettle upon the plants, which, for want of air to keep the fluid in motion, will ſtagnate and rot them.

When your plants are grown to be four or five inches high, you muſt, with ſome ſlender forked ſticks, incline them toward the earth, each one a ſeparate way; but this muſt be done gently at firſt, leſt, by forcing them too much, you ſhould ſtrain or break the tender veſſels of the plants, which would be very hurtful to them. In this manner you ſhould, from time to time, obſerve to peg down the runners, as they are produced, laying each in exact order, ſo as not to interfere or croſs each other; nor ſhould you ever after remove them from their places, or handle them too roughly; whereby the leaves may be broken or diſplaced, which is alſo equally injurious to them; but, whenever you have occaſion to weed the bed between the plants, do it with great care, holding the leaves aſide with one hand, while with the other you pull out the weeds.

In about a month after they are ridged out, you may expect to ſee the beginnings of fruit, which very often are preceded by male flowers, which many people are ſo ignorant as to pull off, calling them falſe bloſſoms: but this I am fully convinced, by many experiments, is wrong; for theſe flowers are of abſolute ſervice to promote the welfare of the fruit; which, when theſe male flowers are intirely taken off, does very often fall away, and come to nothing: nor ſhould the vines be pruned, as is too often the practice of unſkilful people, eſpecially when they are too luxuriant; which often happens when the ſeeds were freſh, or of the laſt year's ſaving, and the plants in good heart.

At this time, when your vines are ſpread, ſo as to cover the hot bed, it will be of great ſervice, when you water them, to ſprinkle them all over gently, ſo as not to hurt the leaves; but obſerve to do this not at a time when the ſun is very hot; for hereby I have known a whole bed of Cucumbers ſpoiled. The watering of the beds all over will be of great ſervice, by giving nouriſhment to thoſe roots, which by this time will have extended themſelves all over the bed: and if the warmth of the bed ſhould now decline, it will be of great ſervice to add a lining of freſh dung round the ſides of the beds, to give a new heat to them: for, as the nights are often cold at this ſeaſon, where the beds have not a kindly warmth left in them, the fruit will frequently drop off the vines, when grown to the ſize of the little finger: and, if upon this lining of dung there is a thickneſs of ſtrong earth laid for the roots of the plants to run into, it will greatly ſtrengthen them, and continue the plants in vigour a much longer time than they otherwiſe will do; for the roots of theſe plants extend to a great diſtance when they have room, which they cannot have in a bed not more than five feet wide; ſo that, when they have no greater extent for their roots, the plants will not continue in vigour above five or ſix weeks, which, if they have a depth and extent of earth, will continue three months in bearing; ſo that, where there are ſeveral beds made near each other, it will be the beſt way to fill up the bottom of the alleys between them with warm dung, and cover that with a proper thickneſs of earth, ſo as to raiſe them to the level of the beds.

The ſeaſon for ſowing the Cucumbers for the laſt crop, and for pickling, is towards the latter end of May; when the weather is ſettled: theſe are ſown in holes dug to a little depth, and filled up with fine earth, in form of a baſon, eight or nine ſeeds in each hole. Theſe will come up in five or ſix days, and, till they are about a week old, are in great danger from the ſparrows; after they require only watering now and then, and keeping clear from weeds. There ſhould be only five plants, at firſt, left in each hole, and, when they are grown a little farther up, the worſt of theſe is to be pulled up, that there may finally remain only four. The plants of this crop will begin to produce fruit in July. *Miller.*

CUNI'CULUS, in mining, a term uſed by authors, in diſtinction from puteus, to expreſs the ſeveral ſorts of paſſages and cuts in theſe ſubterranean works. The Cuniculi are thoſe direct paſſages in mines, where they walk on horizontally; but the putei are the perpendicular cuts or deſcents. The miners in Germany call theſe by the names ſtollen and ſchachts; the firſt word expreſſing the horizontal, and the other the perpendicular cuts. It is an obſervation with our miners, that the damps, ſo much dreaded in all mines, happen generally in the horizontal cuts; but Dr. Brown, in his examination of the gold and ſilver mines in Hungary, obſerves, that they as often happen there in the putei or ſchachts, as in the Cuniculi or ſtollen. Another obſervation, as to the damps with us, is, that they are more frequent in clayey and ſoft places under ground; but in thoſe mines they are as frequent where the matter is hard ſtone; and one of the moſt miſchievous that had then lately happened, was in a place every-where ſurrounded with ſtone, ſo hard, that the tools of the miners could ſcarce work through it; and the deſcent had, in the very ſpot where the damp was, been made by means of gunpowder. In ſome of the Cuniculi in theſe mines, there are damps that regularly return on certain occaſions; as, if the lower end of the Cuniculus be filled up with water, certain parts in going to it are always affected with damps, which will put out a lamp or candle, the moment it enters them, and often do great miſchief to the miners in paſſing them. *Phil. Tranſ.* N°. 48.

CUP-*galls*, in natural hiſtory, a name given by authors to a very ſingular kind of galls found on the leaves of the oak, and ſome other trees. They are of the figure of a cup, or drinking-glaſs, without its foot, being regular cones, adhering by their point or apex to the leaf; and the top or broad part is hollowed a little way, ſo that it appears like a drinking-glaſs with a cover, which was made ſo ſmall, as not to cloſe it at the mouth, but to fall a little way into it. This cover is flat, and has in the center a very ſmall protuberance, reſembling the nipple of a woman's breaſt. This is of a pale green, as is alſo the whole gall, excepting only its rim which runs round the top; this is of a ſcarlet colour, and that very beautiful. Beſides this ſpecies of gall, the oak leaves furniſh us with ſeveral others, ſome of which are oblong, ſome round, and others flatted; theſe are of various ſizes, and appear on the leaves at various ſeaſons of the year.

CUPRE'SSUS, *the Cypreſs-tree.*— This tree is very proper to intermix with ever-greens of a ſecond ſize next to pines and firs, to form clumps; in which claſs it will keep pace with the trees of the ſame line, and be very handſome. Beſides, the wood of this tree is very valuable, when grown to a ſize fit for planks; which I am convinced it will do, in as ſhort a ſpace as oaks; therefore, why ſhould not this be cultivated for that purpoſe, ſince there are many places in England where the ſoil is of a ſandy or gravelly nature, and ſeldom produces any worth cultivating? Now, in ſuch places theſe trees would thrive wonderfully, and greatly add to the pleaſure of the owner, while growing, and afterwards render as much profit to his ſucceſſors, as perhaps the beſt plantation of oaks; eſpecially ſhould the timber prove as good here, as in the iſlands of the Archipelago, which I ſee no reaſon to doubt of: for we find it was ſo gainful a commodity to the iſland of Candia, that the plantations were called Dos Filiæ; the felling of one of them being reckoned a daughter's portion.

The timber of this tree is ſaid to reſiſt the worm, moth, and all putrefaction; and is ſaid to laſt many hundred years. The doors of St. Peter's church at Rome were framed of this material, which laſted from the great Conſtantine to pope Eugenius IV's time, which was eleven hundred years, and were then found and intire, when the pope would needs change them for gates of braſs. The coffins were made of this material, in which, Thucydides tells us, the Athenians uſed to bury their heroes; and the mummy-cheſts, brought with thoſe condited bodies out of Egypt, are many of them of this material.

This tree is by many learned authors recommended for the improvement of the air, and a ſpecific for the lungs, as ſending forth great quantities of aromatic and balſamic ſcents; wherefore many of the ancient phyſicians of the eaſtern countries

tries uſed to ſend their patients, who were troubled with weak lungs, to the iſland of Candia, which at that time abounded with theſe trees, where, from the effects of the air alone, very few failed of a perfect cure.

CU'RRAN-*tree*, *ribes*, in botany, a genus of plants, whoſe characters are:

It hath no prickles; the leaves are large; the flower conſiſts only of five leaves, which are placed in a circular order, and expand in form of a roſe: the ovary, which ariſes from the center of the flower cup, becomes a globular fruit, which is produced in bunches.

All ſorts of Curran-trees may be eaſily propagated by planting their cuttings, any time from September to March, but the autumn is the beſt, upon a ſpot of freſh earth, which, in the ſpring, muſt be kept very clear from weeds; and in very dry weather, if they are watered, it will greatly promote their growth. Theſe may remain two years in the nurſery; during which time, they muſt be pruned up for the purpoſes deſigned, i. e. either to clear ſtems, if for ſtandards; or, if for walls, pales, or eſpaliers, they may be trained up flat.

Then they ſhould be planted out where they are to remain; the beſt ſeaſon for which is ſoon after the leaves begin to decay, that they may take root before winter, ſo that they may be in no danger of ſuffering from drought in the ſpring.

Theſe plants are generally planted in rows about ten feet aſunder, and four diſtance in the rows; but the beſt method is to train them againſt low eſpaliers, in which manner, they will take up much leſs room in a garden, and their fruit will be much fairer.

The diſtance they ſhould be placed for an eſpalier, ought not to be leſs than ten or twelve feet, that their branches may be trained horizontally; which is of great importance to their bearing.

Thoſe that are planted againſt pales or walls, ſhould alſo be allowed the ſame diſtance; if they are planted againſt a ſouth-eaſt wall or pale, it will cauſe their fruit to ripen, at leaſt a fortnight or three weeks ſooner than thoſe in the open air; and thoſe which are planted againſt a north wall or pale, will be proportionably later, ſo that by this method the fruit may be continued a long time in perfection; eſpecially if thoſe againſt the north pales are matted in the heat of the day.

Theſe plants produce their fruit upon the former year's wood, and alſo upon ſmall ſnags which come out of the old wood; ſo that, in pruning them, theſe ſnags ſhould be preſerved, and the young ſhoots ſhortened in proportion to their ſtrength. The only method, very neceſſary to be obſerved in pruning them, is, not to lay their ſhoots too cloſe, and never to prune their ſnags to make them ſmooth: this, with a ſmall care in obſerving the manner of their growth, will be ſufficient to inſtruct any perſon how to manage this plant, ſo as to produce great quantities of fruit.

Theſe plants will thrive, and produce fruit, in almoſt any ſoil or ſituation, and are often planted under the ſhade of trees; but the fruit is always beſt when they are planted to the open air, and upon a dry ſoil. *Miller's Gard. Dict.*

CU'RRIERS, mechanics, or artificers, who prepare, after the tanners, the leather chiefly uſed for the upper parts of ſhoes and boots, ſaddles, &c. a pretty hard, dirty buſineſs, though not numerous, but profitable.

They take with an apprentice ten or fifteen pounds, and pay a journeyman fifteen ſhillings a week, who work from ſix to eight. To ſet up a maſter, it will take from 200 to 500 pounds; and ſome of them are alſo leather-cutters.

They were a brotherhood in the year 1367, in the reign of king Edward III, and were not incorporated into a company, till 1605, by James I. Livery fine 9 l. 13 s. 4 d.

Their hall is over-againſt London wall, near Cripplegate; and their court-day on the Saturday next after quarter-day.

Arms. Sable, a croſs ingrailed or, between four pair of ſheaves in ſaltier argent.

Motto. Spes noſtra Deus: God is our hope.

CUT-*water*, the ſharp part of the head of a ſhip below the beak. It is ſo called, becauſe it cuts or divides the water before it comes to the bow, that it may not come too ſuddenly to the breadth of the ſhip, which would retard her.

CU'TLERS, artificers, whoſe buſineſs is making, forging, tempering, in which part ſome have been remarkably famous, and mounting all ſorts of knives, razors, ſheers, ſciſſars, ſurgeons inſtruments, and ſword-blades; but making the hilts is a different trade; and, formerly, cutlery was divided into blade-ſmiths, haft-makers, and ſheath-makers.

It is an ingenious branch of the ſmithery, and not hard work; many Cutlers alſo keep handſome ſhops, and deal in divers other things, as buckles, buttons, canes, &c. though not very numerous.

They take with an apprentice ten or fifteen pounds, who muſt work from ſix to nine: of journeymen there are but few, and about fifty pounds will make a maſter of him; but many ſhopkeepers employ a great deal more.

They were incorporated into one joint company in the year 1417, in the reign of king Henry V. Livery fine 10 l. Their hall is in Cloak-lane, or Dowgate-hill, Thames-ſtreet; but their court-day uncertain.

Arms. Gules, ſix daggers in three ſaltier croſſes argent, handled and hilted or, pointing toward the chief.

Motto. Pour parvenir à bonne foy: to arrive at good faith.

CY'ANUS, *the blue-bottle*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the floſculous kind, being compoſed of a number of floſcules; but theſe of two different kinds: thoſe which ſtand in the middle of the flower are ſmall, and divided into a number of equal ſegments; but thoſe placed nearer the edges are much larger and more conſpicuous, and are, as it were, bilabiated: both kinds, however, are placed on the embryo's, and all are contained together in a general cup, which is ſcaly, and not prickly. The embryo's afterwards become ſeeds winged with down.

CY'BELE, generally called the mother and grandmother of the gods, was by the ancients thought to be Saturn's wife; they called her Ops, Rhea, Dyndimene, Berecynthia, Good-goddeſs, &c. They repreſented her crowned with towers, with a key in her hand, and clad in flowered ſtuff, placed upon a chair drawn by four lions. The pine-tree was conſecrated to her; after Atis, whom ſhe loved ſo well, was metamorphoſed into it. Her prieſts were eunuchs, and they, as well as their ſacrifices, are laughed at by Tertullian in his Apologetic. The pagan divinity, which always conceals ſome natural truth in its fabulous myſteries, teacheth us, that this goddeſs called Cybele, either from the mountain of this name, whereon ſhe was ſacrificed to, or from the word cube, was the earth which produces all things; and it was for this reaſon ſhe was called the great mother. Her crown of towers and cities repreſents what the earth is covered with. The key ſhe holds in her hand, implies that ſhe locks up all her fruitfulneſs during winter, which in the ſpring begins to appear, and then it is ſaid the earth opens. This painted or flowered garment can become nothing ſo well as the earth, which is variegated with all kinds of flowers. The four beaſts that draw the chariot, mark the four ſeaſons of the year, wherein the earth appears ſo differently. Some take them for the four qualities of the earth, the four elements, four cardinal winds. And, if the ancients had known the four parts of the world, they might have been compared to them. In fine, Saturn, which ſignifies time, is believed to be the earth's huſband, to ſhew that it muſt have time to bring forth its productions. Euſebius believes with Diodorus Siculus, that Cybele was a woman who had very good remedies for young children, and that the ancients had all their philoſophy from this ſource. *Euſebius*, *Diodorus.*

CYCLA'MEN, *ſow-bread*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is globoſe, and of a rotated form, and uſually divided into five ſegments, which all bend upwards; from the cup there ariſes a piſtil, which is fixed, in the manner of a nail, to the hinder part of the flower, and afterwards becomes a roundiſh membranaceous fruit, which contains numerous ſeeds, uſually of a longiſh figure, and angular, and fixed to a placenta.

There are ſeveral ſpecies of this plant cultivated in gardens, for the pretty appearance of its flower: they are propagated by the curious from ſeed, in the manner of the xyphium. See XYPHIUM. But they are four or five years before they come to flower, and, for the firſt year or two of their flowering, their roots are ſo ſmall, that the flowers they produce are but few: the roots, however, annually increaſe in bulk, and the number of flowers increaſe in proportion, ſo that they will grow to fourteen inches in diameter, and, when of this ſize, will produce upwards of an hundred flowers in one ſeaſon. The beſt ſeaſon for tranſplanting theſe roots is in June and July, ſoon after the ſeed is perfected; but they ſhould not be kept long out of the ground, for the roots are diſpoſed to ſhoot out freſh fibres, with the firſt moiſt weather after the ſeeds have fallen, and in about ſix weeks produce their flowers, which appear upon long ſingle footſtalks before the leaves appear: theſe ſprout up after the flower is fallen, and remain green all the winter, and being of a fair green, and ſpotted in the middle with white, they make a very pretty appearance during that dead ſeaſon. The pedicle of the flower afterwards twiſts like a ſkrew, incloſing the embryo of the fruit, which is buried among the leaves, and, by that means, ſcreened from the ſeverity of the winter, and ripens its ſeed in June. *Miller's Gard. Dict.*

CY'CLE, *Chineſe*, a period of 60 years, whoſe uſe had ſome relation, or at leaſt reſemblance, with that of the olympiads, indictions of the ſolar and lunar cycles, or the golden number. This cycle is compoſed of ten repeated letters, and twelve Chineſe characters that mark the hours. Each year is diſtinguiſhed by a letter and chifre, continuing until they come to a year that has the firſt letter and chifre, which is the 60th. Theſe Cycles have their perpetual revolution from ſixty to ſixty years, and are very certain rules for chronology; for, marking the number of the Cycle with the letter and chifre of the year, they give an infallible knowledge of the time a thing is done in. As, for example, in ſaying 1 Cycle

K. 2, I mark the 50th year of the firſt Cycle, which begins the year 2697 before Chriſt's birth; ſo that the 50th year of this Cycle is the 2648th before the Meſſias, which is known by ſubtracting 49 from 2697. *Couplet. Confucius.*

CY'DER.—Under the article CIDER, in the Dictionary, we have given its chemical analyſis, and uſes; we ſhall here give the method of making this liquor.

As it has been thought neceſſary, in every part of England, to lay the harder Cyder-fruits in heaps for ſome time before breaking their pulps, the Devonſhire people have much improved the practice; in other counties the method is to make theſe heaps of apples in a houſe, or under ſome covering incloſed on every ſide; this method we found defective, becauſe, by excluding the free air, the heat ſoon became too violent, and a too great perſpiration enſued, by which, in a ſhort time, the loſs of juices was ſo great, as to reduce the fruit to half their former weight, attended with a general rottenneſs, rancid ſmell, and diſagreeable taſte. In the South-Hams, a middle way has been purſued to avoid the inconveniences and loſs attending the aforementioned practice; they make their heaps of apples in an open part of an orchard, where, by the means of a free air and leſs perſpiration, the deſired maturity is brought about, with an inconſiderable waſte of the juices and decay of the fruit, intirely free of rankneſs; and, though ſome apples rot, even in this manner, they are very few, and are ſtill fit for uſe; all continue plump and full of juices, and very much heighten the colour of Cyders, without ill taſte or ſmell.

In purſuing the Devonſhire method, it is to be obſerved,

1. That all the promiſcuous kinds of apples that have dropped from the trees, from time to time, are to be gathered up and laid in a heap by themſelves, and to be made into Cyder after having ſo lain about ten days.

2. Such apples as are gathered from the trees, having already acquired ſome degree of maturity, are likewiſe to be laid in a heap by themſelves for about a fortnight.

3. The latter hard fruits, which are to be left on the trees till the approach of froſt is apprehended, are to be laid in a ſeparate heap, where they are to remain a month or ſix weeks, by which, notwithſtanding froſt, rain, &c. their juices will receive ſuch a maturation, as will prepare them for a kindly fermentation, and which they could not have attained on the trees by means of the coldneſs of the ſeaſon.

It is obſervable, that, the riper and mellower the fruits are at the time of collecting them into heaps, the ſhorter ſhould be their continuance there; and, on the contrary, the harſher, immaturer, and harder they are, the longer they ſhould reſt.

Theſe heaps ſhould be made in an even and open part of an orchard, without any regard to covering from rain, dews, or what elſe may happen during the apples ſtaying there, and, whether they be carried in and broke in wet or dry weather, the thing is all the ſame; if it may be objected, that, during their having lain together in the heap, they may have imbibed great humidity, as well from the air, as from the ground, rain, dews, &c. which are mixed with their juices; the anſwer is, this will have no other effect than a kindly diluting, natural to the fruit, by which means a ſpeedier fermentation enſues, and all heterogeneous humid particles are thrown off.

It is a conſtant practice, in the Iſles of Jerſey and Guernſey, to put a pail of water into every fermenting hogſhead of Cyder, to dilute and ſet its parts more quickly at liberty.

By purſuing the above methods, beſides making the beſt Cyder, hurry and expence will be prevented, as they require no room within doors.

Among other improvements in Cyder-making, the people in Devonſhire have been ſucceſsful in their invention of an engine, which leaſt bruiſes the ſkin, pulp, and kernels of the apples; for ſuch as leaſt do ſo are to be preferred, becauſe from an immoderate breaking of them, in ſome kinds of apples, there proceeds ſuch an auſterity and bitterneſs, as the Cyder never can be cured of.

To evince, that there is ſuch auſterity attending the ſkins or rinds of ſome particular fruits, the pear called the winter rouſſelit is an inſtance; this fruit, when the ſkin is taken off, is in eſteem at the table, but without this treatment it has ſuch a roughneſs as renders it uneatable.

The engine I here recommend is worked by coggs and rounds, which turn two or more tumblers ſtuck full of teeth. In ſome places it is worked with horſes, but, where moderate quantities of Cyders only are made, it it worked by hand. I forbear a further deſcription of it, ſuppoſing it to be at preſent in uſe where-ever Cyder is made in the different counties in England. Its further excellencies are, it quicker diſpatches the work; the pummice of the apples, broke therewith, produces leſs foul Cyder when it comes from the wring, alſo much ſooner, and it certainly becomes fine after; and is leſs liable to harſhneſs and ill taſtes in the vat and caſks, than what is broken by any other engines.

The pummice of the apples is to be received into a large open-mouthed veſſel, capable of containing as much thereof as is ſufficient for one making, or one cheeſe. Though it has been a cuſtom to let the pummice remain ſome hours in the veſſel appropriated to contain it, yet I would by no means adviſe the practice; for if the fruits did not come ripe from the trees, or otherwiſe matured, the pummice, continuing in the vat too long, will acquire ſuch harſhneſs and coarſeneſs from the ſkins as never to be got rid of; and, if the pummice is of well-ripened fruit, the continuing too long there will occaſion it to contract a ſharpneſs that very often is followed with want of ſpirit, and pricking, nay, ſometimes it becomes arrant vinegar, or always continues of a wheyiſh colour; all which proceeds from the heat of fermentation that it almoſt inſtantly falls into on lying together; wherefore I recommend, that the pummice remain no longer in the vat, than until there may be enough broke for one preſſing, or that all be made into a cheeſe, and preſſed the ſame day it is broken.

Of all the preſſes now in uſe throughout the kingdom, there is none to be compared to the great wring or preſs with two ſcrews, worked or brought home with a capſtan, either for a quicker diſpatch of the work, as frequently a cheeſe or cake is made that produces a tun and half of Cyder, or for preſſing dry, and keeping the cheeſe upright and together, or with more eaſe, as it requires but two men to work it.

A deſcription of ſuch a Cyder-preſs, and its ſeveral parts. See the *Plate* XV. *fig.* 12.

The great or upper beam, in which are female ſcrews, ſhould be ſeventeen feet four inches in length; and two feet ſix inches or three feet ſquare, either of one ſolid piece of timber or more; when formed of ſeveral pieces, they ſhould be firmly united with wooden keys, and bound about with iron braces, near and on each ſide each hole where the ſcrew paſſes.

The whole length of the pieces, out of which each ſcrew is is to be formed, ought to be fourteen feet ſix inches, viz. ten feet the ſhaft of the ſpiral line, or ſcrew. Two feet the ſquare part, containing the holes for letting in the hand-ſpikes for turning the ſcrews, and two feet ſix inches for the ſpindle.

The ſpindle of the ſcrews, which ſhould have the ſame diameter as the ſtem of the ſpiral line, muſt be let into ſockets made in a large beam of equal dimenſions with the upper beam. This great beam is to reſt on the floor. The diſtance between the ſcrews ſhould be eleven feet ten inches.

The reaſon for leaving the upper and under beam ſo long on the outſide of each ſcrew, and the ſpindles, is, to give the ends of the beams more ſtrength, as the ſcrews and ſpindles otherwiſe would be apt to make the ends open.

The holes for admitting hand-ſpikes ſhould be quite through, one hole above another, that the ſcrews may be turned with two hand-ſpikes at the ſame time.

The holes ſhould be guarded by two iron plates to prevent their wearing, which ſhould be faſtened with two iron bands, bracing round that part of the ſcrew, and neceſſary to ſtrengthen it.

The buckler, which is to cover the top of the cheeſe or cake, is an aſſemblage of thick planks, united and ſtrengthened by ſubſtantial traverſe pieces of eight inches ſquare, to which the planks are faſtened by oak pins. On the traverſe pieces are laid two floors of blocks of wood, each croſſing one the other, on which depends the upper beam.

The buckler is ſometimes made round, and ſometimes ſquare; in the dimenſions of either, great allowance muſt be made for the ſpreading of the cheeſe or cake, when very much preſſed. The round buckler may be ſomething more in diameter than five feet, and the other five feet ſix inches ſquare.

The floor of the preſs may be compoſed of elm planks, three inches thick and ſeven feet ſquare, joined together by ſubſtantial traverſe pieces of eight inches thick or ſquare, placed about the diſtance of one foot from each other, to which the planks of the baſon are faſtened by oak pins. Every part ſhould be very firm and well connected, as the floor muſt reſiſt a very great force and preſſure, when the upper beam is ſcrewed down upon the cheeſe.

The floor is to be borne up to the heighth of two feet ſix inches from the ground, and ſupported partly by the under beam, where are ſpaces to be cut for letting down the traverſe pieces of the baſon, and partly by blocks of wood, or ſtillings laid under it for that purpoſe; there muſt be care in fixing the baſon, that every part bears equally on each other.

Between the ſcrews and the baſon, on each ſide, will be a ſpace of two feet clear, for a paſſage round the baſon, except where the under beam croſſes.

The ſtage or baſon is to be ſloped with a gentle declivity from the ſeat of the cheeſe to a groove or gutter, which is made near the edges of the baſon, to convey the expreſſed juice of the apples into a veſſel fixed under the middle of the fore part of the baſon.

Beſides this groove or gutter, there muſt be a ledge nailed round the ſides of the baſon, to prevent the Cyder from overflowing the baſon, which it will be apt to do on the firſt preſſing.

In fixing the baſon on ſtillings or blocks, it ſhould be obſerved, that it ſtoops a very little on the fore part, that the Cyder might tend that way in draining from the cheeſe.

The capſtan is placed at about twelve feet diſtance, more or leſs, from one of the ſcrews, and is made uſe of after two men, or more, have uſed their utmoſt efforts to ſcrew down the great beam; then they have recourſe to the capſtan, by which they ſcrew down the great beam ſomething lower, and the Cyder runs a-freſh, and the cheeſe is ſqueeſed quite dry.

The length of the capſtan depends, as does its diſtance from the ſcrew, on the conveniency of fixing a beam for taking in the upper ſpindle; it ought to be eight or ten feet; the under ſpindle is let into a ſocket made in a ſquare block of wood ſunk into the ground. It ought to be ſo large as not to be apt to ſtart.

The end of the rope which is round the capſtan is faſtened to the end of a hand-ſpike which is in a hole of the ſcrew, and the capſtan turned till the hand-ſpike is brought ſo near the capſtan as to have no more purchaſe; then the hand-ſpike is put into another hole, and the ſame repeated. The capſtan is turned by poles of about twelve feet in length, run through the ſquare, or holes of the capſtan, and form a croſs. Theſe poles are fixed about two feet ten inches above the floor, which ſhould be conſidered when the capſtan is making, that the ſquare and round parts of it may have proper ſituations.

This preſs requires a ſpacious houſe for its reception, which is the only inconvenience that attends it. Other preſſes may be commodious enough for making ſmall quantities of Cyder; but this is neceſſarily required where it is made in abundance.

As the Cyder runs from the wring or preſs, it is to be received into a veſſel fixed within the ground for the more commodious dipping of a ladle or bucket, and, as it fills, from time to time, to be taken from thence and put into another veſſel or caſk that ſtands on its bottom, the head being ſtruck out, over the top of which, is to be laid a-croſs a frame, or two ſimple ſticks, a coarſe hair ſieve for ſtraining the Cyder, that the pummice, or groſſer part of the pulp of the apples, mixed with the juice, may be kept back.

I would caution every one againſt mixing the laſt expreſſed juices or droppings with the Cyder intended for keeping, becauſe it is of too weak a nature; but yet it makes a pleaſant beverage, by which name it is known in Devonſhire, and, if aſſiſted with a ſmall quantity of ſpices, will continue good two months. If it could be had in ſummer, or would keep ſo long, it would ſerve as an agreeable, cool, refreſhing liquor.

I come now to treat of that, on which the whole ſucceſs depends, in making ſweet Cyder, viz. fermentation, which is attended with no manner of difficulty; but care and watchfulneſs is abſolutely required, and to be well furniſhed with clean caſks in proper readineſs.

In order to avoid a great deal of trouble, and to perform the work more effectually, by diveſting the new made Cyder of what pummice and other impurities remain; after ſtraining it through a hair ſieve, on its coming from the wring, or preſs, it is neceſſary to be provided with a large open vat, keeve, or clive, which will contain a whole pounding, or making of Cyder; or as much as can be preſſed in one day: after the Cyder has remained in this vat a day, or ſometimes leſs, according to the ripeneſs of the fruit, of which it has been made, and the ſtate of the weather, you will find riſe to the top the pummice, or groſſer parts of the pulp, &c. of the apples; and in a day or two more, at moſt, grow very thick; and when little white bubbles or fermentations, of the bigneſs of the top of your finger, break through it, then preſently draw it off through a cock or faucet-hole, within three inches of the bottom, if large; but, if ſmall, not nearer than four inches of the bottom, that the lees may not be drawn off, but quietly remain behind.

If the Cyder is not immediately drawn off, on the firſt appearance of theſe white fermentations, all the head which is then become a thick cruſt, will ſink to the bottom; ſo that, if this criſis, which happens but once, of the firſt ſeparation of the Cyder from its lees is neglected, the opportunity of making ſweet Cyder will be loſt and irrecoverable.

On drawing off the Cyder from the vat, it muſt be tunned into cloſe caſks well ſcented, wherein, on letting it remain a ſhorter or longer time, with what lees and impurities it carried with it, depend the hardening or ſoftening it at pleaſure.

To have Cyder perfectly ſweet, after it is tunned into cloſe caſks, you are again carefully to watch and obſerve its ſtate, and when you find white bubbles or fermentations, as aforeſaid, at the bung-hole, as before in the vat, immediately rack it off again into another clean and well ſcented caſk; after which, by making frequent trials of its fineneſs (and it commonly happens to be fine in two, three, four, or five days, or ſooner, according to the weather) by drawing ſome of it into a glaſs from a ſpile-hole, you will diſcover if proper to repeat the racking, which ſhould again be immediately done, if found to be fine; which repetition of racking ſhould be continued till the Cyder is as ſweet as you deſire, and ceaſes hiſſing.

It is to be noted, that the weaker Cyders cannot ſupport themſelves under many rackings, one or two being all they can bear, for they have not body enough to undergo the operation. But, as to the bolder and ſtronger Cyders, when you intend to render them very ſoft and mellow, and perfectly ſweet, which theſe frequent rackings will effect, you may repeat them till they are brought to your palate, and quieted to ſuch a degree as to be entirely mute, which is an infallible indication of their being abſolutely free of impurities, and not liable to be troubled by any future commotions.

The manner of making rough Cyder differs from that of the ſweet, as it is neceſſary to refrain drawing it off, on the firſt appearance of the white bubbles, as before mentioned; but, letting that criſis paſs unregarded, do it on the next tolerable ſeparation from the fouler and thicker lees, by which a luſcious ſweetneſs will be avoided. But, even in rough Cyder, the omiſſion of one or two rackings is attended with a diſagreeable coarſeneſs, harſhneſs, bitterneſs, fetidneſs, and ſometimes with all theſe faults, which it can never be diveſted of. Wherefore I would propoſe, after racking out of the vat, to give it another clarification, at the end of November or December, if made very late.

There muſt be care taken, after the fermentation is over, to fill every hogſhead in the cellar up to the bung, which is to be continued once a month, and without which the Cyder will be apt to grow flat and heavy, and likewiſe to contract an ill taſte and ſmell, from an ingendered rancid air lodged in the cavity between the upper part of the caſk and the Cyder. Vent ſhould be ſometimes given at a ſpile-hole during the firſt three months after the Cyder is made. Until it has done hiſſing, &c. the bung-hole would be beſt covered with a tile, ſlate, or flat ſtone, but, when found to be perfectly quiet, it ſhould be cloſely bunged down. *Treatiſe on Cyder-making.*

Pepin CYDER. This is a ſort of Cyder which, in many places, might be made in great quantities, where the red-ſtreak Cyder-apple will not thrive: the harſhneſs that is apt to be in this ſort of Cyder, is the only objection to its value, it being of a good body, and otherwiſe, in all reſpects, commendable. The great reaſon of this harſhneſs is the light foulneſs; or, as the Cyder people expreſs it, the flying lee that always is in this ſort. But it is eaſy, by watching a proper time, to draw of the liquor from this into other veſſels, or to ſtrain it through a cloth: in either caſe, much of the lee will be left out, and the Cyder loſe its harſhneſs. *Phil. Tranſ.* N°. 70.

CYDER-*ſpirit*, a ſpirituous liquor drawn from Cyder by diſtillation, in the ſame manner as brandy from wine. The particular flavour of this ſpirit is not the moſt agreeable, but it may, with care, be diveſted wholly of it, and be rendered a perfectly pure and inſipid ſpirit, upon rectification. The traders in ſpirituous liquors are well enough acquainted with the value of ſuch a ſpirit as this: they can give it the flavours of ſome other kinds, and ſell it under their names, or mix it in a large proportion with the foreign brandy, rum, and arrack, in the ſale, without danger of a diſcovery of the cheat.

CYDO'NIA, *the quince-tree*, a genus of trees whoſe character are:

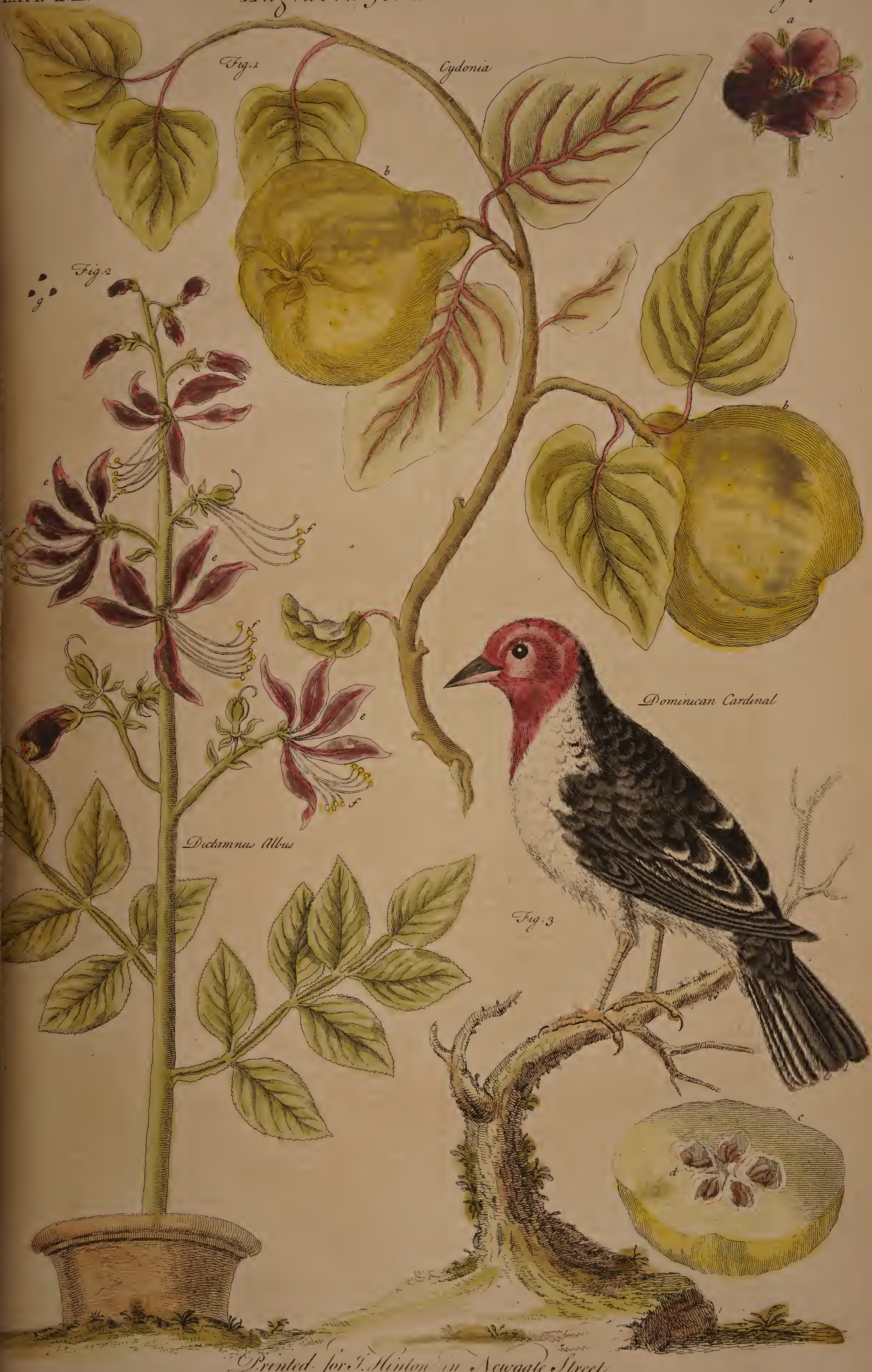
The tree is of a low ſtature: the branches are diffuſed and crooked: the flower and fruit are like that of the pear-tree; but, however cultivated, the fruit is ſour and aſtringent, and is covered with down. See *plate* XVIII. *fig.* 1. where *a* is the bloſſom, *b* the fruit, *c* the fruit open, *d* the ſeed.

All ſorts of quince-trees are cultivated in moſt nurſeries near London; but the Portugal kind is moſt valued for the goodneſs of its fruit.

They are all eaſily propagated, either by layers, ſuckers, or cuttings, which muſt be planted in a moiſt ſoil. Thoſe raiſed from ſuckers are ſeldom ſo well rooted as thoſe which are obtained from cuttings or layers; and are ſubject to produce ſuckers again in greater plenty, which is not ſo proper for fruit-bearing trees. The cuttings ſhould be planted early in the autumn, and in dry weather muſt be often watered to encourage their rooting. The ſecond year after, they ſhould be removed into a nurſery at three feet diſtance row from row, and one foot aſunder in the rows; where they muſt be managed as directed for apples. In two or three years time, theſe trees will be fit to tranſplant, where they are to remain for good; which ſhould be either by the ſide of a ditch, river, or in ſome other moiſt place; where they will produce a greater plenty, and much larger fruit than in a dry ſoil; though thoſe in the dry ſoil will be better-taſted, and earlier ripe. *Miller's Gard. Dict.*

CY'LINDER (*Dict.*) — The ingenious Mr. Francis Blake, in the forty-ſeventh vol. of the Philoſophical Tranſactions, has conſidered what are the beſt proportions for ſteam engine Cylinders, which, we preſume, will not be unacceptable to the reader.

LATE XVIII. *Engraved for the* SUPPLEMENT. *Facing* Cydonia



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The fire-engine, or (to term it more properly) the ſteam-engine, for draining of mines, is a maſter-piece of machinery, a very capital contrivance in the work of art, and meriting our attention for further improvements. This is univerſally allowed, as well upon account of the theory it is founded on, as its uſefulneſs in practice. And is it arrived then at the laſt degree of perfection, that we appear at a ſtand? I think not. The prodigious veſſel of water to be kept always boiling, when only an inconſiderable part of it is employed in the wort, ſavours too little of the frugality of nature, which we ought ever to imitate. But, waving that now, what I would inquire into here, and endeavour to regulate, is, the Cylinder's proportion of the altitude and baſe; which hath not, as I know of, been hitherto noticed.

It is evident, in the firſt place, from a fundamental law of mechanics, that, the content of the Cylinder remaining the ſame, the quantities of water diſcharged at each lift will in all caſes be equal, by only changing the diſtance of the center of the piſton from the fulcrum of the balance. You will agree likewiſe (for I ſuppoſe the principles and working-part to want no deſcription) that the exceſs of the pillar of the atmoſphere above that of the water is a weight on the piſton, driving it to a depth of five feet, or thereabouts, by the preſent conſtruction, with the cavity of the Cylinder; acceleratedly till friction and an impediment from the ſteam, which remains in the Cylinder even after the jet d'eau, and is increaſed in elaſticity, whilſt its bounds are diminiſhed, ſhall equal the accelerative force; and that then again the piſton is retarded the reſt of the way. It may be convenient to remark too, that, if the rarefaction be ſo complete, that the deſcent would be greater than the conſtruction admits of, the retardation is augmented by a brachium of the balance preſſing upon ſprings. But, to ſay nothing of friction here, we can, notwithſtanding this diminution of force by the remainder of ſteam within the cavity of the Cylinder, demonſtrate the ratio of the velocities, and the times of deſcent of the piſtons, in Cylinders of unequal altitudes, to be exactly the ſame, as if the reſiſtance was nothing; whence we ſhall without difficulty arrive at ſome concluſion in this matter.

MN (*plate* XVII. *fig*. 8.) is the working-part of a ſteam-engine Cylinder, of the uſual height, equal in diameter to a ſhorter one mn, *fig*. 9; and, the rarefaction in both being ſuppoſed the ſame, $AQ = aq$, $RQ = rq$, and $AR = ar$, may repreſent the exceſs of the atmoſphere's weight above the pillar of water, the reſiſtance to the piſtons from the remainder of ſteam, and the effective force, reſpectively, *e. g.* at the beginning of the deſcent. Take, then, every-where $ak : AK :: an : AN$, and at all ſimilar poſitions the reſiſtance bc of mn and the force kc on its piſton will equal the reſiſtance BC of MN and force KC on its piſton; and, by what Sir Iſaac Newton has demonſtrated (Book I. Prop. 39.) of the deſcent of bodies, we have $\sqrt{akcr} : \sqrt{AKCR} ::$ celerity in k : celerity in K. But, theſe areas being evidently as the correſponding parallelograms kq and KQ, and they again as their heights, the celerities generated are in the ſubduplicate ratio of $ak : AK$, as though the reſiſtance had been nothing; and, by an obvious enough reaſoning from the ſaid propoſition, the times alſo appear to be in the above-mentioned ratio; which ratio is not any way varied, though the reſiſtance prevails from the interſecting points O.

Now, to apply what has been ſaid to the buſineſs in hand; if TW be a Cylinder of equal content with the Cylinder MN, the quantity of water delivered by both will, as a conſequence of the fundamental law of mechanics obſerved above, be the ſame at each lift: but the Cylinder TW is no higher than nm, and, ex hypotheſi, their rarefactions are equal; and therefore, by what has been proved with regard to the times, the time of the piſton's deſcent in TW will be to that of the piſtons deſcent in $MN :: \sqrt{EW} : \sqrt{AN}$; whence, in any given time, the broad Cylinder TW will perform more than the longer one MN of equal content, and that in the ratio of their diameters; for $\overline{ET}|^2 \times EW = \overline{MA}|^2 \times AN$, ex hypotheſi, $EW : AN :: \overline{MA}|^2 : \overline{ET}|^2$, and, conſequently, $\sqrt{EW} : \sqrt{AN} :: MA : ET$. The friction too is diminiſhed with the ſlowneſs of the motion, and becauſe the periphery increaſes, in a leſs ratio than does the area of a circle.

The reſult of the whole then is in favour of the broad Cylinder; and ſtill the broader the better; for, unleſs ſome mechanical conſiderations ſhould limit the problem, it is evident in a geometrical ſenſe, that there is no limitation. A diſadvantage might ariſe perhaps to the effect of the jet d'eau from thus increaſing the breadth; which however would be remedied, I think, by a number of theſe jets: but, be that as it will, it is certain, that to augment the diameters, and diminiſh the lengths of the ſmaller kind of Cylinders, now uſed, could have no ſuch inconvenience, nor fail of being attended with an augmentation of force.

CY'LINDRUS, in conchyliology, the name of a genus of ſhell-fiſh, of which there are many very elegant and precious ſpecies. This genus is more generally, at preſent, called rhombus, though this is very improper, the word Cylindrus very aptly expreſſing the ſhape of the ſhell, which is cylindric and oblong; and the rhombus, which ſignifies that figure we call a lozenge, not being at all expreſſive of it.

CY'PRESS-*tree*. See CYPRESSUS.

CYST, in ſurgery, the bag, or membrane, in which an encyſted tumor of the ſteatomatous, atheromatous, or ſarcomatous kind, is included. In the extirpating theſe tumors, if, by neglect, or accident, the Cyſt, or any conſiderable part of it, be left behind, the tumor will not fail to return. Indeed, if the tumor be a ſchirrus, the contents are hard enough to make a clear extirpation of it, notwithſtanding its including coats be wounded: but, when the matter of the tumor is ſoft, or fluid, by its eſcaping the tumor will be come flaccid; ſo that it will be hardly poſſible to make a clear extirpation of the Cyſt, without leaving ſome fragments of it behind, which muſt, in that caſe, be brought away afterwards by ſuppuratives, digeſtives, and a proper treatment; and, when the ſinus is by this means cleared, the wound may be ſafely healed, without any danger of the return of the complaint. *Heiſter's Surgery*.

CY'TISUS, *ſhrub trefoil*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind; from its cup there ariſes a piſtil, which finally becomes a flat pod, which ſeparates, when ripe, into two parts, and is full of oblong ſeeds. The leaves ſtand three on every ſtalk.

We have ſeveral ſpecies of this plant cultivated in the gardens of the curious, where ſome ſpecies make a very agreeable figure, as they grow to be eight or ten feet high, and in May are beautifully loaded with long ſtrings of yellow flowers.

They are all propagated by ſowing their ſeeds, which they afford in great plenty, in March, on a bed of good, freſh, light earth, ſifting over the ſeeds about half an inch of fine mould: in a month's time the plants will come up; they muſt be kept clear from weeds, and watered at times, if the ſeaſon prove dry. They ſhould remain in the ſeed-bed, till the March following, when they ſhould be removed into nurſery beds of a foot diſtance, in rows three feet aſunder: here they muſt be watered, and the roots mulched till they are thoroughly rooted, and then the ground kept clear from all weeds. They ſhould remain here three years, and be then removed to the places where they are to remain, in October, or elſe in February.

The ancient botaniſts evidently were acquainted with two very different ſhrubs, under the name Cytiſus; and there have been no ſmall errors about the true meaning of ſeveral paſſages in Dioſcorides and Theophraſtus, on occaſion of the miſtaking one of theſe things for another.

Dioſcorides deſcribes the Cytiſus, as being a ſhrub with leaves white and hoary, both on the upper and under ſide, and of no uſe, or value, to mankind: as to its wood, Pliny tranſlates this account, and adds to it from Hyginus, that it was a very hardy and ſtrong ſhrub, not being affected by heat, or cold, ſnow, or hail, or any other injuries of the weather, nor of its enemies, as Pliny expreſſes it (hoſtium.) It is not very eaſy to conceive what enemies theſe ſhould be; but the moſt probable conjecture, as to this odd paſſage, is, that Pliny had tranſcribed it in his uſual careleſs way, and that what is called hoſtium ſhould be the word noſtrum.

The ſenſe then is clear enough; the author had juſt before ſaid that the wood was good for no uſe to mankind; and therefore, when he was ſpeaking of the trees ſtanding a long time, and fearing the injuries of no weather, he might very well add, nor of us; for, the wood being good for nothing, men would not be at the trouble of cutting it up. It is plain, however, that Theophraſtus means quite a different ſhrub by this name Cytiſus; for as Dioſcorides ſays that the wood of his was white throughout, and very light, Theophraſtus obſerves, that it was black at the heart, and as heavy and ſolid as ebony; and, in many places, where he ſpeaks of the hard and elegant woods uſed for inlaying, he mentions the Cytiſus wood, coupling it with the ebony, heart of oak, and other the hardeſt and moſt elegant woods known in his time. Pliny mentions no other Cytiſus than that of Dioſcorides, which was the common kind cultivated by the Greeks and Romans, as a food for cattle: he ſays, it was raiſed by ſeed, and came to its perfection in three years, and that it was gathered in the ſpring juſt after the time of its flowering; he adds, that this was uſually the office of children, or old women, unfit for other work, and was the cheapeſt of all the offices of huſbandry. It is eaſy to conceive that ſuch a ſhrub as the Cytiſus of Theophraſtus, with a wood as firm as the heart of oak, and hard as ebony, did not come to perfection in three years from the ſowing; nor could any more be cut up by boys and old women, than eaten by cattle, when taken up. There were, therefore, two kinds of Cytiſus among the ancients, the one ſown and cultivated as food for cattle; the other a wild tree, or ſhrub, growing in woods, and being larger than the ſown kind. Dioſcorides and Pliny deſcribe the firſt, and Theophraſtus alone the latter, except that Pliny has now and then taken a ſentence from Theophraſtus, when he mentions the Cytiſus occaſionally among other hard woods, and placed it to the account of his manured Cytiſus.

D.

DAA'LDER, a name given by the Dutch to pieces of thirty ſols, coined by them, and which are worth one florin, or guilder and half, being equivalent to the ſmall French crown of three livres Tournois, or ſixty ſols. Formerly, according to the old rate of money in that kingdom, the Daalder went for thirty-ſeven ſols, ſix deniers.

Daalders are coined alſo at Hamburgh, called Daalders, lups, or lubs, of two marks lubs each. It is worth from thirty-two to thirty-three ſols of Holland, and from ſixty-ſix to ſeventy ſols in France. It is uſed as current money in many other cities of Germany, and in keeping their books of accounts. Formerly, they went for forty French ſols. The Hollanders call alſo every ſort of crown a Daalder, which is worth no more than thirty ſols; they denominate them differently, viz. ryks Daalder, that is to ſay, an imperial crown.

DA'BAS, cloths and woollen ſtuffs of the manufacture of Bas in Languedoc, are ſo called at Lyons.

DA'BUIS, a white cotton ſtuff made in the Eaſt-Indies. It is in the number of baffetas, and takes its name from the place where it is made.

DACE, in ichthyology, the Engliſh name for the fiſh called by authors the leuciſcus. According to the new ſyſtem of Artedi, this is a ſpecies of the cyprinus; and it is called by ſome albicula and albicilla.

This fiſh is extremely common in our rivers, and gives the expert angler great diverſion. The Dace will bite at any fly; but he is more than ordinarily fond of the caddis, or May fly, which is plentiful in the latter end of April, and the whole month of May. Great quantities of theſe may be gathered among the reeds or ſedges by the water ſide, and on the hawthorn buſhes near the waters. Theſe are a large and handſome bait, but, as they laſt only a ſmall part of the year in ſeaſon, recourſe is to be had to the ant-fly. Of theſe the black ones, found in large mole-hills or ant-hills, are the beſt. Theſe may be kept alive a long time in a bottle, with a little of the earth of the hill and ſome roots of graſs; and they are in ſeaſon throughout the months of June, July, Auguſt, and September. The beſt ſeaſon of all is when they ſwarm, which is in the end of July, or beginning of Auguſt; and they may be kept many months in a wooden veſſel, waſhed out with a ſolution of honey and water, even longer than with the earth and graſs roots in the phial; though that is the moſt convenient method to be taken with a ſmall parcel, procured for one day's fiſhing. In warm weather this fiſh ſeldom refuſes a fly at the top of the water: but, at other times, he muſt have the bait ſunk to within about three inches of the bottom. The winter fiſhing for Dace requires a very different bait: this is a white maggot with a reddiſh head, which is the produce of the eggs of the beetle, and is turned up with the plough in great abundance. A parcel of theſe put in any veſſel, with the earth they were taken in, will keep many months, and are excellent bait.

Small Dace may be put into a glaſs-jar with freſh water, and there preſerved alive a long time, if the water be properly changed. They have been obſerved to eat nothing but the animalcula in the water. They will grow very tame by degrees. See *Philoſ. Tranſ.* N°. 478.

DA'CZAJIE, a ſilver money current in Perſia, worth five mamoudis; two Daczajies make the haſaer denarie.

DA'ILS. See DOTTLE *Fiſh.*

DA'LLE, a nominal money, uſed in keeping books of accounts in many cities of Germany: it is worth thirty-two ſols lubs, which make forty French ſols; the ſol lubs being ſomewhat more than the ſol Tournois.

DAMASQUE'TTE, a kind of ſtuff made at Venice, that ſells well in the Levant, particularly at Conſtantinople.

There are two ſorts of it; one with gold flowers, the other with ſilk: the pieces are eighteen ells long. Thoſe with gold flowers are ſomewhat like the gold and ſilver ſtuffs formerly made at Lyons.

DAMASSE', or *Petite Veniſe*, a kind of wrought linen made in Flanders, ſo called from the faſhion of its large flowers, ſomething like thoſe of damaſks: it is uſed chiefly for tables. A table-cloth and a dozen napkins of this, is called a damask ſervice.

There is alſo a ſilk ſtuff ſo called, which looks like a damask on one ſide, and on the other is plain.

DAMPS (*Dict.*) — Naturaliſts furniſh us with very ſurprizing inſtances of the effects of Damps. In the Hiſtory de l'Academie des Sciences Anno 1701, we read of a well in the city of Rennes, into which a maſon, at work near its brink, letting fall his hammer, a labourer who was ſent down to recover it, before he reached the water, was ſtrangled. A ſecond, ſent to fetch up the corpſe, met with the ſame fate, and ſo a third: at laſt a fourth, half drunk, was let down, and charged to call out, as ſoon as he felt any thing incommode him. He called accordingly, as ſoon as he came near the water; and was inſtantly drawn out: yet he died three days afterwards. The information he brought them was, that he felt a heat, which ſcorched up his entrails. A dog, being let down, cried about the ſame place; and died as ſoon as he came to the air; but, throwing water on him, he recovered; as happens to thoſe thrown into the Grotto del Cani near Naples. The three carcaſſes being drawn up with hooks, and opened, there appeared not any cauſe of their death.—Now, what renders the relation the more conſiderable, is, that the water of this well had been drawn, and drunk ſeveral years, without the leaſt ill conſequence.

In the ſame hiſtory, anno 1710, a baker of Chartres, having carried ſeven or eight buſhels of brands out of his oven into a cellar thirty-ſix ſtairs deep; his ſon, a robuſt young fellow, going with more, his candle went out on the middle of the ſtairs; having lighted it a-freſh, he was no ſooner got into the cellar, than he cried out for help; and they heard no more of him: his brother, an able youth, run immediately after him; cried out he was dead; and was heard no more. He was followed by his wife; and ſhe by a maid, and ſtill it was the ſame. Such an accident ſtruck the whole neighbourhood with a panic; and nobody was forward to venture any farther: till a fellow, more hardy and zealous than the reſt, perſuaded the four people were not dead, would go down to give them help: he cried too and was ſeen no more. Upon this a ſixth man, requiring a hook to draw ſome of them forth without going to the bottom, drew up the maid: who, having taken the air, fetched a ſigh and died. Next day, the baker's friend, undertaking to get up all the carcaſſes with a hook, was let down with ropes on a wooden horſe, to be drawn up, whenever he ſhould call. He ſoon called, but, the rope breaking, he fell back again; and, though the rope was ſoon pieced again, he was drawn forth dead. Upon opening him, his meninges were found extravagantly ſtretched; his lungs ſpotted with black, his inteſtines ſwelled as big as one's arm, inflamed and red as blood; and, what was moſt extraordinary, all the muſcles of his arms, thighs, and legs, torn and ſeparated from their parts. The magiſtrate, at length, taking cognizance of the caſe, and the phyſicians being conſulted; they gave their opinion, that the brands had been but ill extinguiſhed: the conſequence of which muſt be, that, as all the cellars in Chartres abound with ſaltpetre, the unuſual heat in this had raiſed a malignant vapour which had done the miſchief: and that a good quantity of water muſt be thrown in to put out the fire, and lay the vapour. This performed, a dog and a lighted candle were let down without injury to either: an infallible ſign the danger was over.

A third hiſtory we ſhall add from Dr. Connor, in his Diſſert. Med. Phyſ. Some people digging in a cellar at Paris, for ſuppoſed hidden treaſure; after a few hours working, the maid, going down to call her maſter, found them all in their digging poſtures, but ſtark dead. The perſon who managed the ſpade, and his attendant who ſhovelled off the earth, were both on their feet, and ſeemingly intent on their ſeveral offices: the wife of one of them, as if a-weary, was ſat down on the ſide of a hopper, very thoughtful, and leaning her head on her arm; and a boy, with his breeches down, was evacuating on the edge of the pit; his eyes fixed on the ground: all of them, in fine, in their natural poſtures and actions, with open eyes, and mouths that ſeemed yet to breathe; but ſtiff as ſtatues, and cold as clay.

The German miners think themſelves not qualified for their buſineſs, if they are not able to make their weather, as they expreſs it; that is, to cure their Damps. Theſe are of various kinds in their mines; ſome ſo ſtrong that they ſuffocate the workmen; others leſs violent, and only making them faint without doing them any farther hurt, unleſs they are ſo imprudent as to continue a long time in the place. The common way of curing the Damps is by letting the air in and out, and, cauſing a circulation in it, they ſometimes have cured very conſiderable Damps by blowing, for many days together, with large bellows: but the ordinary method of working is by means of long tubes communicating with the air above, by means of which they have continual freſh air, and are able to work on, as far as they pleaſe: ſome of the cuniculi of theſe mines are five-hundred fathoms long; and, in the ſilver Trinity mine by Sebemnitz, there is a paſſage quite through a very large hill, coming out on the oppoſite ſide to that where it enters. The tubes always anſwer very well in the horizontal cuts; but not in the perpendicular ones, when they go to great depths: in theſe they place a tube all the way down by one ſide, and they then fit a piece of wood work to the ſize of the hole or cut; and ſeveral times in a day they are forced to thruſt this down, in order to force up all the foul air that is in the pit by the tube, to give room for freſh air in its place. *Phil. Tranſ.* N°. 48.

In ſome of the coal-pits in the neighbourhood of Mendip-hills, fire Damps almoſt continually happen, ſo that great numbers have been killed, maimed, and burnt by them. The colliers however continue their work notwithſtanding, only uſing the cautions of renewing their air very quick, and uſing no candles in their work but thoſe of a ſingle wick, and of ſixty or ſeventy to the pound; which notwithſtanding will give as good a light there, as others of ten or twelve to the pound in other places. They always have the caution to place even theſe behind them, and never preſent them to the breaſt of the work. When any perſon is burnt by theſe Damps, they preſently betake themſelves to a good fire, and, ſending for a large quantity of cows-milk, they bathe the burnt places with this, while warm; and, afterwards, the places will heal by the common cooling ointments, and healing plaiſters.

In regard to the periodical return of theſe Damps, mentioned by ſome, we find that, by the caution of ſmall candles, uſed by the colliers of theſe places, there is a continual propenſity in them to take fire at all times of the year; and, though theſe works ſeldom do take fire, yet, as the colliers ſay, they are moſt ſubject to it in the violence of winter, and chiefly in a black froſt. The danger of firing is alike both in wet and dry grounds. There are no flames coming out at the mouth of any ſhaft in theſe places, which will take fire at lighted torches or candles being held over them. They ſometimes take fire of themſelves, and ſet fire to the coal of the mine: they ſeem to be as frequently on or near the floor of the pits, as about their roofs; and no current of vapours, or wind, is to be met with at the mouths of the ſhafts by which they go down to theſe pits. In wet works there are many times bubbles ſtanding on the ſurface of the water, which will take fire, if a candle be held to them; but theſe, on a cloſe examination, do not appear to be occaſioned by ſubterraneous vapours; but are owing to the dropping of water from the roof of the mine, or the falling in of pieces of coal. Theſe Damps are commonly obſerved in our coal pits; but the lead-mines on Mendip-hills are alſo ſometimes affected by them. *Phil. Collect.*

DANK, or **Danck**, a little piece of ſilver current in Perſia, and ſome parts of Arabia. It weighs the ſixteenth part of a drachm.

Dank, is alſo a little weight, uſed by the Arabians to weigh jewels and drugs, when theſe laſt are uſed in the compoſition of medicines. It is the ſixth part of an Arabian drachm, which is eight grains French weight.

DARIA'BANIS, a white cotton ſtuff that comes from Surat.

DARI'DAS, a ſort of India taffeta, made of ſilk drawn from plants.

DARNA'MAS, the beſt ſort of cotton that comes from Smyrna, is ſo called, from a plain near that city, where it is cultivated in ſuch great quantities, that, one year with another, 10,000 bales are bought, though at leaſt as much more is conſumed in the manufactures of the country.

DAU'CUS, *the carrot*, in botany, a genus of plants, whoſe characters are:

It hath, for the moſt part, a fleſhy root: the leaves are divided into narrow ſegments: the petals of the flower are very unequal, and ſhaped like an heart: the umbel, when ripe, is hollowed and contracted, appearing ſomewhat like a bird's neſt: the ſeeds are hairy, and in ſhape of lice.

Carrots are propagated at two or three different ſeaſons, or ſometimes oftener, where people are fond of young carrots through all the ſummer months. The firſt ſeaſon for ſowing the ſeeds is ſoon after Chriſtmas, if the weather is open, which ſhould be in warm borders, under walls, pales, or hedges: but they ſhould not be ſown immediately cloſe thereto; but a border of lettuce, or other young ſallad-herbs, of about a foot wide, ſhould be next the wall, &c. for, if the carrots were ſown cloſe to the wall, they would run up to ſeed without making any tolerable roots.

They delight in a warm ſandy ſoil, which is light, and ſhould be dug pretty deep, that the roots may the better run down; for, if they meet with any obſtruction, they are very apt to grow forked, and ſhoot out lateral roots, eſpecially where the ground is too much dunged the ſame year that the ſeeds are ſown, which will alſo occaſion their being worm-eaten; it is, therefore, the better method to dung the ground intended for carrots the year before they are ſown, that it may be conſumed, and mixed with the earth.

Theſe ſeeds have a great quantity of ſmall forked hairs upon thin borders, by which they cloſely adhere, ſo that they are difficult to ſow even, ſo as not to come up in patches; you ſhould therefore rub it well through both hands, whereby the ſeed will be ſeparated before its ſown; then you ſhould chuſe a calm day to ſow it; for, if the wind blows, it will be impoſſible to ſow it equal; for the ſeeds, being very light, will be blown into heaps. When the ſeed is ſown, you ſhould tread the ground pretty cloſe with your feet, that it may be buried, and then rake the ground level.

When the plants are come up, you ſhould hoe the ground with a ſmall hoe about three inches wide, cutting down all young weeds, and ſeparating the plants to four inches diſtance each way, that they may get ſtrength; and in about three weeks after, when the weeds begin to grow again, you ſhould hoe the ground over a ſecond time, in which you ſhould be careful not to leave two carrots cloſe to each other, as alſo to ſeparate them to a greater diſtance, cutting down all weeds, and ſlightly ſtirring the ſurface of the ground in every place, the better to prevent young weeds from ſpringing, as alſo to facilitate the growth of the young carrots.

In about three weeks or a month after, you muſt hoe them a third time, when you muſt clear the weeds as before; and now you ſhould cut out the carrots to the diſtance they are to remain, which muſt be proportioned to the ſize you intend to have them grow: if they are to be drawn, while young, five or ſix inches aſunder will be ſufficient; but, if they are to grow large before they are pulled up, they ſhould be left eight or ten inches diſtant every way: you muſt alſo keep them clear from weeds, which, if ſuffered to grow amongſt the carrots, will greatly prejudice them.

The ſecond ſeaſon for ſowing the ſeeds is in February, on warm banks ſituated near the ſhelter of a wall, pale, or hedge; but thoſe which are intended for the open large quarters, ſhould not not be ſown before the beginning of March, nor ſhould you ſow any later than the end of the ſame month; for thoſe which are ſown in April or May, will run up to ſeed before their roots have any bulk, eſpecially if the weather ſhould prove hot and dry.

In July you may ſow again, for an autumnal crop; and in the end of Auguſt you may ſow ſome to ſtand the winter; by which method you will have early carrots in March, before the ſpring ſowing will be fit to draw; but theſe are ſeldom ſo well taſted, and are often very tough and ſticky. Many people mix ſeveral other ſorts of ſeeds, as leek, onion, parſnip, radiſh, &c. amongſt their carrots; and other plant beans, &c. but, in my opinion, neither of theſe methods are good; for, if there is a full crop of any one of theſe plants, there can be no room for any thing elſe amongſt them; ſo that what is got by one is loſt by the other; and, beſides, it is not only more ſightly, but better, for the plants of each kind to be ſown ſeparate; and alſo, by this means, your ground will be clear, when the crop is gone, to ſow or plant any thing elſe; but, when three or four kinds are mixed together, the ground is ſeldom at liberty before the ſucceeding ſpring: beſides, where beans, or any other tall growing plants, are planted amongſt the carrots, it is apt to make them grow more in top than root; ſo that they will not be half ſo large as if ſown ſingly without any other plants amongſt them.

But, in order to preſerve your carrots for uſe all the winter and ſpring, you ſhould, about the beginning of November, when the green leaves are decayed, dig them up, and lay them in ſand in a dry place, where the froſt cannot come to them, taking them out from time to time as you have occaſion for them, reſerving ſome of the longeſt and ſtraighteſt roots for ſeed, if you intend to ſave any; which roots ſhould be planted in the middle of February, in a light ſoil about a foot aſunder each way, obſerving to keep the ground clear from weeds; and, about the middle of Auguſt, when you find the ſeeds are ripe, you muſt cut it off, and carry it to a dry place, where it ſhould be expoſed to the ſun and air for ſeveral days to dry; then you may beat out the ſeeds, and put it up in bags, keeping it in a dry place till you uſe it. This ſeed is ſeldom eſteemed very good after the firſt or ſecond year at moſt; but new ſeed is always preferred, nor will it grow when it is more than two years old. *Miller's Gard. Dict.*

DAZE, in natural hiſtory, a name given by our miners to a ſort of glittering ſtone, which often occurs in their works; and, as it is an unprofitable ſubſtance, is one of thoſe things which they call weeds. The word Daze takes in, with them, every ſtone that is hard and glittering; and therefore it comprehends the whole genus of the telangia, or ſtony nodules, which have flakes of talc in their ſubſtance: theſe, according to the colour of the ſtony matter they are bedded in, and their own colour, give the name of black Daze, white, red, and yellow Daze, to theſe ſtones. The Daze ſtones, in general, much reſemble ſome of thoſe nodules with which the ſtreets of London are paved. But in ſome, inſtead of the matter forming regular nodules of a compact ſubſtance, it forms itſelf into a vaſt number of thin plates, which are applied cloſely over one another, and form ſhelves or even ſeries of planes, encompaſſing, ſometimes a roundiſh, ſometimes an oblong maſs of ore.

DEA'CONS (*Dict.*) — The name of Diaconi is as old as the Apoſtles time; but whether it was always uſed as it is now, for the third order of the clergy, is a matter of ſome doubt. It is certain, Ignatius ſtiles them miniſters of the myſteries of Chriſt, and of the church of God: though the council of Trullo ſays, the ſeven Deacons, ſpoken of in the Acts, are to be underſtood only of ſuch as ſerved at tables, and attended the poor. But the whole current of antiquity runs againſt this notion, as well as Ignatius. Cyprian calls them miniſters of epiſcopacy, and of the church; and ſays they were called ad altirias miniſterium, to the miniſtry and ſervice of the altar. Tertullian join them with biſhops, ſtiles them guides and leaders of the laity, and makes them, in their degree, paſtors and overſeers of the flock of Chriſt: and St. Jerom does the ſame in ſome places, though he ſpeaks more contemptuouſly of them in others.

But, though they were eſteemed a ſacred order, the name of prieſts was not generally given them. They were commonly diſtinguiſhed from prieſts by the names of miniſters and levites. The fourth council of Carthage ſays, they were not ordained to the prieſthood, but only to the miniſtering office, or inferior ſervice.

Certain it is, the ordination of a Deacon differed from that of a preſbyter, both in the form and manner of it, and in the gifts and power conferred thereby. The ordination of a Deacon might be performed by the biſhop alone, becauſe, as the council of Carthage words it, he was ordained not to the prieſthood, but to the inferior ſervices of the church.

The moſt common office of a Deacon was to aſſiſt the biſhop and preſbyters at the altar; alſo to take care of the holy table. It was the Deacon's office alſo to receive the people's offerings, and preſent them to the prieſt, who preſented them to God at the altar: and, after that, to repeat publickly the names of thoſe that offered. In ſome churches, but not in all, the Deacons read the goſpel both in the communion ſervice, and before it alſo.

In the adminiſtration of the euchariſt, it was the Deacon's buſineſs to diſtribute the elements to the people that were preſent, and carry them to thoſe that were abſent alſo.

In ſome caſes Deacons had the power to adminiſter baptiſm ſolely.

Another office of the Deacons was to direct the people in the exerciſe of their public devotions in the church, by giving them notice when each part of their ſervice began, and exciting them to join them; which they did by certain known forms of words appointed for that purpoſe. The Deacons alſo were to give the catechumens, penitents, and energumens, notice when to come up and make their prayers, and when to depart; and in ſeveral prayers they repeated the words before them, to to teach them what they were to pray for. And this was called κηρύττειν, among the Greeks, and prædicare, among the Latins; not to ſignify preaching, but performing the office of a κῆρυξ, or præco, in the aſſembly. And hence Deacons were called ἱεροκήρυκες i. e. the holy cryers of the church.

Deacons were allowed to preach, only when they had the biſhop's licence, and not without it.

Deacons had alſo the power of reconciling penitents, with the ſame limitation. In caſes of extreme neceſſity, when neither biſhop nor preſbyter were at hand to do it, Deacons were ſometimes authorized, as the biſhop's delegates, to give men the ſolemn impoſition of hands, which was the ſign of reconciliation.

They might be deputed by their biſhops to be their repreſentatives and proxies in general councils: and then they ſat and voted, not as Deacons, but as proxies, in the room and place of thoſe that ſent them.

DEADS, in mining, is uſed to expreſs that part of the ſhelf or faſt ground which contains no ore, but which incloſes the view or bed of ore, like a wall, on every ſide. The drifts which they ſink for the tin ore in Cornwall are generally about three feet over, and about ſeven feet high; ſo that a man may conveniently ſtand upright at work, and manage his tools. In caſe the vein itſelf is not broad enough to allow this, as in many places it is not half a foot over, then they pick down the ſtrata that incloſe it, ſo as to make an opening of the ſame breadth. This work they call breaking up the Deads. *Phil. Tranſ.* N°. 69.

DECA'NDRIA *, in botany, a claſs of plants with hermaphrodite flowers, and ten ſtamina, or male parts, in each. See *plate* XXII. *fig.* 1.

* The word is formed of the Greek δέκα, ten, and ἀνδρεῖος, male.

Of this claſs of plants are the judas tree, baſtard dittany, &c.

DECLAMA'TION (*Dict.*)—It is amazing that in all ages and nations of polite learning, no ſchools for Declamation have ever yet been eſtabliſhed: the maſters of public ſchools and colleges give boys ſome ſlight notions which they never reduce to practice in any of the ſtages of civil life; but indeed, as their principal employment is to teach the dead languages, they have no time to beſtow on other ſtudies: Beſides, the boys whom they have commonly under their care are too young, and incapable either to make ſolid reflections by themſelves, or to comprehend the precepts of their maſter. Should an old orator fill a public chair, and teach the art of Declamation, he would be as uſeful to ſociety as moſt of the fine eſtabliſhments that are in great cities: young people would then ſtudy oratory, when moſt of their own ſtudies were over, when they were advanced in age, and conſequently more capable to comprehend the reaſons that would be offered; but, above all, they would retain the natural and ſtriking impreſſions conveyed by animated ſpeech in the practice of declaiming, and all the different branches of that art.

Declamation, or manner of ſpeaking upon the ſtage, was by the ancients compoſed with notes; which, however, was not ſinging to muſic: In this ſenſe we ſhould often underſtand in the Latin poets the words canere, cantus, and even carmen, which do not always ſignify ſinging, properly ſo called, but a certain manner of ſpeaking or reading. According to Bryennius, this declaiming or ſpeaking was compoſed with accents, and in conſequence it was neceſſary, in writing it, to make uſe of the characters which expreſſed thoſe accents. At firſt they were only three, the acute, the grave, and the circumflex; they afterwards amounted to ten, each marked with different characters. We find their names and figures in the ancient grammarians. The acute is the certain rule by which the voice ſhould be raiſed or depreſſed in the pronunciation of every ſyllable: as the manner of ſounding their accents was learned at the ſame time, with reading, there was ſcarce any body who did not underſtand this kind of notes: beſides the help of accents, the ſyllables in the Greek and Latin languages had a determinate quantity, that is to ſay, they were either long or ſhort. The ſhort ſyllables had only one, and the long, two ſeconds of time: this proportion of ſyllables was as abſolute as that in theſe days between notes of different length, viz. that two black notes in our muſic ought to have as much time, as one white one in the muſic of the ancients; two ſhort ſyllables had neither more nor leſs than one long one. Hence, when the Greek or Roman muſicians were to compoſe any thing whatſoever, they had no more to do, in ſetting the time to it, than to conform to the quantity of the ſyllables upon which they placed each note. It is a pity the muſicians amongſt us, who compoſe muſic to hymns, &c. do not underſtand Latin, and are ignorant of the quantity of words; from whence it often happens, that upon ſhort ſyllables, over which they ought to run lightly, they inſiſt and dwell a great while, as if they were long ones: this is a conſiderable fault, and contrary to the moſt common rules of muſic.

We have obſerved, that the Declamation, or manner of ſpeaking of the actors upon the ſtage, was compoſed and wrote in notes, which determined the note it was proper to take. Amongſt many paſſages, which demonſtrate this, we ſhall only obſerve one from Cicero, where he ſpeaks of Roſcius, his contemporary, and intimate friend. Every body knows that Roſcius became a perſon of very great conſideration, by his excellency in this art, and his reputation for probity; the people were ſo much prejudiced in his favour, that, when he did not act ſo well as uſual, they ſaid it was either out of negligence or indiſpoſition. In fine, the higheſt degree of praiſe, that they gave to a man who excelled in his profeſſion, was to ſay he was a Roſcius, in his way. Cicero, after having ſaid, that an orator, when he grows old, might ſoften his manner of ſpeaking, quotes, to a proof, an example of it, what Roſcius declared, that, when he perceived himſelf grow old, he obliged the inſtruments to play in a lower key. Cicero, accordingly, in a later work than that now cited, makes Atticus ſay, that actor had abated his Declamation or manner of ſpeaking, by obliging the player on the flute, that accompanied him, to keep a ſlower time with the ſound of his inſtruments. It is evident that the ſinging, for it was often called ſo, of the dramatic pieces on the ſtages of the antients, had neither diviſions, recitatives, continued quaverings, nor any of the characters of our muſical ſinging: in a word, that this ſinging was only declaiming, or ſpeaking, as with us. This manner of utterance was, however, compoſed, as it was ſuſtained by a continued baſs, of which the ſound was proportioned, in all appearance, to that made by a man, who declaims or pronounces a ſpeech. This may ſeem to us an abſurd and almoſt incredible practice, but is not therefore the leſs certain; and, in matter of fact, it is uſeleſs to object any arguments. We can only ſpeak by conjecture upon the compoſition which the continued baſs might play, that accompanied the actor's pronunciations; perhaps it only played from time to time ſome long notes, which were heard at the paſſages, in which it was neceſſary for the actor to aſſume ſuch tones as it was not eaſy to hit with juſtneſs; and thereby did the ſpeaker the ſame ſervice as Gracchus received from the player upon the flute, he always had near him, when he harangued, to give him, at proper times, the tones concerted between them.

DEER, *cervus*, in natural hiſtory, the name of a genus of animals, comprehending the common Deer, and the elke. The characters of this genus are, that the horns fall off every year, that they are ſolid and branched, and that the animal chews the cud.

The word cervus, uſed alone, is underſtood by authors to mean the ſtag, or red Deer, the others being all diſtinguiſhed by their ſeveral adjectives; the common fallow Deer being called cervus, platyceros, or the broad-horned Deer. *Ray's Synopſ. Quad.*

The red Deer differs from the common kind in its ſize, and in the figure of its horns. The common Deer is more preſerved in England than in any other part of the world, and carries its diſtinction from the red Deer in the falcated figure of its horns.

We keep ſeveral ſpecies of thoſe however, and may perhaps increaſe them in ſome ſort to many more, as they are a very ſalacious animal, and will be apt to mingle one ſpecies with another. The principal kinds we know at preſent, are 1. The Spaniſh Deer, which is almoſt as large as the red Deer, but has a very ſlender neck, and is of a deep duſky colour; the tail in this ſpecies is alſo longer than in ours, and is black all over, not white next the body. 2. The mottled Deer, which are beautifully variegated with black, white, and tawny. 3. The Virginia Deer, which are larger and ſtronger than ours, and have thicker necks, and are of a grey or aſh colour rather than tawny, and remarkable for the largeneſs of their penis and ſcrotum. 4. A ſpecies which have their hinder hoofs marked with white on the outſide; the ears and tails of theſe are long, their horns branched, and their forehead a little depreſſed or hollowed between the eyes. Theſe will eat bread, fruits, and any thing that is offered them, and are often beautifully variegated; many of them have black variegations, and a black liſt down their back, with a ſeries of white ſpots on each ſide; others are ſo beautifully marked with white ſpots and other variegations, as to equal the zelora in beauty: theſe they call monated Deer. *Ray's Synopſ. Quad.*

DELPHI'NIUM, *lark-ſpur*, in botany, the name of a large genus of plants; the characters of which are theſe: the flower is of the polypetalous anomalous kind, conſiſting of ſeveral irregularly ſized petals, the upper one ending in a ſpur or tail, and receiving into its hollow another of the petals, which has alſo its tail or ſpur: the piſtil which occupies the center of this flower, finally becomes a fruit compoſed of ſeveral vaginæ, which open lengthwiſe, and contain a number of ſeeds, uſually of an angular form. The ſpecies of lark-ſpur, enumerated by M. Tournefort, are thirty-eight.

DELPHI'NUS, *the dolphin*, in the Linnæan ſyſtem of zoology, makes a diſtinct genus of fiſhes of the plagiuri, or tranſverſe-tailed order; the characters of which are, that the back has two fins, and there are teeth in both jaws. *Linnæi Syſtema Naturæ.*

In the Artedian ſyſtem of ichthyology, Delphinus is alſo the name of a genus of the plagiuri, or cetaceous fiſhes; the characters of which are theſe: the teeth are placed in both the jaws, the pipe or opening is in the middle of the head, and the back is always pinnated.

The dolphin is a cetaceous fiſh, covered with a ſmooth but very tough and firm ſkin; its body is long and rounded, and its back prominent; its noſe long, and rounded at the end; its mouth very large, but ſhutting very nicely and exactly; its teeth ſmall and ſharp, and placed like the teeth of a comb; its tongue broad and ſerrated; its eyes large, but ſo covered with the ſkin that the pupil only appears. Its eyes are placed near the angle of the mouth; and behind theſe are its ears, or auditory paſſages, which are very ſmall. Above the ſnout it has a double pipe, by which it throws out the water neceſſarily taken in with food. It has two fins joined like the ſhoulders of a human body to the muſcles, which move them. In the middle of the back it has alſo one fin, which is partly cartilaginous, and partly bony, but has no ſpines or prickles. Its back is black, and its belly white; the fleſh is blackiſh, and it has a regular lungs in its breaſt of a more tough conſiſtence than thoſe of quadrupeds. Theſe fiſh are ſuppoſed to live a great number of years. The figures of them on ſome antique marbles and coins, which repreſent them crooked, are unnatural; and have been conceived originally by perſons who had ſeen them playing about on the ſurface of the water, in which caſe they ſometimes deceive the eye, and appear crooked: from theſe probably our ſign-painters took their idea of the dolphin. They are an extremely ſwift fiſh in ſwimming, and are able to live a long time out of the water, though they can continue but a little while under it without air; hence they are ſometimes taken up dead by fiſhermen in their nets, having been ſuffocated by being forcibly kept under water: they have been known to live three days on dry ground. *Willughby, Hiſt. Piſc.*

DE'LVIN, in natural hiſtory, a name ſometimes given by the miners of Cornwal to that ſort of talky ſtone or ſlate, which they more generally call killas; but in ſome places, as at Lowancowiggan, they uſe it as the name of a coarſe but very hard ſtone in which the ore lies. The ore is tin, and is conſiderably rich there, but the hardneſs of this ſtone makes it difficult to be got out.

DENDRANA'TOMY, a term uſed by Malpighi and others to expreſs the diſſection of the ligneous parts of trees and ſhrubs, in order to the examining their ſtructure and uſes.

DENS *Canis*, dog's-tooth, in botany, the name of a genus of plants: the characters of which are theſe: the flower is of the liliaceous kind, and is compoſed of ſix petals, which are pendulous, and bend backward. The middle of the flower is occupied by a piſtil, which finally becomes a round fruit, or ſeed veſſel, divided into three cells, and containing a number of oblong ſeeds: to this it is to be added, that the root is fleſhy, and of the ſhape of a dog's fruit.

The ſpecies of Dens canis, enumerated by M. Tournefort, are eight.

The powder of the dried root of this plant is ſaid to kill worms in children. Drank in wine, it is an approved remedy for the cholic. It is ſaid to be reſtrictive and reſtorative, and, taken in water, cures children of the epilepſy: it is alſo eſteemed a great provocative to venery.

DENS *Leonis*, dandelion, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the ſemi-floſculous kind, and the petals it is compoſed of are placed on the embryo-ſeeds, and ſurrounded by the cups. The embryo's finally become ſeeds winged with down, which are affixed to the thalamus, but expand their downy ends into a globular head, and the ſtalks are uſually hollow and not branched. The ſpecies of Dandelion, enumerated by M. Tournefort, are twenty-two.

The common ſpecies of this plant has much the ſame virtues as the common endive, but in a greater degree: the roots eaten in ſpring are eſteemed of great ſervice in obſtructions in the liver and ſpleen.

DENTA'LE, in natural hiſtory, the name of a genus of the tubuli marini: the characters of which are, that they are ſhelly tubes, reſembling the tuſks of elephants, or the horn of ſome animal which is a little bent. Some authors have called theſe elephants teeth.

DE'NTES *Canini*, dogs teeth, are ſo termed, becauſe they are naturally a little pointed, and appear longer than the reſt, almoſt in the ſame manner as in dogs: they might alſo be properly enough be called angular, becauſe they make an angle, by which the inciſores are ſeparated from the grinders; the two ſuperior have alſo been named eye-teeth from their ſituation. The bodies of the Dentes canini are thicker and more prominent than thoſe of the inciſores; they are convex, and a little rounded on the outſide, and end in a ſhort triangular point, one of the ſides of which is a continuation of the convexity of the outſide, and the other two are flatter and turned inwards. Theſe points are often worn out by maſtication: their roots are commonly larger, thicker, longer, and more pointed than thoſe of the inciſores, and ſometimes perforate to the bottom of the maxillary ſinus. *Winſlow's Anatomy.*

Dentes inciſores, the cutting teeth, have their name from their uſe; and are by ſome authors called riſorii, becauſe they appear in laughing; the four upper inciſores are larger and broader than the four lower; and, of the upper, the two in the middle are larger than the other two: the bodies of theſe teeth reſemble large cutting wedges, and their roots are pointed. Their bodies are ſo diſpoſed that their ſharp ends lie all in a line, making one uniform edge; each body has properly four ſides; one anterior a little convex, one poſterior a little concave, and two lateral much narrower than the former, and almoſt flat: the anterior and poſterior ſides decreaſe in breadth towards the neck, the lateral ſides towards the edge; ſo that they repreſent in ſome degree four triangles, with their apices and baſes reciprocally oppoſite.

Theſe teeth have long roots, the lateral ſides of which are broad and flat, the anterior and poſterior narrower: they terminate by degrees in a point, in which a ſmall hole is obſervable, in children pretty conſiderable, but almoſt obliterated in old age. *Winſlow's Anatomy.*

DESIDERA'TUM, is uſed to ſignify the deſireable perfections in any art or ſcience: thus, it is a Deſideratum, with the black-ſmith, to render iron fuſible, by a gentle heat, and yet preſerve it hard enough for ordinary uſes; with the glaſs-man and looking-glaſs maker, to render glaſs malleable; with the clock-maker, to bring pendulums to be uſeful where there are irregular motions; with the brazier and copperſmith, to make malleable ſolder; with the ſhipwright, to build veſſels that will ſail under water: with the diver, to procure manageable inſtruments for conveying freſh air to the bottom of the ſea, ſufficient for reſpiration, and the burning of lights; with the aſſay-maſter, to melt or copel ores, immediately, without the uſe of bellows or furnace; and, with the carvers and joiners, to faſhion wood in moulds like plaiſter of Paris or burnt alabaſter, &c. And though, as Mr. Boyle obſerves, the obtaining of theſe Deſiderata may be thought chimerical, yet it is proper they ſhould be propoſed; for, although perfection may not be attainable, yet approaches to it may be made, and arts thereby improved.

To this we may add, that the making iron malleable with pit coal was once perhaps looked upon as chimerical, yet it is now put in practice, to the great advantage of the owners of ſeveral mines in this kingdom.

It is a Deſideratum, in the tin works, to find a method of obtaining the ſilver out of the tin, as it is now got out of the lead, in places where the ores are ſo rich as to make it worth the while.

In the glaſs-works, it is a Deſideratum to ſolder up the cracks and flaws in the pots, while they are detained in the fire, and another to make glaſs without veins.

A taſteleſs and inodorous wine is a Deſideratum among vintners, and a taſteleſs, acid, inodorous ſpirit among diſtillers.

The painters want a permanent green, and the callico-painters a laſting blue.

In ſhort, all arts have their defects, and it is not at firſt to be gueſſed, for how many of theſe remedies may be found, by means of chemical reſearches properly directed.

Chemiſtry itſelf is greatly defective in many particulars, as in an experimental hiſtory of general fermentation, ſeparatory and combinatory, in ſubjects of the animal, vegetable, and mineral kingdoms. A hiſtory of putrefaction, rancidneſs, muſtineſs, mouldineſs; and of the making of glues, mulages, and the like preparations, in the moſt perfect manner is alſo wanted.

The ſublimer metallurgy is in particular yet greatly defective. It wants a more eaſy method of extracting the mercuries of metals, than thoſe commonly deſcribed; a cheaper method of meliorations is wanted, and, in general, all the parts of this branch of the art ſeem equally defective.

The ſchemes for new trades will riſe occaſionally in the proſecuting many of the ſubjects; thus, it is natural for the common operations of brewing and ſugar-baking to ſuggeſt that ſugar may be procured from malt and other vegetables. That nurſeries of peculiar ferments, both native and foreign, may be raiſed on the common principles; and it is evident, that the introduction of ſuch new trades would greatly improve the buſineſs of brewing, ſugar-baking, and the like.

If a proper number of perſons duly qualified for making experiments, and improving from them, would ſet about each his particular ſhare of the neceſſary experiments, and communicate the reſult of all their proceſſes to one another, the buſineſs of chemical experiment would be much better directed in regard to future ſtudents, and many of the Deſiderata in the art probably ſupplied. *Shaw's Chem.*

DESI'GN, or *Deſigning*, in the manufactories, expreſſes the figures wherewith the workman enriches his ſtuff or ſilk, and which he copies after ſome painter, or eminent draughtſman; as in diaper, damaſk, and other flowered ſilk and tapeſtry, and the like, &c.

In undertaking of ſuch kinds of figured ſtuffs, it is neceſſary, ſays Monſ. Savary, that, before the firſt ſtroke of the ſhuttle, the whole Deſign be repreſented on the thread of the warp; we do not mean in colours, but with an infinite number of little packthreads, which, being diſpoſed ſo as to raiſe the threads of the warp, let the workmen ſee, from time to time, what kind of ſilk is to be put in the eye of the ſhuttle for woof.

This method of preparing the work is called reading the Deſign, and reading the figure, which is performed after the following manner:

A paper is provided, conſiderably broader than the ſtuff, and of a length proportionate to what is intended to be repreſented thereon. This they divide lengthwiſe, by as many black lines as there are intended to be threads in the warp; and croſs theſe lines by others drawn breadthwiſe, which, with the former, make little equal ſquares.

On the paper thus ſquared the draughtſman deſigns his figures, and heightens them with colours, as he ſees fit. When the Deſign is finiſhed, a workman reads it, while another lays it on the ſimblot.

To read the Deſign, is to tell the perſon who manages the loom the number of ſquares, or threads, compriſed in the ſpace he is reading, intimating, at the ſame time, whether it is ground or figure.

To put what is ready on the ſimblot, is to faſten little ſtrings to the ſeveral packthreads, which are to raiſe the threads named: this they continue to do, till the whole is read.

Every piece being compoſed of ſeveral repetitions of the ſame Deſign, when the whole Deſign is drawn, the drawer, to rebegin the Deſign a-freſh, has nothing to do but raiſe the little ſtrings with ſlip-knots to the top of the ſimblot, which he had let down to the bottom. This he is to repeat as is neceſſary, till the whole be manufactured.

The ribbon-weavers have likewiſe a Deſign, but far more ſimple than that we have deſcribed. It is drawn on paper, with lines and ſquares, repreſenting the threads of the warp and woof. But, inſtead of lines, of which the figures of the former conſiſts, theſe are conſtituted of points only, or dots, placed in certain of the little ſquares, formed by the interſection of the lines. Theſe points mark the threads of the warp that are to be raiſed, and the ſpaces left blank denote the threads that are to keep their ſituation. The reſt is managed as in the former.

DE'TENTS, in a clock, are thoſe ſtops which, by being lifted up or let fall down, lock and unlock in ſtriking.

Detent-wheel, or hoop-wheel, in a clock, that wheel which has a hoop almoſt round it, wherein there is a vacancy, at which the clock locks.

DE'VENSHRING, or *Denſhiring*, a term uſed by the farmers to expreſs the burning land by way of manure: the method is to cut off the turf about four inches thick, and burn it in heaps, and then ſpread the aſhes upon the land; they probably call it Devenſhring, from its having been earlieſt practiſed in Devonſhire. See the article BURNING *of land.*

DEUILLE'*s Piſton*, in hydraulics, a piſton without friction invented by Meſſieurs Goſſet and de la Deuille, and ſucceſsfully made uſe of in the king of France's garden at Paris.

This piſton may be made as big as you pleaſe, even to have 36 inches diameter; but I ſhall only give 15 to that I am going to deſcribe, this bigneſs ſeeming moſt convenient for the reaſons that will appear, as we deſcribe this piſton. As it is to act in a pump different from thoſe commonly deſcribed, I will ſhew in what it conſiſts. It is made of two boards of oak or elm, 20 inches diameter, and five inches thick: in the middle of each of theſe boards, you muſt cut a hollow cylindrical cavity 15 inches diameter, and $2\frac{1}{2}$ inches deep, which forms two boxes, which muſt be applied to one another with their hollows together; their profile taken diametrically is repreſented by each of the rectangles A B C D, and E F H G (*Plate* XVII. *fig.* 10.)

The piſton is made of a circular board Y Z, an inch thick, whoſe diameter muſt be a little leſs than that of the hollow T O Q V, to facilitate its play: this board is fixed to a great circle of leather (or to ſeveral, when one is not ſtrong enough) in ſuch manner that the leather may extend all round beyond it ſix or ſeven inches; then you muſt put the board Y Z in the bottom of the box S T V X, and what exceeds of the leather muſt be folded up all round the edge E X G of the ſame box. Then you put down the other box upon the firſt, ſo as to ſqueeſe the leather between; and, that it may be preſſed the more ſtrongly, ſo that the two boxes may make but one, they are drawn together by means of ſeveral iron pins 17, 18, whoſe ends are cut into ſcrews, to fit into nuts; then the piſton makes a ſort of a purſe 3, 4, 5, 6, which turns inſide out every time the bottom Y Z is drawn upwards.

At the bottom of this purſe there is an hole L, covered with a valve K, which, when it is raiſed, comes to lean againſt the handle M W M, which handle is faſtened to the rod N, that works the piſton up and down; for doing of which there is another hole 9, 10, in the bottom of the upper box, which anſwers to the riſing pipe 13, 14, in which the rod N goes up. This hole is made ſpreading downwards, that the moveable board may apply itſelf cloſe to the top O Q, when the piſton riſes. In the lower bottom of the box there is another hole 19, 20, which anſwers to the ſucking pipe 15, 16, that ſtands in the water to be raiſed; this hole is covered with a valve I, as uſual.

When the piſton riſes, the water from the ſucking pipe opens the valve I, and paſſes into the hollow that is made in an height of four inches, which is all the play that the piſton ought to have, not to weaken the leather too much, which would not hold out long, if it had too long a ſtroke; whereas, having at moſt but 2 inches and $\frac{1}{2}$ to riſe from 5 to X, it wears but little: when the piſton comes down, the valve I ſhuts again, the other K opens, and the water which is between the bottom T V, and the leather 3, 4, 5, 6, goes through the hole L, and comes into the ſpace O P Y Z Q, whence it is lifted into the riſing, or forcing, pipe; thus you ſee that the piſton, always moving between the water above, and that below, has no friction. I ſhall add, that, when it is made of good leather, it may be continually worked for three or four months, without repairing, as experience has ſhewn it in thoſe pumps, that Meſſieurs Goſſet and de la Deuille had made for draining the mines in Brittany.

The only fault to be found with this piſton, is, that, of whatſoever diameter the riſing pipe 13 and 14 is, the power is always loaded with the weight of a column of water, whoſe baſe is the circle O Q, and height the elevation of the reſervoir above the ſpring; it is true, that one may increaſe the diameter of that pipe, and decreaſe that of the piſton, that, when they are equal, the power may only raiſe its natural weight.

It may may yet perhaps be objected, that this piſton, having ſo ſhort a ſtroke, will give but a little water every time; but that is not a fault, ſince one may make the ſtrokes more frequent; ſo that what may be loſt on one hand may be gained on the other, and as much water be raiſed as if the ſtroke were longer.

As the rod of the piſton goes through the riſing (or forcing) pipe, water may not be raiſed to a conſiderable height by this pump, yet the rod of the pump, erected in the king's garden, is at leaſt 25 feet long; and, if the ſame length be given to the ſucking pipe, one may however raiſe water 50 feet above its ſpring, in a very plain and cheap way. For, if you make uſe of wood, ſuch a pump will coſt under ten piſtoles: and that ſerves, upon many occaſions, where a pump of great expence would raiſe no more water with the ſame power.

DEW (*Dict.*)—Thoſe who have made no other reflections on Dew than ſuch as preſent themſelves naturally, think that all the moiſture one finds in the morning on plants and upon the ground, comes in reality from above; but, when the affair is examined with more attention, one ſees that at leaſt a great part of the Dew ariſes from the earth itſelf and the plants, and keeps hanging to their ſurface. Mr. Gerſten who hath made a diſſertation on this ſubject in particular, hath even thought that there fell no Dew from above on the ground, and that all which we ſee under the form of Dew aroſe from the earth or plants, on which it keeps hanging in pearls till the heat of the day hath diſperſed it.

This opinion of Mr. Gerſten was not new, and we find, in the Hiſtory of the Academy for 1687, that ſome perſons of the company had advanced, that the Dew roſe from the earth and did not deſcend from above, becauſe they found under glaſs-bells as much Dew as in other places expoſed to the air; it is probable, that ſince that time ſeveral perſons have been of the ſame ſentiment; one finds even traces of it in ancient authors: but Mr. Gerſten did not derive his notion from thence; he had given, in the work which we have cited, a new explication of the riſings and fallings of the barometer that did not agree with the deſcent of Dew; this made him think of examining the thing with more attention, than had hitherto been done. He had already obſerved in gardens that the graſs was full of a moiſture in the evening, and covered with very perceptible little drops, whilſt the leaves of trees, and plants that were more raiſed from the ground, had not the leaſt appearance of it; he remarked moreover that all the plants had it not equally, that on ſome it was very abundant, whilſt he could ſcarce perceive it on others.

We ſhall not relate a great number of experiments, that were made by Mr. Gerſten, although ſome of them are extremely curious; but the reader will ſee by thoſe which we ſhall give an account of afterwards, that it was neceſſary, in order to draw certain and exact conſequences, to have a knowledge of ſeveral facts, the diſcovery of which was reſerved for Mr. Muſſchenbroek; who after having verified the greateſt part of Mr. Gerſten's experiments, at firſt ſubmitted himſelf to his opinion, but he hath ſince changed, and is fixed in acknowledging ſeveral ſorts of Dews, of which one more denſe than all the others riſes from lakes, rivers, and marſhes.

And a third falls from above: Mr. Muſſchenbroek founds the exiſtence of this laſt on a great number of experiments which he hath made upon the leaden terras of the Obſervatory at Utrecht; it was not poſſible that any vapour ſhould riſe from this terras of lead, yet ſeveral bodies which he expoſed there received Dew on their upper ſurface; from whence Mr. Muſſchenbroek concludes that there is really a Dew that falls.

Several obſervations and experiments repeated very often, and which always proved uniform, leave no longer any doubt with me concerning the nature of Dew, at leaſt with regard to its riſing or falling; and I think one may be ſatisfied that it riſes only from the earth and plants; that this moiſture or this vapour conſiſts of an infinite number of little aqueous globules extremely light with which the air is loaded, and which it carries with it whitherſoever it is driven by its fluctuating motion: thus the bodies which are met by this aqueous vapour, receive it in all the parts of their ſurface, and are immerſed all at once.

In the experiments of Mr. Muſſchenbroek where bodies expoſed on the leaden terras received Dew on their upper ſurface, it is true, the moiſture did not come from the terras, but it roſe from the earth, and from the plants round about; it came ſucceſſively, and by the vehicle of air to the terras of lead; it was afterwards diffuſed through all the air that was above this terras, and faſtened to the bodies which were expoſed to receive it: if Mr. Muſſchenbroek had attended to the time when the Dew began to be perceived on the terras, he would have remarked, that it was ſenſible a long time before at the foot of the tower, on whoſe ſummit he made the obſervation; I even doubt not but, if he had raiſed a mirrour or piece of glaſs to ſix feet above the leaden terras, he would have found drops of Dew attached to the inferior ſurface of the glaſs, as ſoon and in as great quantities as on the ſuperior ſurface: this I cannot doubt of from experiments I have made along the different heights of the ſteps of a ladder. I placed two ladders oppoſite each other, joined at their tops, ſpreading wide aſunder at their bottoms, and ſo high as to reach thirty-two feet. To the ſeveral ſteps of theſe I faſtened large ſquares of glaſs, and ſet them in ſuch a manner that they ſhould not ſhade or over-hang one another. It was plain that, if the Dew deſcended without firſt riſing, the top ſquares muſt be firſt wetted, and that on their upper ſurface; but on the contrary, if the Dew firſt aſcended from the earth, the bottom ſurfaces of the lower panes muſt firſt receive it: and thus in fact it happened; the lower ſurface of the loweſt piece of glaſs was firſt wetted, then its upper ſurface; then the lower ſurface of the pane next above it, and ſo on gradually till the whole was wetted to the top of the ladders.

But, in order to aſſure myſelf more certainly, and leave no room for doubt on this ſubject, I have lately repeated the ſame experiments at Paris upon a leaden terras. I ſuſpended a glaſs upon a wooden frame, raiſed only two feet, and I conſtantly found drops of Dew pretty nearly in equal quantity on the under ſide as on the upper ſide of the glaſs; which is different from the former experiments that were made in the country, where the inferior ſurface was always ſooner and more abundantly moiſtened than the ſuperior; but the reaſon of this difference is very evident, for in the country the aqueous vapours roſe directly from the earth, and faſtened themſelves to the under ſurface of the glaſs; but it is not ſo on a terras of lead, and ſurrounded by lofty buildings; in this caſe, the air that is loaded with moiſt vapours cannot arrive thither but by long windings, and a very irregular fluctuation; ſo that there is no more reaſon why it ſhould faſten itſelf to the under than to the upper ſide of the glaſs; or, in other words, the vapour doth not riſe there perpendicularly as in the country, but is driven in a lateral direction.

Notwithſtanding all I have been ſaying, I do not pretend that there is but one kind of Dew, and deny not but there may be a Dew whoſe parts are groſs enough, and have ſufficient weight to fall to the ground; yet I think in that caſe it would be viſible, and form what we know by the name of fog: but our inquiry is at preſent of that kind of Dew, ſo ſtiled by all, which is imperceptible to the eyes, and becomes ſenſible only by wetting thoſe bodies that are expoſed to the air in the night. *Mem. Acad. Roy. Sciences.*

The reverend Dr. Hales, in his treatiſe of Vegetable Statics, tells us, that in order to find out the quantity of Dew that fell in the night, on the 15th of Auguſt, at 7. p. m. he took two glazed earthen pans, which were three inches deep, and twelve inches diameter in ſurface; that he filled them with pretty moiſt earth, taken from off the ſurface of the ground, and they increaſed in weight by the night's Dew 180 grains; and decreaſed in weight by the evaporation of the day one ounce + 282 grains.

He ſays likewiſe, he ſet theſe in other broader pans to prevent any moiſture from the earth ſticking to the bottom of them. He adds, the moiſter the earth is, the more Dew falls on it in a night, and more than a double quantity of Dew falls on a ſurface of water than there does on an equal ſurface of moiſt earth: the evaporation of a ſurface of water in nine hours winter's dry day, is $\frac{1}{21}$ of an inch: the evaporation of a ſurface of ice, ſet in the ſhade during a nine hours day, was $\frac{1}{41}$. So here are 540 grains more evaporated from the earth every 24 hours in ſummer, than fall in Dew in the night; that is, in 21 days near 26 ounces from a circular area of a foot diameter; and circles being as the ſquares of their diameters, 10 pounds + 2 ounces will in 21 days be evaporated from the hemiſphere of 30 inches diameter, which the ſunflower's root occupies; which, with the 29 pounds drawn off by the plant in the ſame time, makes 39 pounds, that is, 9 pounds and $\frac{3}{4}$ out of every cubic foot of earth, the plant's roots occupying more than 4 cubic feet: but this is a much greater degree of dryneſs than the ſurface of the earth ever ſuffers for 15 inches deep, even in the drieſt ſeaſons in this country.

In a long dry ſeaſon therefore, eſpecially between the tropics, we muſt have recourſe, for ſufficient moiſture to keep plants and trees alive, to the moiſt ſtrata of earth, which lie next below that in which the roots are.

Now, moiſt bodies always communicate of their moiſture to more dry adjoining bodies; but this ſlow motion of the aſcent of moiſture is much accelerated by the ſun's heat to conſiderable depths in the earth, as is probable, he ſays, from the twentieth experiment in the ſaid book.

Now, 180 grains of Dew falling in one night, on a circle of a foot diameter = 113 ſquare inches; theſe 180 grains being equally ſpread on this ſurface, its depth will be $\frac{1}{59}$ part of an inch $= \frac{180}{113 \times 254}$. He adds, that he found the Dew in a winter's night to be the $\frac{1}{90}$ part of an inch; ſo that if we allow 151 nights for the extent of the ſummer's Dew, it will in that time ariſe to one inch deep: and, reckoning the remaining 214 nights for the extent of the winter's Dew, it will produce 2, 39 inches deep; which makes the Dew of the whole year amount to 3, 39 inches deep.

And the quantity which evaporated in a fair ſummer's day from the ſame ſurface, being as 1 ounce 282 grains, gives $\frac{1}{40}$ part of an inch deep for evaporation, which is four times as much as fell at night.

He ſays likewiſe, that he found, by the ſame means, the evaporation of a winter's day to be nearly the ſame as in a ſummer's day; for, the earth being in winter more ſaturated with moiſture, that exceſs of moiſture anſwers to the exceſſive heat in ſummer.

It is very certain, that ſubſtances of a very different kind from the uſual and natural matter of the Dew, have ſometimes fallen in that form. Our Philoſophical Tranſactions give an account, that, in the year 1695, there fell in Ireland, in ſeveral parts of the provinces of Leinſter and Munſter, for a conſiderable part of the winter and ſpring, a fatty ſubſtance, reſembling butter, inſtead of the common Dew; it was of a clammy texture and dark-yellow colour; and was, from its great reſemblance, generally called Dew-butter by the country people. It always fell in the night, and chiefly in the mooriſh low grounds, and was found hanging on the tops of the graſs, and on the thatch of the houſes of the poor people. It was ſeldom obſerved to fall twice in the ſame place, and uſually, wherever it fell, it lay a fortnight upon the ground before it changed colour, but, after that, it gradually dried up, and became black. The cattle fed in the fields where it lay, as well as in others, and received no hurt from it: it fell in pieces of the bigneſs of one's finger end, but they were diſperſed ſcatteringly about, and it had an offenſive ſmell, like that of a church-yard. There were, in the ſame places, very ſtinking fogs during the winter, and ſome people ſuppoſe this no other than a ſediment or connection of the heavier matter of thoſe fogs. It would not keep very long, but it never bred worms. The country people, willing to have ſome good of it, tried it on their children's foreheads, and it always cured them of a ſcald-head. *Phil. Tranſ.* N°. 220.

Cryſtalline DEWS, a term uſed by ſome modern writers, to expreſs certain Dews, or ſteams, which, in their fall upon the earth, become, as they ſay, cryſtal. This greatly favours the opinion of the ancients, that all cryſtal was only water frozen into a kind of ice harder than ordinary, but it is erroneous. Mr. Beaumont gives an account, in the Philoſophical

Tranſactions, of theſe cryſtal Dews on Mendip-hills; in which he tells us, that the miners of that place find ſometimes, in the roads where the earth is bare, triangular cryſtals, about two inches in length, and an inch over, not with ſharp angles, but roundiſh and blunted ones, and carried up round at the ends like a cocoa-nut; and that none of theſe are ever found under ground in digging, but only lying on the ſurface. He tells us alſo, that he had ſeen ſome taken up in Glouceſterſhire, and confirms the opinion of theſe cryſtalline Dews producing real cryſtals, by the account given of ſome places in Italy, where cryſtals are, as it is ſaid, frequently produced in clear evenings by a coagulation of the Dews falling on nitrous ſteams. Whatever the cryſtals are, which authors ſeem to ſuppoſe to have been generated in this manner, it is very certain, that they have in reality another origin; and theſe are only the accounts of ignorant and inconſiderate people, to give credit to the ſtrange and unnatural method here given for their formation. *Phil. Tranſ.* N°. 129.

DIA'BOLUS *Marinus*, the ſea devil, in zoology, the name of an ugly and ſtrangely ill-ſhaped fiſh, of the ray kind. Its noſe or ſnout is bifid, and runs out into two horns, and its ſides are both terminated by thin fins: its ſkin toward the head is variegated with duſky ſpots. It grows to a very conſiderable ſize, being ſometimes caught of ſix or ſeven feet long. *Ray's Ichithyogr. Append.* p. 5. See *Plate* XXII. *fig.* 2.

DIADE'LPHIA, in botany, a claſs of plants with hermaphrodite flowers, whoſe ſtamina, by the conjunction of thin filaments, are formed into two bodies.

The characters of the Diadelphia are theſe: the perianthium conſiſts of one leaf, and is of a bell-like ſhape, and gibbous at the baſe; this always falls with the flower. It ſtands on a pedicle, is obtuſe at the top, and carries a drop of honey-like juice at the baſe. Its mouth or rim is divided into five ſegments, which are ſometimes erect, ſometimes oblique, and always irregular, and acute. The bottom ſegment, which has no fellow, is longer than all the reſt; and the top pair are ſhorteſt of all, and ſtand fartheſt aſunder. The receptacle of the fructification is incloſed in the bottom, where it is wetted with the drop of honey. The flower is of an irregular ſhape, and is of that kind called by authors papilionaceous, from its ſomewhat reſembling the wings of a butterfly.

DI'AMOND (*Dict.*)— *Valuation of* DIAMONDS. Mr Jeffries lays down the following rule for the valuation of Diamonds of all weights. He firſt ſuppoſes the value of a rough Diamond to be ſettled at two pounds per carrat, at a medium; then, to find the value of Diamonds of greater weights, multiply the ſquare of their weight by two, and the product is the value required. E. g. to find the value of a rough Diamond of two carrats, $2 \times 2 = 4$, the ſquare of the weight, which, multiplied by two, gives eight pounds, the true value of a rough Diamond of two carrats. For finding the value of manufactured Diamonds, he ſuppoſes half their weight to be loſt in the manufacturing them; and, therefore, to find their value, we muſt multiply the ſquare of double their weight by two, which will give their true value in pounds: thus, to find the value of a wrought Diamond, weighing two carrats; we firſt find the ſquare of double the weight, viz. $4 \times 4 = 16$, then $16 \times 2 = 32$. So that the true value of a manufactured Diamond of two carrats is 32 pounds.

By this rule, Mr. Jeffries has conſtructed tables of the price of Diamonds, from 1 to 100 carrats. *Jeffries on Diamonds, p.* 8, 9, *and p.* 11 *& ſeq. of his Tables.*

Rough Diamonds are more commonly found of a ſix-pointed figure than of any other; and theſe are called ſix-pointed rough Diamonds, the figure of which is compoſed of two ſquare pyramids, joined at their baſes. Hence the whole figure is compoſed of eight triangular faces, or planes, four of which meet in a point above the baſe, and four below it, in another point. The diſtance of theſe two points is the axis of the figure.

Shining of DIAMONDS *in the dark.*— The ancients having mentioned many precious ſtones which ſhone in the dark, the moderns have made a great number of experiments, in order to diſcover whether Diamonds had really any luſtre in the dark. The great Mr. Boyle made a multitude of experiments of this kind; and Mr. Du Fay has lately repeated theſe experiments, and added ſeveral others, an extract of which will not, perhaps, be diſagreeable to the reader.

After having verified upon ſeveral Diamonds the experiments related by Mr. Boyle, I plainly diſcovered that it was not neceſſary that the Diamond ſhould be heated, in order to contract a tranſient light, ſuch as that which it produces, when rubbed upon glaſs or metals; but I thought that it muſt be ſenſibly heated to acquire that permanent and durable light, which ſubſiſted for ſeveral minutes, when the Diamond had been near to a lighted candle, or expoſed to any other heat. With this view I expoſed to a very burning ſun-ſhine, for 22 minutes, ſeveral Diamonds, namely, one white, of a very beautiful water; two yellow, of which one was leſs coloured than the other, weighing about 60 grains; one of a roſe-colour, one green, and one of an amethyſt-colour.

I examined afterwards all theſe Diamonds in the dark, and I found only the two yellow luminous, but they were extremely ſo, and principally the ſmalleſt, which was of the deepeſt colour; they were ſo, to ſuch a degree, that they enlightened the others which were placed near them, inſomuch that it was neceſſary for me to take theſe two away, in order to be aſſured that the others were not luminous: theſe two yellow Diamonds kept their light very perceptibly for more than 12 minutes.

Although every one knows how neceſſary it is that theſe experiments be made in the moſt perfect obſcurity that is poſſible, yet I believe, that it will not be uſeleſs to mention the precautions which it is neceſſary to take, in order to ſee theſe experiments in all their beauty, without which, I might be ſuſpected of exaggeration ſometimes in the deſcription I give, becauſe, without theſe precautions, the ſame experiments ſucceed much leſs perfectly.

It is neceſſary to continue a quarter of an hour, at the leaſt, in the moſt perfect darkneſs that is poſſible, before you let the Diamonds be brought you which have been expoſed to the ſun; it requires ſuch a time, in order to let the vibration ceaſe, which the light of the day cauſes in the eyes, and that the pupil, which had been extremely contracted, ſo as to permit only a certain quantity of rays to paſs, whilſt you was expoſed to the light, might have time enough to dilate itſelf ſufficiently to receive the moſt that is poſſible, from objects the leaſt luminous, or the leaſt enlightened. There is no one but muſt have obſerved, ſeveral times in his life, that, when he goes out of broad day-light, and enters into an obſcure place, he ſees none of the objects which he eaſily diſcerns after having ſtaid there a quarter of an hour, where the eyes no longer feel the impreſſion of the day-light. I do not know whether others have remarked the little relation, and the independency there is in this reſpect between the two eyes; for if you cloſe one for a quarter of an hour, and the other continues open, the luſtre of the Diamonds, and of other phoſphori of the like nature, will be ſeen very diſtinctly by the eye that hath been cloſed, whilſt the other will not perceive it in leaſt degree; which proves, that the dazzling cauſed by broad day-light, and which renders the eye inſenſible of a weak light, acts upon each eye diſtinctly, and that its action ceaſes before the union of the two optic nerves. There reſults from this obſervation a very great conveniency, with regard to the performance of theſe experiments; for you may cloſe one eye, and yet make all the little preparations that are neceſſary, and which it is often difficult to leave the care of to another perſon: this, at leaſt, is certain, that the obſervation hath been of great ſervice to myſelf, ever ſince I made the diſcovery.

As I had obſerved, in the firſt experiment I have related, that the Diamonds, although they had been 22 minutes in the ſun, had not acquired any ſenſible heat, I tried the effect of expoſing them to the ſun for a leſs time; I left them there only 10 minutes; there were two large white Diamonds, weighing between 70 and 80 grains; two blue, one of which weighed 18 grains, but the other was ſmaller and deeper in colour; one green, one of a roſe-colour, and two yellow; the two white Diamonds did not take any luſtre at all, nor did the deepeſt-coloured of the two blue; the green and the roſe-coloured aſſumed a little ſplendor; but two ſmall carrat Diamonds that were ſet round one of theſe rings, the two yellow, and above all, the large and bright-blue Diamond, appeared extremely luminous, and their luſtre continued twelve or thirteen minutes, growing weaker by imperceptible degrees.

I tried afterwards ſeveral other Diamonds of various ſizes, and of all the colours I could meet with; I found ſeveral of them extremely luminous, and others that were not ſo at all. But hitherto I have not diſcovered any difference in this reſpect, which could be attributed to the colour alone of the ſtone, except that the yellow Diamonds which I have tried have all been luminous; there were, indeed, ſome more luminous than others, but they were not always thoſe whoſe colour was the deepeſt. Beſides a great number of yellow Diamonds, weighing from 8 or 10 to 80 grains, which I have tried, I have had the opportunity of having in my hands about four hundred yellow carrat Diamonds, and there was not one of them but was luminous; ſo that we may eſtabliſh it as a general law, that all yellow Diamonds, having been expoſed to the light, are impregnated with it in ſuch a manner, that they preſerve it in the dark for a conſiderable time.

Artificial DIAMONDS.— Art, which imitates nature in ſo many things, hath attempted alſo in this admirable production, but very imperfectly, the beſt of them being far ſhort of the natural; for which reaſon they bear no price, in compariſon to the other. There is, however, a pretty great trade in them for maſquerades and play-houſe habits.

There is a particular ſort of falſe Diamonds, called Alencon Diamonds, made of ſtones or cryſtals, found near Alencon, a city of Normandy. The village where they are produced, and which is about two leagues from the city, is called Hertré; the ſoil is full of glittering ſand, and of a hard and grey rock. There are of theſe Diamonds ſo clean and brilliant, that ſome are deceived herein.

On the coaſt of Medoc, alſo are found certain hard and tranſparent flints, which, being properly cut, are not to be diſtinguiſhed, among falſe Diamonds.

Method of making the Diamonds *of Alencon.*—Take an earthen glazed pot, ſet it on a little furnace, put in it filings of ſteel, with ſome vine aſhes at diſcretion; place therein by one another cryſtals cut and poliſhed; then pour common water gently upon them, which keep boiling during the ſpace of twelve hours, taking care to add boiling water freſh into the veſſel, as the water in it conſumes by boiling, and take care it boil continually. Then ſee if your cryſtals have acquired the colour and hardneſs you expected: if not, continue the fire ſome hours longer, and they will be like the true Diamonds of Alencon; taking care to poliſh them again at the wheel, to give them colour and brightneſs.

A method of giving the true colour and hardneſs of a Diamond *to cryſtals and Diamonds of Alencon.*— There are cryſtals and precious ſtones, which have neither the colour nor natural hardneſs of Diamonds, and which, ſome have aſſerted, may be imitated by art, according to the following proceſs:

Take good Dutch tripoli, and make a paſte of it with water out of the ſmith's forge; in this paſte wrap up the quantity you deſign of cryſtal, or Diamonds of Alencon cut and poliſhed; then ſet it in a crucible covered and luted on a gradual fire, where let it ſtand till the crucible becomes red-hot. A little time after take it out, and take out the ſtones; then poliſh them again at the wheel, to give them their colour.

To ſet them in work, take Indian paper, with leaves of tin, like thoſe you put behind looking-glaſſes; then let them be ſet by a ſkilful jeweller, and they will not be diſtinguiſhable from ſome natural Diamonds, but by nice diſcerners.

Another method of hardening cryſtals and Diamonds *of Alencon.*— Cryſtals alſo acquire hardneſs in the paſte we are now going to deſcribe, becauſe their humidity exhales, and they become more fixed.

Take barley-meal well diluted, with petroleum, or rock oil; then cut that paſte in the middle, and put all your ſtones in order, ſo that they may not touch one another. Then cover your ſtones with more of the ſame paſte, and put them in a crucible covered with another, and luted well together, and let it dry. After which, ſet this crucible in a gradual wheel fire, from five to ſix hours; a ſmall fire the two firſt hours, which increaſe every two hours, till the end of the ſix: let the whole cool of itſelf. Then break your crucibles, and you will find your ſtones mended beyond expectation, which repoliſh at the wheel, and let them be ſet by an experienced jeweller.

Another proceſs ſaid to anſwer the ſame end as the preceding, and to give a ſuperior luſtre.— Although this is ſaid to be an important ſecret, and may be abuſed, yet we ſhall communicate it; becauſe, if true, it will put people upon their guard, and convince them of the neceſſity of dealing only with people of honour and credit in the Diamond way.

Take one pound of loadſtone, a pound of quicklime, and half a pound of common ſulphur, the whole reduced to powder, and well mixed. With this powder cement your cryſtals and Diamonds of Alencon well cut, in a crucible covered and well luted: being dry, ſet it in a glaſs-houſe furnace, if you have not one ready for the purpoſe, three days, in a place where the matter may be continually red-hot, without fuſion; and take care not to take out the crucible all at once, but let it cool gently, otherwiſe the ſtones might break. Having broken the crucible, you will find your ſtones to have acquired an additional brilliancy as well as hardneſs, and will reſemble the Diamonds of the old rock, which repoliſh at the wheel to give the colour, and let them be well ſet.

The method of making artificial Diamonds.— Take, of the fineſt natural cryſtal, calcined, and reduced to ſubtile powder, what quantity you pleaſe; fill a pot with it, and ſet it in a glaſs-houſe furnace twelve hours, to be melted and purified: then drop the melted matter into cold water, dry it, and reduce it again to powder; add to that powder its weight of fine ſalt of tartar. Mix theſe two powders well, and make little pills of them, with common water. Then wipe theſe pills, and put them into an earthen pot on a ſtrong fire, there to grow red-hot for twelve hours ſpace, without melting. Afterwards put them into a pot in a glaſs-houſe furnace, where leave them two days, to be well melted and purified. Then put the matter twelve hours in the annealing furnace, to cool very gradually. Break the crucible, and you will have a fine material for the imitation of Diamonds, which cut and poliſh at the wheel.

DIA'NDRIA *, in botany, a claſs of plants, which have hermaphrodite flowers, with two ſtamina or male parts in each.

* The word is formed of the Greek δὶς twice, and ἀνὴρ male.

Of this claſs of plants are, the jeſſamine, phyllerea, olive, roſemary, &c. See *Plate* XXII. *fig.* 3.

DICTA'MNUS *albus*, baſtard dittany.— The roots of this dittany are pretty large, white, and ſpreading, ſending forth long pinnated leaves, pretty much reſembling the leaves of the aſh-tree: the ſtalks ariſe to be about two feet high, having ſmaller leaves growing alternately on them: the flowers grow at the top of the ſtalks, in ſpikes, of an irregular ſhape, conſiſting of five pretty long and narrow leaves, ſet on like the flowers of violets, of a pale red colour, and ſeveral crooked ſtamina coming out of the middle, and turning upward: the ſeed is black, roundiſh, and ſhining, growing in long horned ſeed veſſels. The whole plant has a ſtrong and ſomewhat reſinous ſcent. It grows wild in ſeveral places of Germany and France; but is only planted with us in gardens, and flowers in June and July. See *Plate* XVIII. *fig.* 2. where *e* is the flower, *f* the ſtamina, *g* the ſeed.

The root is eſteemed a cardiac and alexipharmic, and ſerviceable againſt peſtilential contagions, if it be taken any way. Matthiolus affirms it to be good againſt poiſons, and the bites of venomous animals. Drank to the weight of a drachm, it kills worms in the inteſtines. It is preſcribed in cold diſeaſes of the uterus; for it provokes urine and the menſes, promotes delivery, and brings away the ſecundines, and the dead child, if it be uſed either in a peſſary, or in a ſuffumigation with penny-royal, or taken to the quantity of two drachms in pure wine; it is, alſo, good for the gripes of the belly, and to cleanſe the kidneys of the gravel, and is a uſeful ingredient in potions for internal wounds. The women in Rome uſe the diſtilled water as a coſmetic, and for inflammations of the eyes; which is a plain argument, ſays C. Hoffman, that it cannot be uſed as a ſuccedaneum to the true dittany; but, ſince it is bitter and acrimonious, ſays Ray, I ſee no reaſon why it ſhould not be effectual for the ſame purpoſes as this plant. The pods and flowers excite an itching by their contact, and, in hot countries, exulcerate the ſkin: the plant varies with reſpect to its flower, which is ſometimes white. *Raii Hiſt. Plant.*

The whole plant has a moſt fragrant ſmell, abounding with oil: the flowers and ſtalks are aromatic, balſamic, and ſweet; whence it is reckoned among balſamic and vulnerary herbs. This ſpecies may be had in all the ſhops: it has a balſamic ſmell, and is very ſweet and fragrant in all its parts: the bark is much commended for facilitating delivery, and purging the lochia; and, on account of its intenſe bitterneſs, is preſcribed againſt worms: the ſeeds, leaves, and roots, are uſed in the ſhops; and the plant, for want of the true dittany, ſupplies its place in the Theriaca Andromachi: the conſerve of the flowers, by its aſtringent virtue, corroborates the ſtomach and inteſtines. *Hiſt. Plant. aſcribed to Boerhaave.*

DIDYNA'MIA *, in botany, a claſs of plants, whoſe flowers have two of their male parts or ſtamina of greater efficacy in the action of impregnation of the ſeeds than the others: they are known by the two efficacious ſtamina being always much longer than the others.

* The word is formed of the Greek, δὶς twice, and δύναμις power or efficacy.

Of this claſs of plants are thyme, lavender, baſil, &c.

DI'GGING, in minerology, a term appropriated by the miners, to expreſs that penetrating into the earth, where they have the ore before them, and every ſtroke of the tools turns to account. They appropriated the word to this ſenſe, expreſſing the random openings, which they make in ſearch of mines, by the word hatching, or eſſay-hatching. See the article *Tracing of* Mines.

When the eſſay-hatches have been opened ſo long, that the orifice of the mine or load is found, the opening which has led to it, loſes its name of eſſay-hatch, and is called a ſhaft or metal-hatch; this is to be ſunk down about a fathom, and then they leave a ſquare ſpace, called a ſhamble, and ſo continue ſinking from caſt to caſt; that is, as high as a man can conveniently throw up the ore with a ſhovel, till the load is found to grow ſmall, or elſe to degenerate into ſome unprofitable ſubſtance, or weed, as they metaphorically expreſs it. The degeneracy of the ore is ſoon perceived, by the finding mundic or marchaſite growing more plentiful among it. This is a ſulphureous mineral, of a yellow, whitiſh, or greeniſh colour, and is very troubleſome to the Corniſh miners. The other unprofitable ſubſtance found in the place of the ore, or mixed in large quantities with it, where it degenerates, are daze, which is white, black, or yellowiſh; iron mould, which is black or ruſty; caul, which is red; gliſter, which is blood-red, or black, is alſo another degeneracy of the ore. In this caſe, they begin to drive either eaſt or weſt, as the goodneſs of the land, or the convenience of the hill, unite. The drift or opening, on this occaſion, is three feet over, and ſeven feet high, ſo that a man may conveniently ſtand and work: but in caſe the land is not broad enough of itſelf, as ſome are ſcarce half a foot; then they break down the deads, firſt on the north ſide of the lands, for the greater conveniency of the right arm working, and then they begin to rip the load itſelf; by the term deads, they mean that part of the ſhelf, which contains no metal, but incloſes the load or vein as a wall between two rocks.

The inſtruments commonly uſed in mines with us, and that ſerve for ripping the lands, are the beele, or, as it is called in Cornwall, the tubber. This is a weapon of eight or ten pounds weight; well ſteeled and ſharpened at each end, ending in a point each way, and having a hole in the middle:

this will laſt half a year, but muſt be new ſharpened every fortnight. The ſecond inſtrument is a ſledge; this is uſually made from ten to twenty pounds weight, and will laſt ſeven years, if new ordered once in three or four months. Beſides theſe, they have gadds, or wedges; theſe are of about two pounds weight; they are made four-ſquare, and well ſteeled at the point, and they muſt have ladders and wheel-barrows to carry the deads and the ore out of the adits to the ſhambles. The general proportion of the workmen in Cornwall is this: two ſhovel-men, and three beele-men in a drift; theſe are as many as the drift will contain without ſtanding in one another's way. The beele-men rip the deads and the ore, and the ſhovel-men carry it off and land it, by caſting it up from one of the ſhambles to another all the way up; in ſome places they ſave the trouble of this caſting it to the ſhambles by a winder and two buckets; theſe are ſo contrived, that one goes up as the other comes down, and they are filled and emptied with great eaſe. *Phil. Tranſ.* N°. 69.

DIGE'STION, in chemiſtry *(Dict.)*— The chemiſts of late years have too much given into the more elaborate and forced proceſſes, and neglected the more natural and eaſy ones. Among theſe latter is Digeſtion; a proceſs ſo eaſy, that it requires ſcarce any quality in the operator but patience, and yet will do ſuch things, as all the elaborate proceſſes of that art can never arrive at without it. There is ſcarce a proceſs that has more puzzled the chemiſts of an age or two ago, than the volatalizing ſalt of tartar; yet Langelot aſſures us, that, after uſing all the caution in the common proceſſes that an earneſt deſire of ſucceſs could inſpire him with, he failed in them all, till, trying the effect of a long Digeſtion, he ſucceeded ſo well in the firſt attempt, that he converted almoſt the whole ſalt into a pure white volatile ſubſtance, leaving only a few earthy fæces behind.

Another great uſe of Digeſtion is, the duly preparing the eſſences of mineral ſulphurs; the ſtony ſea plants, which greatly reſemble the nature of foſſils, are alſo better treated by this proceſs than by any other; tartariſed ſpirit of wine receiving a very high tincture from red-coral, after a long Digeſtion, in any diſtilled vegetable oil, though it will not in the common way be at all coloured by it. *Philoſ. Tranſ.* N°. 87.

DI'GITAL *Arithmetic*, is a very ancient, as well as natural art; for this way of reckoning by the fingers ſeems to have been inſtituted by nature, which has given us this expedient as more eaſy than any of the reſt. The fingers are limited to ten, which is a myſterious number, and repreſents any thing that is moſt perfect and compleat: thus we plight our truth to one another, by joining our two right-hands together.

That Digital arithmetic is very ancient, is certain from Nicarthus, who, in a Greek epigram, tells us of an old man, who began again to reckon his years upon his left-hand. St. Jerom informs us, as to this matter, that the number of 100 was carried on from the left-hand to the right, and was reckoned upon the ſame fingers, but not upon the ſame hand; upon which account, Juvenal, ſpeaking of the happy old age of Neſtor, tells us, that he reckoned hitherto the number of his years upon his right-hand.

Numa erected a ſtatue of Janus, according to the relation of Pliny, whoſe fingers of its right-hand were ſo diſpoſed, as to ſignify the number 300, the thumb and fore-finger ſtanding out at full length, while the other three were bended towards the palm of the hand, and the fingers of the left-hand; ſignified fifty-five, the thumb and middle-finger being bended inwards, while the three others ſtood ſtraight. Beda treats of the ſame thing in the firſt book of the Nature of Things, but after a different manner.

It will not be impertinent to our preſent ſubject to relate a diſcourſe, which Francis the Firſt had one day at dinner, as it is ſet down by Viginere.

A diſcourſe was begun in praiſe of Auguſtus, whoſe cuſtom it was to keep always in his chamber two great regiſters; one, in which were entered the receipts; and the other, in which were the expences of ſo vaſt an empire. ' As to myſelf, ſaid the king, I have likewiſe two regiſters which I never part with night nor day, viz. my two hands, whereof the left repreſents to me my receipts; for the thumb, which is the ſtrongeſt of all the fingers, ſignifies my demains, which is alſo the moſt ſolid and lawful revenue a good prince can have; the fore-finger ſignifies my aids and ſubſidies; the the middle-finger, which is longeſt, denotes the taxes; the finger next to it, the caſual forfeitures; and, laſtly, the little-finger, the ſalt and exciſe. The right-hand repreſents to me my expences in general; the thumb ſignifies the maintenance of my houſe, the ſalaries of my menial ſervants, the great and little equerries, and the treaſury; the fore-finger ſignifies the fund reſerved for the neceſſities of the ſtate; the middle-finger, a fund for the armies by land; the ring-finger or the fourth, the payment of all officers of the kingdom, and particularly of the judges in the courts of juſtice, which I ought to adminiſter gratis to my ſubjects; and the little-finger, a fund for the armies by ſea'.

Now, if we reflect upon this way of counting, we may eaſily underſtand that it had its original only from hence, that men, having begun at firſt to reckon upon the fingers, they counted till it came to five upon one hand, and then, having added the other to that number, they made of them both ten, which is the double of the former; and this is the true reaſon why the progreſſion in theſe numbers is always from one to five, and then from five to ten.

All the Roman figures themſelves are alſo owing to the ſame original. For what can be more natural than to ſay, that the I is the ſame thing, as if a man ſhew one, by holding forth one finger only; and that the figure V is the ſame thing, as if a man, catching the three middle fingers, ſhould hold forth only the little-finger and the thumb, as containing the whole hand; and that, if you add to theſe the ſame two fingers of the other hand, joined to either at the top, they will make as it were two V's, whereof one will run acroſs under the other, and ſo make an X, which ſignifies ten.

There is a Digital arithmetic ſtill practiſed by ſome, and often found uſeful: it is the rule of multiplication performed by the fingers, which we ſhall always find ready at hand on all occaſions, when through ſtudy, long calculations, &c. our mind may ſometimes be ſo diſturbed as to be liable to make the greateſt miſtake. The rule is this:

Double down of one hand ſo many fingers as the multiplicant wants digits of ten; do the like with the other hand by the multiplier, and all the fingers that are left ſtanding will be tens, and the fingers doubled down digits to be multiplied, the one hand by the other; which will be eaſily done as the product will be but ſmall.

Example. Suppoſe the numbers 7 times 8
Double of
the right-hand 3, of the left 2, twice 3 — 6.
ſtanding 2 —— 3 —— 50.
56.

Again, 9 times 9.
Double down
right hand 1 left 1 —— 1
ſtanding 4 — 4 —— 80
81.

The like rule may alſo by a little alteration be made to ſerve for multiplying by 12, &c.

DIGITA'LIS, *fox-glove*, in botany, a genus of plants, whoſe characters are:

The leaves are produced alternately on the branches: the cup of the flower conſiſts of one leaf, which is divided into ſix ample long ſegments: the flower conſiſts of one leaf, is tubuloſe and compreſſed, and a little reflexed at the brim: theſe flowers are diſpoſed in a long ſpike, and always grow upon one ſide of the ſtalk: the ovary of the flower becomes a roundiſh fruit, which ends in a point, and opens in the middle: has two cells, in which are contained many ſmall ſeeds.

M. Tournefort has enumerated twenty ſpecies of Digitalis, and Mr. Miller ten.

Theſe plants may all be propagated by ſowing their ſeeds in March, in a freſh ſoil, that is not too ſtiff; and, when the plants come up, they ſhould be tranſplanted into beds ſix inches aſunder, where they may remain until the Michaelmas following, obſerving to keep them clear from weeds; then you may tranſplant them into the middle of large borders, intermixing the variety of colours at regular diſtances amongſt flowers of the ſame growth. In May following theſe will produce their flowers, which will continue near a month in beauty, if the ſeaſon is not too hot and dry, and in Auguſt the ſeeds will ripen; which, if permitted to fall to the ground, will come up in great plenty, and abundantly ſtock the garden with plants.

DILI'CTUM, a term uſed by Agricola, to expreſs a brine, made by pouring water upon ſand, ſtones, earth, &c. that had been before ſtrongly impregnated with ſea-ſalt; from this brine, a ſalt, for the uſe of the table, was made by evaporation in his time, and is ſo ſtill in many parts of the world. At Junthall in Germany they have a ſalt work of this kind, where they make at the rate of eight hundred loaves of ſalt in a week, each loaf weighing four hundred weight.

The ſand of the ſea is alſo in ſome places uſed as a ſubſtance to make ſalt from. There are works of this kind on the coaſt of Normandy, where a brine is made from the ſand, and evaporated at ſo ſmall an expence, that it is worth their while to export it to England and other countries. We had formerly ſome works of this kind in England, as at Wirewater, and ſome other places in Lancaſhire and Weſtmoreland, where, pit coal being ſcarce, they boiled it with turf fires; but ſince the works of the brine-ſalt, and purified rock-ſalt, have ſucceeded ſo happily with us: theſe are all laid aſide, except ſome inconſiderable ones in Lancaſhire. Theſe are near Ulverſtone, and the ſand from which they make their brine there, is extracted from the flat ſandy ſhores, which are only covered with water in the higheſt tides, which flow two or three days before, and three or four days after the new and full moon; for thoſe parts of the ſand which are overflowed by the neap-tides are ſeldom ſufficiently dried, and are at too great a diſtance from the ſalterns.

This ſand they collect in flats and waſhes, or in parts of the ſands, which are perfectly plain, and in little hollows, where the ſea-water is left, and either ſinks into the ſand, or is dried up by the heat of the ſun, and leaves the ſalt behind. This is only collected in dry weather, and at ſuch times when the ſea-water has been exhaled from it by the ſun, and there have been no rains afterwards to waſh the ſalt out of it. They dig a pit adjoining to the ſaltern eighteen feet long, three broad, and one deep; the bottom of this they cover with ſtraw, or ruſhes, and then fill it up with ſand collected in this manner; they pour upon this ſea-water, and this, imbibing the ſalt from the ſand, is filtred through the ſtraw or ruſhes, and runs clear through a pipe at the bottom. *Brownrig of Salt*, N°. 136.

DIMI′NISHED *Interval*, is applied to ſuch as are leſſened by a ſemitone minor. Thus from C♮ to E, being a third minor, if E be lowered by a ſemitone minor, we ſhall have E*b*, and then from C♮ to E*b* is called a Diminiſhed third, in the language of practical muſicians, and occurs frequently in their works. But, ſtrictly ſpeaking, in this caſe, the note E muſt be lowered more than a ſemitone minor.

DIMINU′TION *of a column*, in architecture.— *Plate* IV. *fig.* 6, in the Dictionary, repreſents an upright ſection of a column, in order to ſhew its Diminution, which decreaſes in proportion as the diameters *g g*, *f f*, *e e*, *d d*, *c c*, *b b*, *a a*.

DIOCTAHÆ′DRIA, in natural hiſtory, the name of a genus of ſpars. The word is derived from the Greek δὶς twice, ὀκτὼ eight, and ἕδρα a ſide. The bodies of this genus are ſpars compoſed of twice eight planes, or two octangular pyramids joined baſe to baſe, without any intermediate column. Of this genus there are three known ſpecies. 1. One with long pyramids, which is found in the mines of Rammelſberg in the Hartz foreſt in Germany, and no where elſe, ſo far as is yet known. 2. One with ſhort and ſharp-pointed pyramids found in many of the mines of the Hartz foreſt, and ſometimes tinged with the colours of the gems; and 3. One with ſhort and obtuſe pyramids, which is found in the mines of Cornwal, and lodged in the cetton-ſtone of Rutland. *Hill's Hiſt. of Foſſils.*

DIOE′CIA *, in botany, a claſs of plants which have the male and female parts, not in the ſame, but in different flowers, and thoſe not on the ſame individual, but on different plants of the ſame ſpecies; either of which, though they are called the male and female plants, from their thus carrying the ſeparate male and female flowers, might have ariſen from the ſame ſeed.

* The word is formed of the Greek δὶς twice, and οἶκος habitation. Among the plants of this claſs, are the willow, miſletoe, hemp, ſpinach, &c.

DI′PPING, in minerology, a term uſed to expreſs the deviation of the veins of ore from that regular and ſtraight line, in which they uſually run. A great deal of the ſkill of the miners conſiſts in the underſtanding this Dipping of the veins, and knowing how to manage it. In Cornwal they have this general rule to guide them in this reſpect: moſt of their tin-loads, which run from eaſt to weſt, conſtantly dip towards the north. Sometimes they underlie; that is, they ſlope down toward the north three feet in eight perpendicular. This muſt carefully be obſerved by the miners, that they may exactly know where to make their air ſhafts, when occaſion requires; yet, in the higher mountains of Dartmaer there are ſome conſiderable loads, which run north and ſouth; theſe always underlie toward the eaſt.

Four or five loads may run nearly parallel to each other in the ſame hill; and yet, which is rare, they may meet all together in one hatch, as it were a knot, which well tins the place, and ſo ſeparate again, and keep their former diſtances. *Philoſ. Tranſ.* N°. 69.

DI′PSACUS, *the teaſel*, in botany, a genus of plants, whoſe characters are:

The whole flower hath no proper calyx, but leaves repreſenting the perianthium encompaſſing the bottom of the head; the little flowers, which are produced ſingly from between the ſcales, are collected into an head ſomewhat like a bee-hive: theſe are ſucceeded by longiſh four-cornered ſeeds.

There are four ſpecies of this plant. But the fourth ſort only is cultivated for uſe, which is called carduus fullorum, or fullonum, being of ſingular uſe in raiſing the knap upon woollen cloth; for which purpoſe there are great quantities of this plant cultivated in the weſt country.

This plant is propagated by ſowing the ſeed in March, upon a ſoil that has been well dried: about one peck of this ſeed will ſow an acre; for the plants ſhould have room to grow, otherwiſe the heads will not be ſo large, nor in ſo great quantity. When the plants are come up, you muſt hoe them in the ſame manner as is practiſed for turnips, cutting down all the weeds, and ſingling out the plants to about ſix or eight inches diſtance; and, as the plants advance, and the weeds begin to grow again, you muſt hoe them a ſecond time, cutting out the plants to a wider diſtance; for they ſhould be, at laſt, left at leaſt a foot aſunder: and you ſhould be particularly careful to clear them from weeds, eſpecially the firſt ſummer; for, when the plants have ſpread ſo as to cover the ſurface of the ground, the weeds will not ſo readily grow between them. The ſecond year after ſowing, the plants will ſhoot up to heads, which will be fit to cut about the beginning of Auguſt; at which time they ſhould be cut, and tied up in bunches, ſetting them in the ſun, if the weather be fair; but if not, they muſt be ſet in rooms to dry them. The common produce is about a hundred and ſixty bundles or ſtaves upon an acre, which they ſell for about one ſhilling a ſtave. Some people ſow caraway and other ſeeds amongſt their teaſels: but this is not a good method, for one ſpoils the other; nor can you ſo eaſily clear them from weeds, as when alone.

The leaves of the common wild teaſel dried, and given in powder, or infuſion, are a very powerful remedy againſt flatus's and crudities of the ſtomach. There is alſo another, though ſomewhat whimſical uſe, for which this plant is become famous among the country people. If the heads are opened longitudinally about September or October, there is generally found a ſmall worm in them: one of theſe only is found in each head, whence naturaliſts have named it the vermis ſolitarius Dipſaci. They collect three, five, or ſeven of thoſe, always obſerving to make it an odd number, and, ſealing them up in a quill, give them to be worn as an amulet for the cure of agues. Faith has wrought ſo many cures for them, that they are in many parts of the kingdom of much higher reputation than the bark.

DIRE′CTOR, in ſurgery, a grooved probe, to direct the edge of the knife or ſciſſars in opening ſinus's or fiſtula's, that, by this means, the ſubjacent veſſels, nerves, and tendons, may remain unhurt. Sometimes one end is made in form of a ſpoon, to contain powders to ſprinkle upon wounds or ulcers. Sometimes alſo it is forked at the end to divide the frænum of the tongue. *Heiſter's Surg. Introd.*

DISDIACLA′STIC *Cryſtal*, in natural hiſtory, a name given by Bartholine, and ſome others, to the pellucid foſſil ſubſtance, more uſually called, from the place whence it was firſt brought, Iſland cryſtal; though properly it was no cryſtal at all, but a fine pellucid ſpar, called by Dr. Hill, from its ſhape, parallelopipedum.

This cryſtal is met with in other places beſides Iſland, but not ſo plentifully. It is there found in great abundance all over the country, but is particularly plentiful in a mountain, not far from a bay of Roeziford, where the fineſt and moſt pellucid pieces are found on digging. The mountain lies in 65 degrees of latitude, and has its whole outſide made up of it; but, though this makes a very bright and glittering appearance, it is not ſo fine as that which lies at a little depth, and is met with on opening the ſurface. This is generally taken up out of the earth in maſſes of a foot long, and its corners are very frequently terminated in theſe large maſſes, by a ſort of cryſtals, very different in figure and quality from the reſt of the maſs. The ſtone itſelf is of a parallelopiped figure; but theſe excreſcences are either ſingle pyramids affixed to columns, like common cryſtal or double pyramids, with or without columns between. The ſtone itſelf is ſoft; theſe are hard, and cut glaſs; the ſtone calcines to lime in the fire, theſe run into glaſs; in ſhort, the ſtone itſelf is true ſpar, and theſe are true cryſtal: beſide theſe, there ſometimes grows out of the end of the larger maſſes a pure and fine aſbeſtus. This likewiſe is the caſe ſometimes in the ſpar, found about Barege in France, and ſhews how nearly together the formation of bodies wholly different from one another may happen. The general figure of the ſtone is parallelopiped, or, as ſome expreſs it, rhomboide; and it retains this, not only while whole, but alſo when broken to pieces; every fragment it naturally falls into, though ever ſo ſmall, being truly of that ſhape. But it is remarkable, that, in ſome places of this mountain, the ſame ſort of matter is found in form of triangular pyramids, all which have the ſame property of the double refraction with the parallelopipeds of the ſame ſubſtance; ſo that the original error of ſuppoſing its qualities owing to its ſhape is refuted by this, as well as by the trials made with other pellucid bodies of the ſame figure, which do not ſhew this remarkable property. *Bartholine de Cryſtal. Iſland. Phil. Tranſ.* N°. 67.

DISH, in mining, is a trough made of wood, about twenty-eight inches long, four inches deep, and ſix inches wide; by which all miners meaſure their ore. If any be taken ſelling their ore, not firſt meaſuring it by the bar-maſter's diſh, and paying the king's duties, the ſeller forfeits his ore, and the buyer forfeits for every ſuch offence forty ſhillings to the lord of the field, or farmer. *Houghton's compl. Miner.*

DISPA′RT, in gunnery, is uſed for the ſetting a mark on the muzzle-ring of a piece of ordnance, or thereabouts; ſo that a right-line taken upon the top of the baſe-ring againſt the touch-hole, by the mark ſet on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing which, is, to take the two diameters of the baſe-ring, and of the place where the Diſpart is to ſtand, and divide the difference between them into two equal parts, one of which will be the length of the Diſpart, which is ſet on the gun with wax or pitch, or faſtened there with a piece of twine or marlin: but an inſtrument may be made to do it to all poſſible nicety.

DISSIPA'TION. Circle of Diſſipation, in optics, is uſed for that circular ſpace upon the retina, which is taken up by one of the extreme pencils of rays iſſuing from an object.

To underſtand which, it is to be obſerved, that when the diſtance of an object from the eye is too ſmall, or too great, for perfect or diſtinct viſion, the rays of each pencil iſſuing from the object cannot be united at a point on the retina, but beyond it, or before they arrive at the retina; conſequently the rays of each pencil will occupy a circular ſpace upon the retina; and this circle is called the circle of Diſſipation, becauſe the rays of a pencil, inſtead of being collected into a central point, are diſſipated all over this circle.

The conſideration of the circles of Diſſipation, formed by the rays coming from the extremities of objects, is of uſe to account for ſeveral curious phænomena of viſion.

DISTE'MPERATURE *of trees.*—Some of theſe are in the tree itſelf, and others in the ſoil and other things about it. Of the laſt kind are weeds, which are of the utmoſt ill conſequence to all ſorts of trees, while young, and ſhould be pulled up by hand after rain: if they are too ſtrong rooted for this, they muſt be dug up; and this will have a double advantage, as the ſtirring the earth about their roots will do the tree a great deal of good. When the trees are grown to a tolerable height, they require no care about weeds, for they kill them with their own droppings. Suckers are another Diſtemperature of trees ariſing from the tree itſelf: they muſt be pulled off, or cut up cloſe to the place where they come out, opening the earth to come at them there. Over much wet often is a very great prejudice to trees, and eſpecially to thoſe kinds which naturally love a dry ſoil. This is to be remedied by cutting drains: and if a drip fret the body of the tree by the head, which will certainly decay it, the place muſt be firſt cut ſmooth, and then ſome loam or clay, mixed well with horſe-dung, is to be applied to the place, which will defend it from miſchief till a new bark is formed over it. All wounds, made in trees in winter, are much harder to cure than thoſe made in ſummer; and for theſe it is proper to add ſome tallow to the mixture of loam and dung.

When trees are bark-bound, which is eaſily ſeen by the unnatural tightneſs and ſtraining of the bark over them, it is to be remedied by cutting through the bark with a knife, from the top to the bottom of the tree. This may ſeem a dangerous remedy to thoſe who have not experienced it, but it never was found to do any injury to trees. It is to be done in February or March; and, if the wound gape very much, it may be filled up with cow-dung, which will defend the tree from injury till it heals. The digging about the root of the tree is a very good practice alſo on this occaſion, and the cutting off the dead or withered branches.

The grubs of beetles, called teredines and coſſi, which get between the bark and the tree, do great miſchief: if the places can be found out where they lie, it is proper to pierce into the bark with a pointed inſtrument upon them, and then to open a ſmall hole below, to let out whatever moiſture may be there. When trees of the fruit kind are burnt up and bliſtered on the bark with hot and dry ſeaſons, and this is followed by a vaſt number of pucerons or tree-lice, which feed on the juices, ſome recommend the boring a large hole in the main root, and pouring in ſome brandy, then ſtopping up the hole with a pin of the ſame wood. The tree ſuffers nothing by this, but the juices are ſo much altered for the preſent by it, that theſe animals do not like them, and conſequently quit their habitation.

If a tree is, by any accident, barked or ſtripped all round, ſo that it cannot grow any longer, the proper method is to cut it off juſt above ſome principal branch; the ſtump muſt be cut off ſlanting, and covered with clay; and the branch will ſoon become the body of a tree in the place of the other: the place where the ſtump is cut off being covered with a bark, in the manner of a tree that is grafted.

Deer and hares, as alſo rabbits, are apt to bark trees, and do them great miſchief. The defence againſt deer is by paling them round, or painting the lower part of the tree; but the firſt is much the better method. The hares and rabbits may be kept off by tying bands of ſtraw round the foot of every tree, as far as they can reach. Evelyn recommends the rubbing them over with human dung made into a ſoft paſte with urine, ſo that it may be laid on with a bruſh; but this is attended with great trouble, as it muſt be renewed after every hard rain. Some uſe tar and lime mixed together, but this always damages the tree more than theſe creatures would have done; and, in general, ſtraw-bands, where any thing is neceſſary, do beſt. *Mortimer's Huſbandry.*

DISTILLA'TION (*Dict.*)—*Simple* DISTILLATION.—Simple Diſtillation is the method of ſeparating and collecting the inflammable ſpirit, clear of all the other parts of fermented liquors, by means of fire and the alembic.

This operation includes not only what in the language of diſtillers is called working from waſh, and the producing of low-wines, or ſpirits of the firſt extraction; but alſo ſimple rectification, or the production of ſimple proof-ſpirit, and ſimple alcohol.

The common ways of charging, working, and managing a ſtill, regulating the fire, &c. are here ſuppoſed to be underſtood: but, in order to improve this operation, and bring it to a truth, ſeveral obſervations and methods are required, beſides thoſe vulgarly known and conſidered.

1. It is remarkable that the action of fermentation works ſuch a change in the body of the tincture or ſolution, as to render it ſeparable, by the action of the fire, into parcels of matter that are ſpecifically different; and of a nature entirely foreign to what, by the ſame means, the liquor would have afforded before fermentation.

2. The ſtill being charged, luted, and brought to work, with a ſoft boiling heat, there firſt comes over a quantity of intenſly pungent, aromatic, nidorous liquor; which, if received into a large proportion of cold water, throws off a copious, eſſential, acrid, or aromatic oil; though the original ſubject were ever ſo cooling, mild, or contrary to a ſpicy nature.

3. This eſſential oil is, by experiment, found to be the principal thing that gives the predominant or peculiar flavour to ſpirits; which are hence, by their taſte and odour, denominated malt-ſpirit, melaſs-ſpirit, cyder-ſpirit, wine-ſpirit, arrack, &c.

4. The fineſt, moſt ſubtile, and moſt efficacious part of this eſſential oil is what comes firſt; the ſucceeding portions growing gradually more ſluggiſh, viſcous, reſinous, nauſeous, and terreſtrial.

5. The ſpirit running in a continued ſtream from the noſe of the worm, being examined at different intervals, will be found greatly to differ from itſelf, both in ſmell and taſte; as changing the nature of its oil, much oftener than, without trial, could have been expected.

6. Beſides this eſſential oil, the ſpirit of the firſt running contains alſo an acid, more or leſs in quantity, and more or leſs pungent, volatile, and ſenſible to the noſe, as the fermentation has been more or leſs continued, or according to the degree of acidity acquired in the operation. And this acid alſo may, along with the aqueous part that riſes with it, be in plenty kept back upon a gentle rectification; though, where the acid is very volatile, ſome part thereof is ever apt to riſe along with the totally inflammable ſpirit, ſo as to give it a vinoſity, not unlike a dilute ſpiritus nitri dulcis.

7. It is manifeſt, both a priori, and a poſteriori, that brandies are a compound, conſiſting of at leaſt four different parts; viz. totally inflammable ſpirit, eſſential oil, acid, and water.

8. And as theſe ſeveral parts do not differ greatly in their ſpecific gravity, or degree of volatility; a ſtrong, tumultuary, boiling heat will drive them all over promiſcuouſly together.

9. As, at the beginning of the operation, there uſually riſes more totally inflammable ſpirit than water; ſo, after ſome time, the ſtream contains more water than inflammable ſpirit: and this gives the foundation for what they call low-wines, proof-ſpirit, and faints: low-wines being the whole quantity of ſpirit, weak and ſmall mixed together; proof-ſpirit, a mixture of about equal parts of totally inflammable ſpirit and water; but faints all that runs after the proof is fallen off, where the proportion of water is much greater than of the totally inflammable ſpirit.

10. Theſe low-wines are commonly rediſtilled, to make what they call proof-ſpirit, by leaving out their ſuperfluous phlegm: and in the ſame manner may the faints alſo be ſerved; by which means they are ſuppoſed reducible to a certain ſtandard, or ſtated merchantable degree of ſtrength, called proof.

11. When once the ſtream falls off from proof, the liquor contains a groſſer eſſential oil, which, though not ſo communicative as the firſt, never fails to impregnate the whole with its flavour.

12. Hence all common ſpirits or brandies are really dilute quinteſſences, as the chemiſts call them; that is, a mixture of the ardent ſpirit and eſſential oil of the concrete; only here let down to proof with water, and impregnated with a ſmall proportion of a volatile acid.

13. When the proof falls off, the liquor grows milky; that is, the oil, which before remained diſſolved by the ſtrong ſpirit, is ſet looſe from it by an over-proportion of water; and may now be commodiouſly ſeparated by the chemical glaſs fitted for that purpoſe.

14. It is cuſtomary to continue the Diſtillation ſo long as the liquor that runs will take fire at the flame of a candle, applied to the vapour of a ſmall quantity thrown upon the hot ſtill-head: and indeed there is a certain point of time, when the ſpirit obtained will not pay the fire and labour; viz. when not above a twelfth or fourteenth part of totally inflammable ſpirit comes over in the water.

15. With other views however, as particularly the obtaining a more fixed vegetable acid, and a groſſer eſſential oil, the operation might be continued, till the danger of an empyreuma comes on.

16. The matter remaining in the ſtill, after the operation is ended, has ſeveral uſes; and might in particular be made to afford Mr. Boyle's acid ſpirit of wine.

17. When by repeated Diſtillation, without addition, any ſpirit is entirely freed of its aqueous parts; it is then called totally inflammable ſpirit, alcohol, or perfect ſpirit of wine.

Upon theſe general obſervations may be formed ſome new practical methods for the improvement or perfection of Diſtillation.

1. And, firſt, as the fermented liquor affords different parcels of matter, of different ſpecific gravities or degrees of volatility; when a pure ſeparation of the lighteſt part is intended, the fire ſhould never riſe to a boiling heat, which jumbles and confounds all the parts together, rather than ſeparates them.

In the chemical way this rule may be practiſed to advantage; but great difficulties will attend the obſervance of it in the common buſineſs of Diſtillation.

To render it more commodiouſly practicable, theſe two methods are propoſed; viz. 1. Either to increaſe the height of the ſtill above the liquor; or, 2. To work in balneo mariæ.

1. By running the ſtill-head to the height of two or three yards above the liquor, it has been expected that a boiling heat would carry up the pure inflammable ſpirit, without any great mixture of phlegm, and yet continue to run a full ſtream. But this does not perfectly anſwer upon experience; though the thing is ſtill improveable, and has been attempted by the addition of a tall ſerpentine pipe, for the ſpirit to creep through and depoſit the phlegm, as it aſcends. And thus indeed the ſpirit may in a good meaſure be dephlegmed: but the great objection againſt this method, is, that it requires a boiling heat, which in the caſe of ſimple ſeparatory Diſtillation ſhould never be uſed: becauſe it throws up ſo much oil, as to foul at leaſt the breaſt and head of the ſtill and bottom of the pipe; whence it infects the ſubſequent ſpirit that waſhes them.

2. The other way by the balneum mariæ is preferable on many accounts; ſo that, by a proper regulation, we might hope for a pure ſimple ſpirit almoſt at the firſt extraction. Such an expectation will not appear unreaſonable to one who has ſeen what ſpirit is obtainable even in the common method of the balneum mariæ, where the water of the bath is made to boil with the utmoſt violence, and compared it with another parcel of ſpirit, prepared from the ſame fermented liquor in the common way of the hot ſtill. Indeed the difficulties of working from waſh in this way of the balneum mariæ are very conſiderable; eſpecially if cheapneſs and diſpatch be the principal thing in view. For at once to work both quick and perfect ſeems hitherto impracticable in the buſineſs of Diſtillation. The whole affair has a great dependence upon a ſuitable engine and apparatus. And perhaps a large or long rectangular boiler might commodiouſly be turned into the balneum we ſpeak of; and fitted with a number of low alembics, that ſhould all work, day and night, with a little fire and leſs attendance. The contrivance in general is obvious; but to avoid encumberance and loſs is the principal difficulty. A large number of veſſels or alembics is abſolutely neceſſary; but no worms and refrigeratories are required. And by an eaſy apparatus the whole number of the ſmall veſſels may be charged with nearly as much eaſe as a large one. When the operation proceeds ſo ſlow as not to quit the coſt, all the bottoms may be emptied into a common ſtill, and worked in the uſual way, for a coarſer commodity, that may afterwards be rectified at pleaſure. The heat of the balneum ſhould only be tepid, or at moſt but ſcalding.

By this means a ſurprizingly cool and almoſt inſipid ſpirit has been obtained, at the very firſt extraction, though mixed with a conſiderable proportion of phlegm; ſo that it needed no manner of rectification to fit it even for the finer uſes. The method, therefore, at leaſt is curious, and in ſome caſes uſeful, though it ſhould never be brought into a general practice. And indeed a thing of this nature deſerves to be kept in curious hands, as by a due application it may furniſh productions fit for the cloſets of princes.

In the common method of ſimple Diſtillation all proper means ſhould be uſed to prevent the groſſer eſſential oil from getting into the ſpirit. Theſe means have regard, 1. To the preparation of the fermented liquor: 2. The regulation of the fire: 3. The uſe of percolation: and, 4. To the keeping out the faints.

1. For the manner of preparing the fermented liquor, and clearing it of its groſs oleaginous fæces, before it is committed to the ſtill, ſee BREWING and FERMENTATION.

We ſhall only add that the liquor, thus fined, ſhould not poſſeſs above two thirds of the ſtill, that the groſſer oleaginous matter may the better be kept down, and the whole have free ſcope to work, riſe, and purge itſelf in the operation: which it never can do, if it wants room. 2. As in this Diſtillation a boiling heat is neceſſary, care ſhould be had that the liquor only boil gently and uniformly, without raiſing the fire by ſtarts; which never fails to throw over the coarſe oil in plenty, and foul the ſpirit: ſo that, if poſſible, the operation ſhould be begun and ended with the ſame uniform and invariable degree of heat.

3. The groſſer oil may in ſome degree be kept from mixing amongſt the ſpirit, by ſtretching a piece of very thick woolly flannel over the mouth of the ſtill, or by ſuffering the ſtream to paſs through ſuch a flannel, ſeveral times doubled and placed at the noſe of the worm: and it is ſurprizing what a quantity of groſs, offenſive, fœtid, unctuous matter may thus be collected, eſpecially in the Diſtillation of malt ſpirits.

4. The faints ſhould never be ſuffered to run among the finer ſpirit, on account of the large quantity of this groſs oil, or greaſy matter they contain; eſpecially if the fire be increaſed, as it uſually is to bring them over: though ſome, who value proof more than purity, will uſually have a doſe thereof to give their goods a face. Which prevailing fondneſs for a ſtrong hanging proof, however abſurd in itſelf, is one principal reaſon why the common malt-ſpirits are no cleaner.

This caution of keeping out the faints ſhould likewiſe extend to the keeping out a little of the firſt running, which too, in this operation, is a kind of faints; as containing largely of the oil of the concrete, though much more ſubtile than that in the proper faints. A farther regard muſt alſo be had to the ſtill-head and worm, through which the faints have once paſſed; as theſe all along depoſit ſuch a copious infecting oil, as gives a predominant flavour to an almoſt incredible quantity of pure ſpirit. Nor is this oil eaſily diſlodged from the pores of the ſpongy metal, by running hot water through the worm; but either requires a quantity of boiling lixivium, or elſe ſome highly rectified ſpirit to ſtand in the worm all night, to imbibe, diſſolve, and carry it away. And, if theſe cautions are carefully obſerved, a much better and purer ſpirit may be obtained after the common method, than thoſe who have not tried it would expect.

When, now the faints have run off, and it becomes unprofitable to continue the operation longer, the original maſs of fermented liquor is ſeparated into ſtill-bottoms and low wines, or ſpirit of the firſt extraction. The ſeveral parcels of ſpirituous liquor, come over, are then uſually mixed together, and thrown into another ſtill, to be rectified into what they call a ſaleable commodity, or proof goods.

This operation is a ſecond ſpecies of ſimple Diſtillation, which, without any addition, tends to cleanſe the whole body of the ſpirit from the groſſer oil of the faints, provided the work be carried on in a mild and gentle manner: otherwiſe it ſerves but to keep back the ſuperfluous phlegm that ſunk the ſpirit much below proof, rather than to improve its quality.

Combinatory DISTILLATION, a term introduced into uſe by Dr. Shaw, in his Eſſay on Diſtillation, to expreſs that ſort of rectification of diſtilled ſpirits which is done with additions, and which he otherwiſe calls improper rectification, by way of diſtinction from that proper rectification, which is only the method of reducing a ſpirit to its utmoſt degree of purity and perfection.

In the combinatory Diſtillation many ingredients are added, in order to rectify the ſpirit, as the diſtillers expreſs it; and ſome parts of theſe actually come over and mix themſelves along with the ſpirit ſo intimately, as not to be ſeparable again without great difficulty. This is done with a deſign to alter, improve, or aboliſh the natural flavour of the ſpirit, but, inſtead of rectifying it, they only obſcure and pervert its true qualities. In the buſineſs of rectification, properly ſo called, of the malt ſpirit, all that is neceſſary is the rediſtilling the low wines procured from the waſh; the again diſtilling over the ſpirit thus obtained, and called proof-ſpirit, into a totally inflammable liquor called alcohol. This is done by the common proceſſes, only taking care not to increaſe the fire by ſudden ſpurts, ſo as to raiſe the oil with the ſpirit, which, if once mixed, will not be eaſily ſeparated again, and ſcarce ever perfectly, whatever care is uſed. *Shaw's Eſſay on Diſtillery.*

The methods of combinatory rectification, on the other hand, are very numerous, every diſtiller having his peculiar noſtrum about it. Malt ſpirit is the general ſubject of this proceſs, and the means uſed to rectify it on this plan may be reduced to three heads: 1. That by fixed alkaline ſalts alone. 2. That by fixed alkaline ſalts and acid ſpirits. And, 3. That by ſaline bodies and flavouring additions. The general method is that by fixed alkaline ſalts alone; but it is ſurpriſing to ſee in how careleſs and ſlovenly a manner this is done by the generality of our diſtillers, though we are allowed to excel all other nations in it. The effect of this operation, when carefully performed, is to attenuate and thin the ſpirit, and to keep back a part of its groſs and fœtid oil, and ſo far to alter the part of the oil which comes over, as ſcarce to leave the ſpirit diſtinguiſhable for a malt ſpirit.

This end is greatly promoted by a prudent and ſteady management of the fire, and by leaving out the faints; but this is a thing our diſtillers never attend to: they hurry over the operation, working the ſtill in its full force, and by this means raiſe and carry over the oil, though the whole buſineſs of the proceſs is to keep it back; and they even ſuffer the fulſome bitter oil, made into a kind of liquid ſoap with the ſalt in this proceſs, to run among the ſpirit with the faints; by this the whole intent of the proceſs is fruſtrated, and the ſpirit rendered much harder to clean than it was before.

This operation is uſually performed on proof-ſpirit, and the quantity allowed is from eight to fourteen pounds of ſalt of tartar, fixed nitre, pot-aſh, or more commonly calcined tartar, to the piece. The tartar, being only roaſted to a blackneſs in this laſt proceſs, is ſold under the abſurd notion of a vinous ſalt, and the dealers will often praiſe the vinoſity of their ſpirit, becauſe diſtilled from this ſalt; but the truth is, that this ſalt never fails to give, inſtead of a vinoſity, a ſaponaceous, urinous, or lixivial taſte and ſmell. This is the great misfortune that attends the method of rectifying by means of fixed ſalt, for they all of them become volatile in part during the operation; and this volatile portion paſſes over the helm with the ſpirit, and impregnates it, uniting itſelf alſo with that portion of oil yet retained in the ſpirit, and much more firmly combining it and the ſpirit together than they were before; ſo that in reality the ſpirit thus rectified is no other than an alkaline or tartariſed ſpirit, as the chemiſts call it; a thing extremely different from a true vinous ſpirit.

This method therefore, though it were practiſed to the utmoſt perfection, would never do what was intended by it, but would alter inſtead of rectifying the ſpirit. Hence there appears the neceſſity of ſome acid to deaden the force of the alkali thus uſed in the rectification. The neceſſity of this gave occaſion to the method of mixing acids and alkalies together for theſe purpoſes. The acids uſed by our diſtillers on this occaſion are thoſe of the mineral kingdom, by reaſon of their cheapneſs; and the moſt common in uſe among them are oil of vitriol, ſpirit of nitre, oil of ſulphur, and the like. There is ſome choice however to be made of the ſpirits according to the greater or leſſer foulneſs and need of rectification, and they muſt not only be well proportioned, but carefully introduced, and regularly mixed; and indeed, without ſome ſkill and judgment in the management of the corroſives, no diſtiller ought to attempt to meddle with them.

Theſe ſtrong and violent acids, at beſt, are not ſo well adapted to the work as the milder ones, particularly the ſulphureous ſpirit of vitriol, which comes over in the rectification of the oil; to this may be added the common ſpiritus nitri dulcis, and Mr. Boyle's acid ſpirit of wine well prepared.

Some of our rectifiers inſtead of the fixed ſalts uſe quick-lime, which cleanſes and dephlegmates conſiderably: but this method requires the aſſiſtance of acids alſo afterwards, to take off not only the alkaline diſpoſition, but alſo the ſtinking flavour it leaves behind it. Some alſo uſe chalk, virgin earth calcined, and burnt animals bones. Theſe are of conſiderable uſe in the rectifying brandy without rendering the ſpirit any more unfit for the purpoſe of the compounders than before, or requiring much acid afterwards.

The great art of uſing the flavouring ingredients in rectification is, the proper admixture of ſalts in the operation, for, without theſe, the flavours added by this means do very little. The ſalts uſed on this occaſion are either the fixed alkalies, as pot-aſh and calcined tartar, or decrepitated common ſalt, or calcined vitriol, alum, or ſandiver. The flavouring ingredient is to be applied afterwards, and the whole quantity of the ſpirit either drawn over again, or not, as the occaſion and nature of the addition require. But theſe ſaline bodies perform ſo very little, that the ſpirit is uſually left impregnated with a flavour from its own oil, which is but badly hidden, or overpowered by the other ingredients. The moſt common flavourers, as they call them, are theſe, mace, orrice root, parſnip, artichoak, rhodium, raiſin-ſtalks, damaſk-roſes, wine-lees, rape or grape-huſks, and the oil of wine. The laſt of theſe is infinitely preferable to all the others, but is not ſo well known. Theſe and the like ingredients, judiciouſly mixed, will, when the ſpirit is very well purified firſt, give the flavour of foreign brandies with ſome tolerable exactneſs; but if this is not attained, their flavour will be loſt in the original one, and the general taſte reſulting from the whole will be like nothing at all. The ultimate perfection, aimed at in all the proceſſes of combinatory Diſtillation, is the depurating the Engliſh malt ſpirit at one operation, ſo as to render it taſtleſs and inodorous, and yet vinous; or elſe to make it reſemble the French brandy, arrac, or ſome other low-flavoured vinous ſpirits.

This is certainly practicable, though not uſually practiſed to the perfection that it might be: the principal thing, to be endeavoured after, is the obtaining a taſteleſs ſpirit, capable of receiving any impreſſion, and then the buſineſs of flavouring is eaſy. The method of rectifying, by fixed alkaline ſalts, is capable of great improvement, as by ſteeping the ſpirit firſt brought near to the ſtate of alcohol, upon a well dried ſalt of tartar, or any other cheaper, but pure fixed alkali; by this means, it will be almoſt totally freed of its oil without volatilizing much of the ſalt, as it does in the way of Diſtillation; by this means a weak tincture of ſalt of tartar may be procured, and an acid added to this, to take off the effects of the alkali in the ſpirit; the whole is then to be diſtilled; and, the fire being well managed, a very clean ſpirit will be thus procured at one operation, ſuch as can no way elſe be obtained at once.

The uſe of the compound neutral ſalts in rectification ſeems not yet to be ſufficiently known; what is meant by theſe ſalts is a fixed alkaline ſalt ſaturated with an acid one. Such a ſalt has indeed been expected from the caput mortuum, or white ſaline cake, remaining upon Diſtillation of the ſpirit of nitre with oil of vitriol; but it proves too hard, ſtony, and inſoluble, to be of any great uſe on this occaſion: a much better effect may be expected from ſoluble tartar, carefully prepared, and properly uſed; though even this is apt to render the ſpirit a little ſaponaceous. Some compound neutral ſalts have been made however upon this foundation, that would rectify common malt ſpirit from proof at a ſingle operation, much better than all the other more perplexed and tedious methods in uſe. A prudent uſe of fine dry ſugar may alſo be of ſome ſervice, as it readily unites with the eſſential oil, and detains and fixes it, without imparting any urinous or other nauſeous flavour to the ſpirit rectified upon it; another hint to this purpoſe, which may be made to turn to very good account, is, that given by the ingenious method invented by Dr. Cox, of taking all the oil out of the volatile ſalts, by firſt bringing them to a neutral ſtate with ſpirit of ſalt, and then ſubliming them with ſalt of tartar, which does the buſineſs to perfection. In the caſe of ſpirits the acid may be varied, and virgin earth, chalk, calcined flints, or the like abſorbents uſed in the ſtead of ſalt of tartar, and yet the general effect will be the ſame. *Shaw's Eſſay on Diſtillery.*

Compound DISTILLATION.—By compound Diſtillation, is meant that wherein the addition of certain ingredients gives the ſpirit ſome new properties, virtues, and uſes, different from thoſe of a ſimple ſpirit. Thus the cordial waters of the diſtillers, and the compound waters of the apothecary, are productions of this operation..

The apothecaries have long been ſubject to the ridicule of diſtillers, on account of their inelegant way of making compound waters; and at preſent ſeem to yield the diſtillers maſters of the art, without venturing farther to diſpute the point. But, as apothecaries are all expected to be chemical operators, I do not ſee how they can ſubmit to be out-done in a chemical branch of their buſineſs; eſpecially, how they can acknowledge the diſtillers to make better compound waters than themſelves; yet conſtantly ſupply their patients with thoſe of their own making.

The diſtillers uſually think themſelves ſo perfect in this art, as to need no farther inſtruction; but they will not, it is hoped, be unwilling that a little aſſiſtance ſhould be given the apothecary, in a point that concerns the health of his patients.

In all compound Diſtillation, it is a principal rule, that the ſpirit employed be well rectified, cleanſed, and rendered nearly inſipid; eſpecially if a malt-ſpirit be choſe: otherwiſe the oil of the ſpirit will prevent its being well impregnated with the virtues of the ingredients, and alſo be apt to taſte through them all. And for this reaſon, as well as others, the ſpirit ſhould be brought into the form of alcohol. At leaſt, if a clean proof-leſs malt-ſpirit cannot be procured, let a fine melaſſes ſpirit, which, though proof, ſhews thin and attenuated, be uſed without any farther addition of water in the ſtill. An additional quantity of water only takes up room to bad purpoſe, and not only prolongs, but prejudices the operation. And, when alcohol is employed, let it only be mixed with an equal quantity of fair water.

In the next place, due regard muſt be had to the buſineſs of digeſtion; without which the virtues of ſome ingredients will not riſe in Diſtillation. Thus, without good maceration, the ponderous oil of the cinnamon is not very ready to riſe with the ſpirit: whence the virtue of it ſometimes remains in the ſtill, and requires to be fetched out by cohobation. The apothecaries, to avoid this trouble, or for other reaſons, are uſually content to have their ſtrong cinnamon-water poor, that their ſmall cinnamon-water may be rich. But this is perverting the deſign of the phyſician, who expects both to be made in perfection, and ſecundum artem.

When the ingredients, according to their reſpective natures, have ſtood a due time in digeſtion, the ſpirit is to be drawn from them in the manner that beſt tends to bring over the virtues, whereon the character and expectation of the water are founded. So, if the ingredients naturally abound in a heavy viſcous oil, the operation ſhould be performed with a briſker fire, than when the oil is thin, light, and ethereal. Thus ſtrong cinnamon-water, after ſufficient digeſtion to looſen the oil, might be drawn over ſmarter than citron-water, the ſpirit of mint, or the like; where the eſſential oil aſcends much eaſier along with the ſpirit.

The capital thing of the whole reſts here, that a due proportion of the finer eſſential oil of the ingredients be received into, and embodied with the ſpirit; whilſt the groſſer, leſs ſubtile, and leſs agreeable oil is kept out. To effect this fully requires, 1. That the operation be well regulated from the firſt; 2. That the receiver be changed in due time; and, 3. That the ſpirit be prudently made up. When no regard is had to theſe ſeveral particulars, as it rarely ſeems to be among the apothecaries, the conſequence is the production of a milky, thick, turbid liquor, that taſtes more like what the diſtillers call faints than a cordial water; and, indeed, ſeems more fitted to give ſickneſs, than to cure it. At leaſt, before it can be uſed, it muſt either ſtand a long time to fine of itſelf, if ever it will fine; or have its groſs, unctuous, and terreſtrial parts precipitated by art. On the contrary, when theſe rules are prudently obſerved, the water proves, without farther trouble, clean-taſted, clear, briſk, pleaſant, and refreſhing; ſuppoſing it intended for a common cordial, and not for phyſic.

What ſeems to have led the diſtillers into this clean way of compounding, is their particular eſteem and fondneſs for the bubble-proof; a thing little underſtood by apothecaries, and leſs regarded in their productions. The diſtillers, in the making of compound waters, find, if they ſuffer their faints to run among the high ſpirit, this procedure kills their proof before its time. Hence they are inſtructed to leave them out, and make up with fair water; reſerving their faints for other uſes, to which, as containing a copious oil, they are better adapted: ſo that, by a little management, they may be turned into waters themſelves, or made to give out their eſſential oil. In which manner, and by continuing to run the ſtill longer than the advantage from the ſpirit requires, a large quantity of oil may frequently be procured. And this piece of knowledge among the diſtillers, or their ſervants, has ſent many parcels of oil of aniſeed, oil of juniper, oil of caraway, oil of cloves, &c. to the druggiſt, the chemiſt, and the apothecary, at ſuch an under-price, as ought to ſhew them the trick; if they could not otherwiſe diſtinguiſh between a perfect eſſential oil, and one that has by ſpirit been robbed of its more ſubtile and ethereal part. And this may ſerve to ſhew the nature of that extemporaneous method of making ſome compound and cordial waters with the eſſential oils of aromatics, and certain plants. The common practice is to rub theſe oils into a kind of elæoſaccharum with ſugar, and thus diſſolve it in a proof-ſpirit. And if the eſſential oil be freſh and genuine, the ſpirit clean and thin, and the operation dextrouſly performed; better waters may be made in this manner than are vulgarly found, either at the diſtillers or apothecaries: the chief fault being, that they contain too little of the fine ethereal oil, and too much of the groſſer unctuous matter of the ingredient.

The fine light oil, of which this groſſer is robbed by a careful Diſtillation, is the very thing that gives the flavour, virtue, and ſpecific difference of the compound ſpirit: and this is generally found to come over with the ſpirit, while the fire is kept moderate, or ſo as to cauſe only a ſimmering, and not a boiling, in the liquor of the ſtill. When once the fire is raiſed, as it uſually is, when the ſtill works ſlow; part of the groſſer oil alſo comes over, and thus impregnates the ſpirit. In general, it may be a rule to change the receiver, as ſoon as ever the ſtream appears proof: though there are ſome caſes, as particularly in cinnamon, where a little of the faints ought to be mixed in among the water. But this is univerſal, that ſo much of the faints ſhould in no caſe be uſed, as to bring a cloudineſs or milkineſs upon the water, uſually kept in the ſtate of full proof: this ſtate being ſuppoſed to mellow and ripen it ſooner; as indeed it does much ſooner than a lower ſtate would, becauſe the oil could not then remain diſſolved. But moſt cordial waters, for the apothecaries uſe, had perhaps better be preſerved in the condition of a three fifth of brandy, that is, as they come from the ſtill, unmade up.

The water employed for making up ſhould either be ſoft river-water, or ſpring-water, ſoftened by art or Diſtillation; otherwiſe it is apt to turn the ſpirit thick, and precipitate a ſediment; eſpecially if made below proof: or if the ſpirit partake of an alkaline nature, from the manner of its rectification. But when this happens, or there is a neceſſity for making goods below proof, they may be fined in a day or two, either with a ſmall proportion of alum, the white of eggs, or with jelly of iſing-glaſs, beat up to a froth, and applied in the ſame manner as in the fining of wines.

All compound waters ſhould likewiſe be a little edulcorated with the fineſt ſugar; as this ſerves to unite the eſſential oil of the ingredients more intimately with the ſpirit, and at the ſame time makes the water taſte ſofter and pleaſanter in the mouth.

DITCH. — In marſhes, and other wet land, where there are no hedges, the common fence or incloſure for land is a Ditch. They allow theſe Ditches ſix feet wide againſt highways that are broad, and againſt commons five feet. But the common Ditches about incloſures, dug at the bottom of the bank, on which the quick is raiſed, are three feet wide at the top, one at the bottom, and two feet deep; by this means each ſide has a ſlope, which is of great advantage; for where they neglect this, and dig them perpendicular, they are always waſhing down; beſide, in a narrow-bottomed Ditch, if cattle get down into it, they cannot ſtand to turn themſelves to crop the quick; but where the Ditch is four feet wide, it ſhould be two and a half deep; and, where it is five wide, it ſhould be three deep, and ſo in proportion.

DITRIHÆ'DRIA, in natural hiſtory, the name of a genus of ſpars. The word is derived from the Greek δὶς twice, τρὶς three, and ἕδρα, a ſide, or plane. The bodies of this genus are ſpars compoſed of twice three planes, being formed of two trigonal pyramids joined baſe to baſe, without the intervention of any intermediate column.

DI'VER, in zoology, the Engliſh name of the colymbus, a genus of water birds; the characters of which are: they have narrow, ſtraight, and ſharp bills; their heads are ſmall, their wings ſhort, their feet placed far backward on the body, and near the tail; their legs broad and flatted, and their claws broad like the nails of one's fingers. They are called colymbi, and in Engliſh Divers, from their great expertneſs in diving, and long continuance under water.

DI'VING (*Dict.*)— Diving-bladder, a term uſed by Borelli for a machine, which he contrived for Diving under the water to great depths, with great facility, and preſers to the common Diving-bell. The veſica, or bladder, as it is uſually called, is to be of braſs or copper, and about two feet in diameter. This is to contain the Diver's head, and is to be fixed to a goat's ſkin habit, exactly fitted to the ſhape of the body of the perſon. Within this veſica there are pipes, by means of which a circulation of aïr is contrived; and the perſon carries an air-pump by his ſide, by means of which he may make himſelf heavier or lighter, as the fiſhes do by contracting or dilating their air bladder: by this means, the objections all other Diving machines are liable to, are obviated, and particularly that of the air; the moiſture by which it is clogged in reſpiration, and by which it is rendered unfit for the ſame uſe again, being here taken from it by its circulation through the pipes, to the ſides of which it adheres, and leaves the air as free as before. *Borelli Opera Poſthuma.*

DIURE'TICS (*Dict.*) — The medicines of this kind are, by Celſus, in the thirty-firſt chapter of his ſecond book, characterized and enumerated in the following words: 'Every fragrant vegetable, which is cultivated in gardens, provokes a diſcharge of urine; ſuch as ſmallage, rue, dill, baſil, mint, hyſſop, aniſe, coriander, creſſes, rockets, ſennel, aſparagus, capers, cat-mint, thyme, ſavory, nipplewort (lampſana) parſnip, ſkirret, and onions.' But, of the vegetable kind, I recommend, ſays Hoffman, as Diuretics, the roots of parſley, celeri, aſparagus, graſs, liquorice, madder, parſnip, crowfoot, pareira brava, acmella; the herbs, parſley, ground-ivy, horſe tail, chervil, common nettle, all leeks, and all the ſpecies of garlic; the flowers of butchers broom, and blue bottles; the ſeeds of carrots, parſley, celeri, fennel, grumwell, common nettle, violets, the four greater cold ſeeds, the ſeeds of club-moſs, winter cherries, dog-hips, juniper-berries, ſtraw-berries, the wood of the juniper-tree, ſaſſafras, and its bark. Among reſins and balſams, maſtic, amber, the balſamum de Mecha, and the balſum Capivi. In the animal kingdom, cantharides, millepedes, May-worm, ſcorpions, toads, earth-worms, cochineal, and whey. To the claſs of Diuretics, alſo, belong all alcaline ſalts prepared by incineration, as alſo the ſalt of amber, the arcanum duplicatum, a ſolution of crab's eyes and nitre. The compound medicines belonging to this claſs are, the lixivium benedictum of Mynſicht, the tincture of tartar, the acrid tincture of antimony, the terra foliata tartari, the liquor ſilicum, the lithontriptic liquor of Michaeli, ſoluble tartar, the ſpirits of turpentine, maſtic, and amber, balſam of ſulphur with oil of turpentine, balſam of juniper, oil of juniper, malvaticum juniperinum, the ſyrupus dialthææ of Fernelius, and the trochiſchi Alkekengi. As the diſcharge of the urine may be impaired and rendered difficult from ſeveral cauſes, ſuch as, firſt, a defect of due moiſture in the blood, or, ſecondly, thick and tenacious juices obſtructing the ſmall urinary ducts of the kidnies, thirdly, a violent ſpaſmodic conſtriction of the renal ducts, or, fourthly, their preternatural relaxation and weakneſs; ſo alſo the medicines, calculated for reſtoring a due diſcharge of the urine, muſt be adapted to the removal of theſe ſeveral cauſes. Thus, for inſtance, ſome ſubſtances, by conveying a due degree of fluidity to the inſpiſſated blood, augment the diſcharge of urine; of which kind are all aqueous diluting medicines, liberal draughts of ſpring water, whether cold or warm, eſpecially, if herbs of a diuretic quality are infuſed in them: this intention is likewiſe anſwered by tea and coffee, as alſo by mineral waters, either hot or cold, as they not only dilute the blood, but, by their alcaline quality, diſſolve the viſcid and tenacious humours, and remove the obſtructions of the kidnies. The ſame effect is produced by whey, which is poſſeſſed of an aqueous, abſtergent, and gently ſtimulating principle, as alſo of a ſweet nitrous ſalt. Other ſubſtances diſſolve the tough and viſcid humours which obſtruct and block up the ſecretory ducts of the kidnies, and, by that means, render them fit for performing their functions. Of this kind are all fixed ſalts, and the lixiviums prepared from them; as alſo tincture of tartar, the acrid tincture of antimony, the liquor ſilicum, the terra foliata tartari, the tartarus tartariſatus, the arcanum duplicatum, a ſolution of crab's eyes, and the magneſia alba, which, with the acid of the primæ viæ, is converted into an aperient ſalt; as alſo the tincture of quick-lime, mother of pearl, and coral, prepared with citron juice; as alſo the ſalts obtained by exhalation from mineral waters. Other ſubſtances ſooth and alleviate the ſpaſmodic conſtrictions of the emunctories of the kidnies, which obſtruct and prevent the due diſcharge of the urine. The moſt conſiderable and efficacious of this kind are, nitre, the four greater cold ſeeds, and emulſions prepared of them; the ſeeds of the white poppy, of carrot, and of club-moſs, as alſo winter cherries, and troches prepared of them: the ſame intention is anſwered by the anodyne mineral liquor, which is both a ſafe and efficacious medicine; as alſo by ſaffron, and its eſſence; the juice of graſs, in conſequence of its nitrous ſalt; a decoction of the roots of graſs and aſparagus, and oil of ſweet almonds, which is a liquor of a highly demulcent quality. Other ſubſtances, by their oleous, ſubtile, and balſamic principle, corroborate and ſtrengthen the kidnies; ſuch as maſtic, amber, the balſamum de Mecha, the balſam of Capivi, turpentine, the wood and berries of the juniper-tree, ſaſſafras, parſley, parſnip, fennel, aniſe, crow-foot, celeri; and the oils, eſſences, ſpirits, decoctions, and infuſions of them. Other medicines corroborate the kidnies, by their ſtrengthening, fixed, terreſtrial, and ſulphureous principle. Of this kind are dog-hips, rob of juniper, and the malvaticum juniperinum prepared of it, dried ſtrawberries, pareira brava, ground-ivy, the bark of the root of Egyptian thorn, horſe-tail, Paul's betony, and chervil. Laſtly, other medicines powerfully ſtimulate the renal ducts, when they are ſo far weakened as to have their functions either impaired, or totally deſtroyed: of this kind are almoſt all inſects, eſpecially cantharides, millepedes, ſpiders, ſcorpions, and dried toads: and, in the vegetable kingdom, all the ſpecies of leeks and garlic.

Since there is ſo great a difference among Diuretic medicines with reſpect to their principles, and manner of operation, their uſe muſt, of courſe, be different, and they muſt be judiciouſly adapted to the particular natures of different caſes; for, if to plethoric patients, labouring under the ſtone, we ſhould, before veneſection, and the diminution of the quantity of the blood, exhibit hot ſubſtances impregnated with a ſubtile balſamic oil; ſuch as preparations of turpentine, and juniper, or the balſams of Mecha, Capivi, or Peru; or acrid ſubſtances; or ſuch inſects as abound with a cauſtic ſalt, garlic, onions, or leeks; we ſhould certainly injure the patient, bring on an inflammation of the kidnies, and promote the generation of ſtones. On the contrary, in moiſt, leſs delicate, and more robuſt patients, who live upon coarſe food; as alſo, in diſeaſes ariſing from a redundance of impure ſerum, a fluor albus, a gonorrhœa, a diſpoſition to an anaſarca, and leucophlegmatia; theſe draſtic medicines are of ſingular uſe and ſervice.

Still greater misfortunes are produced by acrid and ſtimulating ſubſtances, in caſes where, in conſequence of ſpaſmodic or nephritic pains, a diſcharge of the urine is ſuppreſſed. Diſorders of this nature are far more ſafely and efficaciouſly removed by ſuch medicines as alleviate pain, and relax ſtrictures; ſuch as winter cherries, the ſeeds of carrot, club moſs, white poppy, and grumwell; as alſo emulſions of the four greater cold ſeeds, the trochiſci Alkekengi with opium, antimoniated nitre depurated, the water of the leaves meadow ſweet, of the lime-tree, and of the Egyptian thorn; oil of ſweet almonds, ſweet ſpirit of nitre, the anodyne mineral liquor, whey; and externally, emollient baths, and fomentations; the virtues of all which are ſo great, that, by alleviating the racking ſpaſms, they not only reſtore the free diſcharge of the urine, but alſo facilitate the progreſs of the ſtone through the ureters, and promote its expulſion.

In diſorders ariſing from a redundance of ſalt and tartareous ſerum, which is generally the cauſe of arthritic and rheumatic pains, this peccant humour is carried off by gentle Diuretics, though not of the hot kind, leſt, by their means, the ſpiculæ of the ſalts ſhould be put into a briſker motion, and the parts in which they are lodged, be more violently racked. The gentle Diuretics, by which this intention is moſt effectually anſwered, are, the roots of ſarſaparilla, pareira brava, ſaſſafras, and China root; as alſo thoſe of liquorice, aſparagus, madder, ſuccory, fennel, parſley, and graſs, together with the wood of the juniper-tree, and the preparations of theſe boiled in broth made with fleſh, or in water. To this claſs, alſo, belong whey, and, more eſpecially, the temperate mineral waters and warm ſprings.

But in caſes where peccant, viſcid, and tenacious humours are lodged in the urinary bladder, and eſpecially when the intention is to expel the firſt beginning of a ſtone, more acrid and powerful medicines become neceſſary. This intention is anſwered by garlick, exhibited with ſpirit of juniper; as alſo by the powder of millepedes, May-worms, eſſence of cantharides, and tincture of antimony, liquor ſilicum, and tincture of quicklime; which may alſo be cautiouſly exhibited in a virulent gonorrhœa, when a viſcid and tenacious matter lodged in the proſtatæ, the neck of the bladder, or the urethra, is to be carried off by urine.

But the moſt ſafe and efficacious medicines for procuring a free diſcharge of the urine, are all kinds, not only of alcaline fixed ſalts, but alſo thoſe called neutral; for they not only diſſolve the tough and viſcid juices, which obſtruct the urinary ducts, but alſo, by a gentle ſtimulus, promote their diſcharge. This intention is excellently altered by ſolutions of the ſalt of tartar, pot-aſh, and fixed nitre, as alſo the tartarus vitriolatus, ſalt of wormwood, the arcanum duplicatum, a ſolution of crab's eyes, tartarus ſolubilis, the terra foliata tartari, antimoniated nitre, and ſal polychreſtum.

Theſe medicines not only contribute to reſtore a due and natural diſcharge of the urine, but alſo produce ſome other excellent effects in the cure of diſeaſes: for, as many of them are poſſeſſed of an aperient and inciding quality, as others of them are corroborative, balſamic, and reſtore the tone of the parts; and others of them of an anodyne nature; ſo they prove highly efficacious in thoſe chronical diſorders, which ariſe from an obſtruction of the glands of the viſcera, and emunctories, or from an impurity of the juices, or a redundance of ſaline, acrid, and tartareous ſerum. And certainly, if relief is to be expected from any medicines in dropſies, œdematous ſwellings, ſtony concretions, the gout and arthritic pains, we are to look for it from the prudent uſe of Diuretics: but we are to beware of all hot, acrid, and cauſtic Diuretics, and uſe thoſe which are of a milder nature, and fit for common uſe, ſuch as ſmall Moſelle wine, the Selteran mineral waters, and ſuch ales and decoctions as are gently Diuretic. *Frederic. Hoffman. Medicin. Rational Syſtemat.*

DO'BCHICK, in zoology, the common Engliſh name of a ſmall water fowl, the leaſt of all the diver kind, and known among authors by the name of colymbus minor. It ſeldom exceeds ſix ounces in weight, and has a ſhort beak not more than a finger's breadth long, large at the baſe, but tapering to a point at the end; its eyes are large, and it is covered with a very thick, downy plumage; it is of a very deep blackiſh brown on the back, and very white on the belly; its wings are very ſmall, and it has no tail.

DOCK-*yards*, in ſhip-building, are magazines of all ſorts of naval ſtores; the principal ones, in England, are thoſe at Chatham, Portſmouth, Plymouth, Woolwich, Deptford, and Sheerneſs. In time of peace, ſhips of war are laid up in theſe Docks, thoſe of the firſt rates moſtly at Chatham, where, and at the yards, they receive, from time to time, ſuch repairs as are neceſſary.

Theſe yards are generally ſupplied, from the northern crowns, with hemp, pitch, tar, roſin, and ſeveral other ſpecies. But, as for maſts, particularly thoſe of the largeſt ſize, they are brought from New England.

How much it imports the good of the public, to keep thoſe magazines conſtantly repleniſhed, every one is able to judge: and it were much to be wiſhed, the improving the forementioned commodities, in our Engliſh plantations, might meet with all poſſible encouragement, leſt, one time or other, it may prove difficult to get them elſewhere. It is reaſonable to think ſuch an undertaking will put the nation to ſome conſiderable charge, before it be brought to perfection; but, when ſo, many are the advantages that will ariſe from it.

DODECA'NDRIA *, in botany, a claſs of plants which have hermaphrodite flowers, with twelve ſtamina or male parts in each. See *plate* XXII. *fig.* 4.

* The word is formed of the Greek δώδεκα twelve, and ἀνὴρ male. Of this claſs of plants are the aſarabacca, agrimony, &c.

DO'DO, in zoology, the name of a bird, called alſo by ſome *cygnus cucullatus*, by others *gallius gallinaceus perigrinus*, and by Bontius *dronte*. It is a very ſingular bird, ſomewhat larger than a ſwan, but wholly different from the ſwan in ſhape, tho' by ſome eſteemed a kind of that bird. Its head is large, and is covered with a membrane reſembling a hood; its beak is of an oblong figure, and is yellow at its origin, and black at the point, and is ſomewhat crooked: it is very naked, having only a few feathers ſcattered over its body, and the rudiments of wings made up of a few naked quills; the hinder part of its body is very bulky and fat, and has a tail made of four or five curled greyiſh feathers, reſembling thoſe of the oſtrich. Its legs are very thick and ſtrong.

DOGS-BANE, *apocynum*, in botany, the name of a plant which conſtitutes a large genus, the characters of which are theſe: the flower conſiſts of one leaf, and is made in the faſhion of a bell, but not regularly figured in all the ſpecies.

In ſome the flower is bell-faſhioned, and divided into ſeveral ſegments; and from its cup there ariſes a piſtil, which perforates the bottom of the flower, and is fixed to its hinder part like a nail; this changes into a fruit, compoſed of two vaginæ, and opening from the baſe to the apex, and filled with large quantities of ſeeds, winged with down, and fixed to a rough placenta. *Tournefort, Inſt.*

In others the flower is bell-faſhioned, and is multifid and inverted; and its middle is filled by a very elegant head, compoſed of five little horns expanded into a circle; to the lower part of this head there is affixed a piſtil, which is joined to it in the manner of a nail; this ariſes from the cup, and finally ripens into a fruit, compoſed of two vaginæ, which open from the baſe to the apex, and contain numerous ſeeds, winged with down, and placed in the manner of ſcales, and affixed to a foliaceous placenta. To this it is to be added, that the apocynums all abound with a milky juice.

DOG-FLY, *cynomyia*, in natural hiſtory, the name of a ſpecies of fly common in woods and among buſhes, and particularly troubleſome to dogs. It uſually ſeizes upon the ears, and it is in vain to beat it off, for it returns in a moment, and cannot be prevented but by being killed. It ſtings very ſeverely, and always raiſes a bliſter in the part. It ſomewhat reſembles the flat black fly ſo troubleſome to cattle. It has no trunk, but has two teeth much reſembling thoſe of the waſp. Its wings are always placed ſo cloſe upon its body that they are not ſeen. There are two kinds of it, one larger and found in woods, and the other common in hedges.

DOG-*roſe*, a name of the common briar or hip-tree. It is obſervable of ſome kinds of this ſhrub, that the flowers ſmell extremely ſweet in the night, or very early in the morning, but not at all ſo in the day-time. The reaſon of which ſeems to be the ſame as in all the noctuolent plants, of which there are ſeveral kinds, as ſome of the geraniums, and of the jaſmines, &c. that is, that the ſun exhales and diſſipates their odorous effluvia in the day-time, as ſoon as they are expanded from the flower; but that in theſe cold times the vapours are condenſated, and reach our noſe in an agreeable manner. *Phil. Tranſ.* N°. 114.

DO′GGERS, in the Engliſh alum works, a name given by the workmen to a ſort of ſtone found in the ſame mines with the true alum rock, and containing ſome alum, though not nearly ſo much as the right kind. The county of York, which abounds greatly with the true alum rock, affords alſo a very conſiderable quantity of theſe Doggers; and in ſome places they approach ſo nearly to the nature of the true rock, that they are wrought to advantage.

DO′LIUM, in natural hiſtory, the name of a genus of ſhells, called by ſome conchæ globoſæ, and by the French tonnes. The characters are theſe: it is an univalve ſhell, with a globoſe or round belly, with a lax aperture, ſometimes ſmooth and ſometimes dentated. The clavicle is either moderately umbonated or depreſſed; and the columella is, in ſome ſpecies, ſmooth, in others wrinkled. Some authors have called theſe conchæ ampullaceæ; and they have had, at times, many other names, but all tending to the ſame ſenſe, and expreſſing the globular figure of the body, which is the great character by which theſe are diſtinguiſhed from all other ſhells. See *plate* XVII. *fig.* 13.

DO′LPHIN, in ichthyology, the Engliſh name of a fiſh of the cetaceous kind, called alſo ſometimes the porpeſſe, but improperly. The word porpeſſe is properly the name of the conic-bodied Dolphin, with a broad back and ſubacute ſnout; but the Dolphin, properly ſo called, and to which the name porpeſſe is erroneouſly given, is the delphinus of Artedi, with an oblong and ſubcylindric body, and a long and acute ſnout. This is the delphis of Ariſtotle, and the other Greek writers; and the other properly called the porpeſſe is their phocæna. Ælian, Appian, and Athenæus, all join in calling this Dolphin, properly ſo named, the delphis, and the ſame name is preſerved by all the more accurate of the Latin writers.

DOLPHIN, is alſo a name given by the Engliſh to the fiſh called hippuris, by the generality of authors; but by ſome hippoſele, and equiſele, and by others dorado.

DOMI′NICAN-CARDINAL, in ornithology, the name of a curious bird, found only in the Braſils, at a great diſtance from any habitation. See *plate* XVIII. *fig.* 3, where this bird is drawn in its natural ſize.

It hath legs and feet rather ſtrong than weak in proportion to its ſize. The bill is of a moderate bigneſs, the upper mandible duſky, or horn-coloured, the lower whitiſh. The eyes are black with dark haſel-coloured irides. The whole head is of a very beautiful red, or ſcarlet-colour, which colour reaches down the fore-part of the neck or throat, as far as the breaſt, and ends in a point. The upper ſide of the neck, the back, wings, and tail, are all of a black colour. The quills that fall next to the back are bordered round with white, as are the covert-feathers next above them; the leſſer covert-feathers of the wings and the back have a ſmall mixture of grey, the feathers being as it were finely fringed with grey. The tail-feathers are edged with white. The ſides of the neck, breaſt, and whole under ſide as far as the tail, are purely white. It hath four toes, three ſtanding forward and one backward, after the uſual manner, all of a brown colour. In brief it may be deſcribed thus: the head is red, the upper ſide black, and the nether white. *Edwards's Hiſt. of Birds.*

DOOR (*Dict.*)—*Plate* IV. *fig.* 16, in the Dict. repreſents folding Doors, adapted to the Ionic order.

DORA′DO, in zoology, the name of a large ſea fiſh, called by the Braſilians guaracapema; and ſo much reſembling the hippuris, as by many to be ſuppoſed to be the ſame fiſh; it grows to ſix or ſeven feet in length, and is of a ſomewhat broad and flatted form, being a foot and a half broad near the head; the head ends in a ſquare, and is thinned away to an edge, for the advantage of the creature's ſwimming the more ſwiftly. Its mouth is but ſmall for its ſize, and is furniſhed with very ſharp teeth; its eyes are large and round, and placed but a little above its mouth; its gills are large. It has one long fin running the whole length of the back, and another anſwering it on the belly, reaching from the anus to the tail; the tail is long, large, and forked; its ſcales are very ſmooth, and ſcarce ſenſible to the touch; its head, back, and ſides are of a ſilver green, its belly white; its back and ſides are ſpotted with blue; it is a very ſwift fiſh in ſwimming, and is a very delicate and well taſted one. *Willughby, Hiſt. Piſc.*

DOREE′, or *John Doree*, in ichthyology, a name given by us to a fiſh, called, by authors, the faber and gallus marinus. We have borrowed the name Doree from the French; and, as to the word John, by ſome writers prefixed to it, it ſeems only a corruption of the French word jaune, yellow. They expreſſing the colour of the ſides of this fiſh, which is a gold yellow, by the phraſe jaune Doree: this has given us the words John Doree, or, by thoſe who ſpell yet worſe, John Dory, as we ſee it in ſome authors.

DORO′NICUM, *leopard's bane*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind; its diſk is compoſed of floſcules, and its outer edge of ſemifloſcules, all ſtanding upon embryo's, and incloſed in a funnel-like or baſon-like cup. The embryo's finally become ſeeds winged with down, and affixed to the thalamus of the flower.

DO′SSIL, in ſurgery, is lint made into a cylindric form, or reſembling the ſhape of dates or olive-ſtones. Doſſils are ſometimes ſecured by a thread tied round their middle. *Heiſt. Surgery.*

DO′TTLE *Fiſh*, or DAILS, in natural hiſtory, a name given by the French to a particular ſpecies of ſhell-fiſh, which ſhines in the dark. They are of the genus called pholas by the ancients, and reſemble in figure a truncated cone.

M. Reamur obſerves that it is not the ſhell, which is luminous, but the animal that it covers; and that it is more luminous in proportion as it is freſher, and but newly taken from the ſea.

DOUBLE *Caſt*, in huſbandry, a term uſed by the farmers for that method of ſowing that does not diſpenſe the neceſſary quantity of ſeed for a piece of land at one bout, but requires the going over it every-where twice in a place. *Plot. Oxf.*

DRABS, in the Engliſh ſalt works, a name given to a ſort of wooden caſes into which the ſalt is put, as ſoon as it is taken out of the boiling-pan. Theſe are partitions like ſtalls made for horſes; they are lined on three ſides, and at the bottom with boards, and at the front have a ſliding board to put or take out occaſionally. Their bottoms are made ſhelving, being higheſt at the backſide, and gradually inclining forwards; by which means the ſaline liquor that remains mixed with the ſalt eaſily drains out from it, and the ſalt in three or four days becomes ſufficiently dry, and is then taken out and laid in large heaps for ſale. In ſome places they uſe cribs inſtead of the Drabs. See CRIBS.

DRA′CO *volans*, in natural hiſtory, a name given by ſome people to one of the flying Lizards. Others have applied the ſame term to a very different ſubject, expreſſing by it a ſort of ignis fatuus very common in this iſland, and others of the more northern countries, which are much redder, larger, and more terrible than our common lambent fires, or will in the wiſps, as our country people expreſs them. This ſort of exhalation is principally ſeen on the borders of rivers, and in marſhy places, and ſeldom riſes very high from the ground, but plays and dances about the ſurface in an agreeable manner; and, if people go up to it, will ſtick to their hands or cloaths without burning, or doing them any injury. They are more common in the ſummer months than in the winter, and are more frequently ſeen in thick weather than in clear.

DRACU′NCULUS, *dragon*, in botany, a genus of plants, whoſe characters are:

The leaves are like thoſe of arum, but are divided into many parts: the ſtalk is ſpotted, but in other reſpects it agrees with the arum.

They are propagated by their knobby roots, which, if ſuffered to remain two or three years undiſturbed, will afford many offſets. The beſt ſeaſon for tranſplanting theſe roots is in autumn, ſoon after green leaves decay; for, if they are removed, after they have taken freſh root, and begun to ſhoot, they ſeldom produce flowers the ſucceeding ſummer; or, if they do, they are very weak: theſe will thrive almoſt in any ſoil and ſituation, but beſt in an open expoſure, and a light ſoil.

DRAINS, a name given in the fen countries to certain large cuts or ditches, of twenty, thirty, nay ſometimes forty feet wide, carried through the marſhy ground to ſome river, or other place capable of diſcharging the water they carry out of the fen lands. Moſt of theſe Drains are made in our fen countries by a body of men called the undertakers, whoſe reward is one third of the ground they drain. They erect ſluices alſo at a great expence, often not leſs than two thouſand pounds each; yet theſe, with all the care they employ in erecting them, are ſubject to be blown up by the vaſt weight of water that lies upon them, when the lands are overflown. Some of theſe ſluices have two or more pair of doors, of ſix, eight, or ten feet high, which ſhut, when the water in the river is higher than in the Drains, by the weight and force of it; and ſo, è contra, throw out a body of eight feet ſquare of water for about ſix or ſeven hours during the ebb. The real uſe of theſe Drains is very evident from the preſent ſtate of the land where they are cut, and that of it before. In Camden's time, all this was bog, and now it is all firm land. The country about Crowland was in that author's time ſo ſoft, that it was not paſſable by carriages; and thus grew a witticiſm upon it, that all the carts that entered this town were caſed on the wheels with ſilver: but this is now ſo firm ground, that carriages of any kind paſs over it. The duck-ponds uſed to be called the fen corn fields, and they now are ſuch in reality, their bottoms being dry, and producing oats, and rape-ſeed, or cole-ſeed, with great increaſe. *Philoſ. Tranſ.* N°. 223.

DRANK, a name given by our farmers to the great wild oats. Theſe are often very troubleſome to the plowed lands, eſpecially after wet ſeaſons and much froſt. Many to deſtroy this weed ſow the land with black oats, which, being ripe much ſooner than the ſeeds of this plant, are cut down, before it can ſow itſelf for another year; eſpecially, if they are cut a little the earlier, which will do them no harm, if they be ſuffered to lie a little upon the ground a while afterwards for the grain to ſwell before they are carried in. But, in general, when plowed land begins to run to theſe weeds and thiſtles, it is a token to the farmer that it is time to fallow them, or elſe to ſow them with hay ſeed, and make paſtures of them. The ſowing beans upon a land ſubject to theſe weeds is alſo a good method, becauſe the farmer may ſend in his ſheep, when they are about three inches high, which will eat up the Drank, and all the other weeds, and will not hurt the beans. The general method is to put twenty ſheep to an acre; but they muſt be put in only in dry weather, and not left too long. *Mortimer's Huſb.*

DRE'SSING *of ores*, the preparing them, as they come rough from the mine, for the working by fire. This is done ſeveral ways in different countries, and in reſpect to the different ores of the metals; in Devonſhire we have a very eaſy method, which is ſo expeditious, and ſo good for all the purpoſes, that it is worthy copying in other places. After the ore is dug, it is toſſed up by hand from ſhamble to ſhamble by the ſhovelmen in the mine, and drawn up in buckets by a winch at the top of the ſhaft. As ſoon as the whole quantity for one dreſſing is brought up, the large ſtones are broken, and the whole is then carried to the mills, where one horſe turns a wheel that moves the machines for powdering a great quantity of it; theſe are called the ſtamping or knocking mills. The ore is unloaded at the head of the paſs or entrance into theſe mills; this paſs is made of two or three bottom boards and two ſide boards, in form of a hollow trough, and ſtands in a ſlanting direction. The ore by its own weight is carried down this trough, and lodges itſelf in the coffer. The coffer is a long ſquare box made of the firmeſt timber, and of three feet long, and a foot and a half broad; the ore is not ſuffered to fall into this all at once, but is ſtopped over the mouth of the trough by a croſs board, where a cock turns in a quantity of water at the ſame time, which waſhes down juſt as much of the ore with it into the trough, as there ought to be. In this coffer there are three lifters placed between two ſtrong board leaves, having two braces or thwart pieces on each ſide to keep them ſteady, as a frame with ſtamp heads. Theſe heads are of iron, and weigh about thirty or forty pounds a-piece, and ſerve to the breaking the lumps of ore in the coffer.

The lifters are about eight feet long, and half a foot ſquare. They are always made of heart of oak, and have as many in timbers or guiders between them; they are lifted up in order, by a double number of toppits, which are faſtened to as many arms paſſing diametrically through the greateſt beam, which is either turned by the wheel and horſe, or where there is conveniency of water, by an over-ſhot water wheel on two boulſters. The toppits exactly but eaſily meet with the tongues, which are ſo placed in the lifters, as that they eaſily ſlide from each other, and ſuffer the lifters to fall with great force on the ore in the trough. The frequent pounding of theſe ſoon reduces the large maſſes into a ſort of ſand, which is waſhed out of the trough by the continual current of the water from the cock through a braſs grate, which is placed at one end of the coffer between two iron bars.

The powdered ore is conveyed out of the trough into the launder, which is a trench cut in the flower of eight feet long, and ten feet over; this is ſtopped at the lower end with turf, ſo that the water is all ſuffered to paſs away, and the powder of the ore is ſtopped. Thus the launder by degrees fills up with the dreſſed ore, and this is removed out with ſhovels, as occaſion requires. The launder is divided into three parts, the forehead, the middle, and the tail; that ore which lies in the forehead, that is, within a foot and half of the grate, is always the richeſt and beſt, and is laid up in a heap by itſelf; the middle and tail afford a poorer ore; and theſe are ſometimes laid up in ſeparate heaps; ſometimes thrown into one heap together.

DRILL, or DRILL-*box*, a name given to an inſtrument uſed in the new method of horſe-hoeing huſbandry for ſowing the land. The Drill is the engine that plants the corn and other ſeeds in rows; it makes the channels and ſows the ſeeds in them, and covers them with earth when ſown, and all this at the ſame time, and with great expedition. The principal parts of the Drill are the ſeed box, the hopper, the plow and its harrow. The ſeed box is the chief of theſe, it meaſures or rather numbers out the ſeeds which it receives from the hopper, and is for this purpoſe as an artificial hand, but it delivers out the ſeed much more equally, than that can be done by a natural hand. The plow and hopper are drawn by a horſe, and by theſe the ground is opened, and the ſeed is depoſited in it; the harrow follows, and lightly rakes in the earth over them. When the ground is fine, and the ſeeds ſmall, a hurdle, with ſome prickly buſhes faſtened to its under part, will ſerve better than the harrow.

DRILL, in mechanics, a ſmall inſtrument for making ſuch holes as punches will not conveniently ſerve for. Drills are of various ſizes, and are chiefly uſed by ſmiths and turners. *Moxon, Mechan. Exerc.*

It is a very well known fact, that a Drill, made of iron, has frequently not only a polarity, but ſo ſtrong an attractive virtue of the magnetic kind, that it will ſuſpend a common needle from its point. It is uſually ſuppoſed that a Drill acquires this polarity by boring iron. But it is not only by boring of iron, that this power is obtained, but in the very making. As ſoon as one of them is finiſhed and hardened, its point becomes a north pole before it has ever been worked either in iron or any other materials, ſo that, of the great numbers of theſe inſtruments found in a ſhop, endued with this power, it is to be ſuppoſed that more of them owe it to their original make, than any after uſe. All pieces of wrought iron which in ſhape reſemble Drills, that is, which are of a long and ſlender form, will not only have this polarity, but they will change it on being placed for ſome time in an inverted poſture, and that which was the oppoſite to the north pole, by ſtanding downwards, will be the north pole. This has been an old obſervation, but, on a fair experiment, it does not prove to be true in all things without exception, though it be ſo in moſt particulars. The larger pieces of iron ſeem to be moſt eaſily influenced in their polarity, by changing their poſition; but the ſmall ones will ſometimes be found to have fixed poles, which no change of poſture will alter. *Philoſ. Tranſ.* N°. 246.

DROCK, in huſbandry, a name given by our farmers to a part of the common plow. It is an upright piece of timber, running nearly parallel with the hinder-part of the plow, but belonging to the right ſide of the tail, as that does to the left. The ground wriſt of the plow is faſtened to this, as is alſo the earth-board. *Tull's Huſbandry.*

DRO'MEDARY, in natural hiſtory, a ſpecies of the camel, about which authors are divided in their opinion, ſome calling that which has one bunch on its back the camel, and that with two the Dromedary; while others call that with one bunch the Dromedary, and that with two the camel; we have followed the former, being the moſt general opinion, and ſhall give a deſcription of the camel under the article HEGEN, the name given to that creature by the Arabians.

The neck of the Dromedary is long, the body very thick and broad, having two bunches on its back; his buttocks ſmall, conſidering the bulk of his body, and his legs very long. See *plate* XXII. *fig.* 7.

The bunches on the Dromedary's back are generally ſuppoſed to be a callous ſort of fleſh; but the academiſts of Paris found it mere hair, and that, when this was preſſed cloſe down, the creature appeared no more bunch-backed than a ſwine.

Tavernier aſſures us, on his own knowledge, that it will travel nine days without water; and, even in the coupling ſeaſon, forty days without either drink or meat.

DRONE, in natural hiſtory, a bee of a much larger ſize than the common working bee, and of a lazy diſpoſition. They are the males of the ſwarm, the common working bees being of no ſex, and the female, generally called the queen bee, is only one in a hive. See QUEEN *Bee.*

The Drones are commonly a third bigger and longer than the bees; their head is rounder and more full of hairs. It is certain they have no ſting, and their internal parts are very different from thoſe of the common bees.

One rarely ſees them go out of their hive, and, whenever they do go out, it is not till two or three o'clock in the afternoon, and never but in fine weather. They do not return loaded with wax; but we have found their bladder or reſervoir full of honey as in the common bees, whether it be that they have collected it in the fields, or that they took it in the hive before they went out; which latter we are the moſt inclinable to believe, becauſe we have never ſeen them ſettle upon flowers, and, after they have returned into the hive, we have never ſeen them lay the honey in the cells; we are even apt to think that they have not the organs for diſgorging it, as the other bees do; for in the other bees you cannot compreſs, ever ſo little, that part of the body which is oppoſite the bladders, when it is full of honey, but you ſee the honey iſſue immediately at that part of the head by which they are accuſtomed to diſcharge it into the cell; whereas it is not ſo with regard to the Drones, although, after having opened them, their bladder hath been found quite full of honey.

In ſome hives the Drones are few in number, in others they are extremely numerous. During a part of the ſummer they are diſpoſed in the hive. Afterwards, in proportion as their number increaſes, they aſſemble together in companies, in different parts of the hive, where they continue cantoned and almoſt intirely motionleſs.

At the time that the ſwarm ſallies forth, and that the bees are all in motion, the Drones keep their place, and do not go out with the ſwarm, or, if any attend the colony, they are only a few in number. But, from the end of July to the middle of Auguſt, theſe Drones are attacked by the common bees; ſeveral bees fall upon a ſingle Drone and ſeize him by his wings and body; and although the Drones reſiſt as much as they are able, they are obliged to withdraw and leave the hive; they diſappear ſo intirely, that we could never diſcover what was become of them.

When this ſort of combat happens, you ſee all theſe animals in great commotion, as well without as within the hive. All the Drones are ſo generally expelled, that of ſeveral hundreds, which we have often remarked in one hive, by the end of October, we have not found a ſingle Drone in ſeveral hives that we have examined.

Their origin is the ſame as that of the bees; they are the offſpring of the queen, and produced in the ſame circumſtances, with this difference alone, that the Drones are lodged in ſeparate combs made expreſly for them.

We have ſaid that in an hive there are combs whoſe cells are a third or an half bigger and longer than the common cells. The pregnant bee chuſes theſe great cells for depoſiting there, with all the ſtate and attendance, that authors have obſerved with regard to the common bees, thoſe eggs from which the Drones are to be hatched, and which cannot be diſtinguiſhed by the ſight from the common eggs; but it is probable that the mother hath ſome exquiſite feeling to diſtinguiſh them, ſince ſhe allots them abodes, proportioned to the ſize they are to have, when they are incloſed in the cell in their utmoſt perfection. The Drones undergo the ſame metamorphoſes as the other bees; they are many days before they ſally forth from their cells, and become recluſes after the eighth day from their birth.

Laſtly, they are nurſed with the ſame care and tenderneſs as the common bees: but it is ſurprizing that this attention and love which the bees have for thoſe little ones, ſhould be turned, as I may ſay, into ſo great an hatred at the end of the ſummer. This hatred is ſo univerſal, that it ſpares not even the young Drones, who are yet only worms or nymphs included in the cells; for we have often remarked, that, at the time when a part of the bees have been expelling the great Drones from the hive, there were other bees employed in unſtopping the cells, where the imperfect Drones were incloſed; in dragging them out of the cell, in killing them, and throwing their bodies out of the hive; where we have ſometimes ſeen two or three hundred killed of different ages. *Mem. de la Acad. des Sciences.*

DRONE-*fly*, or *Bee-fly*, a two winged fly, ſo extremely like the common bee, as to be at firſt ſight not eaſily diſtinguiſhable from it; the diſtinction between the two inſects, however, beſides the different number of the wings, is that the bee has a ſomewhat longer and leſs thick body, and the head is proportionably much ſmaller, than that of the fly which ſo much reſembles them. The bee-fly, alſo, ever carries its wings parallel in their poſition, but without its body; whereas the bee itſelf uſually carries its wings croſſed on the back, and covers its body with them; this is not however an invariable poſture with the wings of the bee, though it is the moſt frequent one. The bee-fly is found among the flowers, as is the bee, and, though it gathers no wax, it has a trunk by means of which it ſucks the honey.

The trunk, by means of which the fly is enabled to do this, has no teeth, and conſequently the fly belongs to Mr. Reaumur's firſt general claſs of the two-winged flies; and the form of its body, which is ſhort and flat, determines it to be of his firſt ſubordinate genus of that claſs. This is properly a ſeparate genus of flies, of which there are many ſpecies. Mr. Ray has deſcribed ſix, and a cloſe obſervation will enable us to add much to that number. The different ſpecies vary extremely from one another in ſize. The ſmaller of them are not ſo large as the common blue fleſh-fly; the others equal or exceed this fly in ſize. They differ alſo in colour, in different ſhades of brown; and ſome of them have ſpots of a fine deep black, and others of a fine gloſſy yellow, which make them very diſtinguiſhable from bees.

DROUGHTS. Great Droughts are very prejudicial to the farmer and his paſture, and ſuch years afford but very little reward for the labour and expence of keeping it in order. The only remedies are high incloſures, and plenty of water at hand. The firſt of theſe is always in the farmer's power, and ſhould be carefully provided by planting hedges in a proper manner, in countries moſt ſubject to ſuffer by this diſadvantage. The other is not always ſo eaſy, but may be managed ſeveral ways, as by ſinking wells; but theſe, when deep, are very expenſive; or by bringing the water in pipes, gutters, or other conveyances: and this is eaſily done where there is a ſpring or brook in the neighbourhood higher than the lands. Pumps, wheels, and ſuch other engines are alſo uſed in ſome places to bring on the water, and, in others, ponds, ciſterns, and receptacles are made to take in the rains and winter floods, and retain the water till ſummer, when it is wanted.

The farmers of England are very deficient in this laſt method, which they might uſe to their great benefit in many places. In Spain they have no water in many parts but what they preſerve in this manner. And at Amſterdam and Venice they have whole cellars made into ciſterns, which receive the water that falls in rains, and preſerve it all the year. Want of water for the earth in ſummer in many places might be eaſily remedied by ſome care of this kind, and many thouſand acres of land made uſeful, which are now left as waſte, by this means alone. It is very evident that this is feaſible, becauſe it is done in places where there falls much leſs rain annually than with us; and yet by this the inhabitants have always freſh water enough for the uſe of their houſes, cattle, and gardens, none of which ever fail. *Mortimer's Huſbandry.*

DRY-CU'PPING, in ſurgery, the application of cupping-glaſſes to various parts of the body, and raiſing the common tumors under them without opening them with the ſcarificator.

The uſe of Dry-cupping is two-fold, either to make a revulſion of the blood from ſome particular parts affected, or elſe to cauſe a derivation of it into the affected part upon which the glaſs is applied. It is in the firſt ſenſe that Hippocrates orders a large cupping-glaſs to be applied under the breaſts of women who have a too profuſe diſcharge of the menſes, intending thereby to cauſe a revulſion of the blood upwards from the uterus. And upon the ſame principles hæmorrhages at the noſe have been ſtopped by applying cupping-glaſſes to the legs and feet, particularly about the ancles and knees. Spitting of blood from the lungs has alſo been cured by the ſame method; and Scultetus gives a remarkable inſtance of a woman, who, by the repeated application of ſix cupping-glaſſes, without ſcarification, to her thighs, was not only relieved of the troubleſome ſymptoms ariſing from an obſtruction of the menſes, but was alſo freed from the obſtruction itſelf.

Dry-cupping is alſo uſed with ſucceſs to make a revulſion by applying the glaſſes to the temples, behind the ears, or to the neck and ſhoulders, for the removal of pains, vertigo's, and other diſorders of the head; they are alſo applied to the upper and lower limbs, to drive blood and ſpirits into them, when they are paralytic, and laſtly to remove the ſciatica, or other pains in the joints: the operation in theſe caſes is to be repeated till the part looks red and becomes painful. *Heiſter's Surgery.*

DUCK, *anas*, in zoology, the name of a very large genus of birds, the characters of which are theſe: the beak is ſhorter, in proportion, than that of the gooſe, and the feet proportionably larger. The legs are ſhorter and are placed farther backward, and the beak is flatter, and the body more compreſſed. Some of theſe love the freſh water, others are found only at ſea, and of both theſe there are very numerous ſpecies.

This fowl is furniſhed with a peculiar ſtructure of veſſels about the heart, which enable it to live without reſpiration a conſiderable time under water, as is neceſſary for it in diving. This made Mr. Boyle think it a proper object for experiments by the air-pump, than any of the other birds. A full grown Duck being put into the receiver of the air-pump, of which ſhe filled one third part, and the air exhauſted, the creature ſeemed to bear it better for the firſt moments, than a hen or other ſuch fowl; but, after about a minute, ſhe gave great ſigns of diſcompoſure, and in leſs than two minutes her head fell down, and ſhe appeared dying, till revived by letting in the air. Thus, whatever facility of diving this and other water fowl may have, it does not appear, that they can ſubſiſt without air for reſpiration, any longer than other animals. A young callow Duck was afterwards tried in the ſame manner, and with the ſame ſucceſs, being reduced very near death in leſs than two minutes. But it is obſervable, that both birds ſwelled extremely on the pumping out of the air, ſo as to appear much larger to the ſpectators, eſpecially about the crop. It not being intended that any water fowl ſhould live in an exceedingly rarified air, but only be able to continue on occaſion ſome time under water; nature, though ſhe has provided them with the means of this, has done nothing for them in regard to the other.

Northern DUCK, *anas arctica*, a name given by Cluſius to a water fowl well known on our coaſts, and called by ſeveral other names both by authors and our own common people. Aldrovand calls it pica marina, and fratercula from Geſner, and Wormius and Hoier, the lunda. We call it in ſome places the puffin, and in others the golden head, bottlenoſe, helegug, coulta-neb, or counter-neb, and the mullet and pope. It is ſmaller than the common Duck; its beak is flatted ſideways, and is broad and ſhort, ſomewhat of a triangular figure, and ending in a point; it has a callous ſubſtance at its baſe, like that over the beak of the parrot. It is partly grey, partly red, and has three remarkable furrows on it. Its legs are placed very backward, and are yellow, when the bird is young; they afterwards are red, and have no hinder toe. Its head, neck, and back are black; its breaſt, throat, and belly white; but there is a remarkable black ring which ſurrounds the throat. The ſides of the head are alſo whitiſh, or of a very pale grey. Its wings are extremely ſhort, and furniſhed with very ſmall feathers; yet by the help of theſe it flies very nimbly along the ſurface of the water, but it cannot fly at all, except its wings continually touch the water. It builds no neſt, but lays its eggs on the naked earth, or in the deſerted rabbit-holes; and, what is very remarkable, each lays only one egg. This is very large, and of a reddiſh colour. They breed with us, but are birds of paſſage, leaving us in autumn, and returning about March in ſmall numbers, as if to examine the place, after which they again depart, and in May return with the whole numbers; and, if it happens to be a ſtormy ſeaſon, multitudes of them are thrown dead upon the ſhores, for they are neither able to travel, nor to get food, except in calm weather.

The ſharp-tailed DUCK, *anas cauda acuta*, in zoology, the name of a peculiar ſpecies of Duck, having a long tail like a pheaſant. It is called in ſome places the ſea pheaſant, but more generally is known, with us, by the name of the cracker.

Horn DUCK, *anas Cornicenſis*, the name of an American Duck, deſcribed by Nieremberg, and having its name from its imitating, with its note, the ſound of the huntſman's horn. It is a very bold though weak bird, and is very difficultly tamed. This is one of the many birds mentioned by this author, which, from his imperfect account, it is impoſſible to know whether it be a new ſpecies, or ſome of thoſe deſcribed by Margrave or others.

Indian DUCK, *anas Indica*, the name of a bird of the Duck kind, deſcribed by Geſner and others, as a diſtinct ſpecies, but ſeeming by the deſcription to be the ſame with what we call the Muſcovy Duck.

Lybian Duck, *anas Lybia*, a name given by Aldrovand, Bellonius, and ſome other authors to a ſpecies of Duck, brought from that part of the world, but which appears to be the ſame with what we commonly know by the name of the Muſcovy Duck. *Ray's Ornithology.*

Muſcovy Duck, *anas Moſcata*, the name of a ſpecies of Duck, the largeſt of all the Duck kind. The general colour, both in the male and female, is a purpliſh black, though the female is ſometimes quite white. It has red fleſhy protuberances about its beak and eyes, and its voice is hoarſe, very ſoft, and ſcarce to be heard, unleſs when it is angry. The eggs of this bird are of a remarkably round figure. *Ray's Ornitholog.*

The fly-catching Duck, *anas muſcaria*, a name given by ſeveral authors to a ſpecies of Duck, from its catching flies that play on the ſurface of the water. It is deſcribed as a diſtinct ſpecies, but Mr. Ray ſuppoſes it the ſame with our wild Duck.

DUCTI'LITY (*Dict.*)—Ductility *of glaſs*.

We all know, that, when well penetrated with the heat of the fire, the workmen can figure and manage glaſs like ſoft wax: but, what is moſt remarkable, it may be drawn, or ſpun out into threads exceedingly fine, and long.

Our ordinary ſpinners do not form their threads of ſilk, flax, or the like, with half the eaſe and expedition, as the glaſs-ſpinners do the threads of this brittle matter. We have of them uſed in plumes for children's heads, and divers other works, much finer than any hair; and which bend and wave, like it, with every wind.

Nothing is more ſimple and eaſy than the method of making them: there are two workmen employed: the firſt holds one end of a piece of glaſs over the flame of a lamp; and, when the heat has ſoftened it, a ſecond operator applies a glaſs-hook to the metal thus in fuſion; and, withdrawing the hook again, it brings with it a thread of glaſs, which ſtill adheres to the maſs. Then, fitting his hook on the circumference of a wheel about two feet and a half in diameter, he turns the wheel as faſt as he pleaſes; which, drawing out the threads, winds it on its rim; till, after a certain number of revolutions, it is covered with a ſkain of glaſs thread.

The maſs, in fuſion over the lamp, diminiſhes inſenſibly, being wound out, as it were, like a pelotoon, or clue upon the wheel; and the parts, as they recede from the flame, cooling, become more coherent with thoſe next to them, and this by degrees: the parts neareſt the fire are always the leaſt coherent, and of conſequence muſt give way to the effort the reſt make to draw them towards the wheel.

The circumference of theſe threads is uſually a flat oval, being three or four times as broad as thick. Some of them ſcarce ſeem bigger than the thread of a ſilk-worm, and are flexible to a miracle. If the two ends of ſuch threads be knotted together, they may be drawn and bent, till the aperture, or ſpace in the middle of the knot, do not exceed one 4th of a line, or one 48th of an inch in diameter.

Ductility *of ſpiders webs.* — The ingenious M. Reaumur obſerves, that the matter whereof ſpiders and ſilk-worms form their threads, is brittle when in the maſs, like dry gums. As it is drawn out of their bodies, it aſſumes a conſiſtence, much as glaſs-threads become hard, as they recede from the lamp, though from a different cauſe. The Ductility of this matter, and the apparatus thereto, being much more extraordinary in ſpiders, than in ſilk-worms; we ſhall here only conſider the former. Something has already been ſaid of each under the article Silk in the Dictionary, which ſee.

Near the anus of the ſpider are ſix papillæ, or teats. The extremities of the ſeveral papillæ are furniſhed with holes, that do the buſineſs of wire-drawers, in forming the threads. Of theſe holes, M. Reaumur obſerves, there are enough in the compaſs of the ſmalleſt pin's-head, to yield a prodigious quantity of diſtinct threads. The holes are perceived by their effects: take a large garden-ſpider ready to lay its eggs, and applying the finger on a part of its papillæ, as you withdraw that finger, it will take with it an amazing quantity of different threads.

Hence M. Reaumur advances, that, as the flexibility of glaſs increaſes in proportion to the fineneſs of the threads, had we but the art of drawing threads as fine as thoſe of a ſpider's web, we might weave ſtuffs, and clothes hereof, for wear.—Accordingly he made ſome experiments this way: he could make threads fine enough, as fine, in his judgment, as any ſpider's web, but could never make them long enough, to do any thing with them.

M. Reaumur has often told 70, or 80, with a microſcope, but has perceived, that there were infinitely more than he could tell. In effect, if he ſhould ſay, that each tip of a papilla furniſhed a thouſand, he is perſuaded, he ſhould ſay vaſtly too little. The part is divided into an infinity of little prominences, like the eyes of a butter-fly, &c. each prominence, no doubt, makes its ſeveral thread; or rather, between the ſeveral protuberances, are holes that give vent to threads; the uſe of the protuberances, in all probability, being to keep the threads, at their firſt exit, before yet hardened by the air, aſunder. In ſome ſpiders thoſe protuberances are not ſo ſenſible; but in lieu thereof there are tufts of hair, which may ſerve the ſame office, viz. to keep the threads apart. Be this as it will, there may threads come out at above a thouſand different places in every papilla; conſequently, the ſpider, having ſix papillæ, has holes for above ſix thouſand threads. It is not enough that theſe apertures are immenſely ſmall: but the threads are already formed before they arrive at the papilla, each of them having its little ſheath, or duct, in which it is brought to the papilla from a good diſtance.

M. Reaumur traces them up to their ſource, and ſhews the mechaniſm by which they are made. Near the origin of the belly, he finds two little ſoft bodies, which are the firſt ſource of the ſilk. Their form and tranſparency reſemble thoſe of glaſs-beads, by which name we ſhall hereafter denote them. The tip of each bead goes winding, and makes an infinity of turns, and returns towards the papilla. From the baſe, or root of the bead, proceeds another branch much thicker; which, winding variouſly, forms ſeveral knots, and takes its courſe, like the other, towards the hind-part of the ſpider. In theſe beads, and their branches, is contained a matter proper to form the ſilk, only that it is too ſoft. The body of the bead is a kind of reſervoir, and the two branches two canals proceeding from it. A little further backward, there are two leſſer beads, which only ſend forth one branch a-piece, and that from the tip. Beſide theſe, there are three other larger veſſels on each ſide the ſpider, which M. Reaumur takes for the laſt reſervoirs, where the liquor is collected. The biggeſt is near the head of the inſect, and the leaſt near the anus. They all terminate in a point; and from the three points of theſe three reſervoirs it is, that the threads, at leaſt the greateſt part of the threads drawn out at the three papilla, proceed. Each reſervoir ſupplies one papilla. Laſtly, at the roots of the papilla, are diſcerned ſeveral fleſhy tubes: probably, as many as there are papilla. Upon lifting up the membrane, or pellicle, that ſeems to cover theſe tubes, they appear full of threads, all diſtinct from each other, and which of conſequence, under a common cover, have each their particular one; being kept like knives in ſheaths. The immenſe quantity of threads contained here, M. Reaumur concludes, upon tracing their courſe, does not all come from the points of the reſervoirs; but ſome from all the turns and angles; nay, probably, from every part thereof. But by what conveyances the liquor comes into the beads, and out of the beads into the reſervoirs, remains yet to be diſcovered.

We have already obſerved, that the tip of each papilla may give paſſage to above a thouſand threads; yet the diameter of that papilla does not exceed a ſmall pin's-head: but we were there only conſidering the largeſt ſpiders.

If we examine the young, riſing ſpiders, produced by thoſe; we ſhall find, that they no ſooner quit their egg, than they begin to ſpin. Indeed their threads can ſcarce be perceived; but their webs, formed thereof, may: they are frequently as thick, and cloſe, as thoſe of houſe-ſpiders; and no wonder: there being often four or five hundred little ſpiders concurring to the ſame work. How minute muſt their holes be? The imagination can ſcarce conceive that of their papilla! the whole ſpider is, perhaps, leſs than a papilla of the parent which produced it.

This is eaſily ſeen: each big ſpider lays four or five hundred eggs; theſe eggs are all wrapped up in a bag; and, as ſoon as the young ones have broke through the bag, they begin to ſpin. How fine muſt their threads be?

Yet is not this the utmoſt nature does: there are ſome kinds of ſpiders ſo ſmall at their birth, that they are not viſible without a microſcope. There are uſually found an infinity of them in a cluſter, and they only appear like a number of red points. And yet there are webs found under them, though well nigh imperceptible. What muſt be the tenuity of one of theſe threads? The ſmalleſt hair muſt be to one of theſe what the moſt maſſive bar is to the fineſt gold-wire drawn by art.

The matter whereof the threads are formed, we have obſerved, is a viſcid juice. The beads are the firſt receptacles where it is gathered, and the place where it has the leaſt conſiſtence. It is much harder when got into the ſix great reſervoirs, whither it is carried by canals from the former: this conſiſtence it acquires in good meaſure in its paſſage; part of the humidity being diſſipated in the way, or ſecreted by parts deſtined for that purpoſe.

Laſtly, the liquor is dried ſtill further, and becomes thread, in its progreſs through the reſpective canals to the papilla. When theſe firſt appear out at the holes, they are ſtill glutinous; ſo that ſuch as ſpring out of the neighbouring holes, ſtick together. The air compleats the drying.

By boiling the ſpider, more, or leſs, the liquor is brought to a greater or leſs conſiſtence, fit to draw out into threads; for it is too fluid for that purpoſe, while yet incloſed in its reſervoirs.

The matter contained in theſe reſervoirs, when well dried, appears a tranſparent gum or glue, which breaks, when much bent: like glaſs, it only becomes flexible by being divided into the fineſt threads. And probably it was on this account nature made the number of holes ſo immenſe. The matter of ſilk formed in the bodies of ſpiders, being much brittler than that formed in ſilk-worms, needed to be wound ſmaller. Otherwiſe we do not conceive, why ſhe ſhould form a great number of threads, which were afterwards to be reunited: a ſingle canal might have done.

DU'CTUS *Alimentarius*, in anatomy, a name given by Dr. Tyſon to the gula, ſtomach, and inteſtines; all which make but one continued canal or duct. This duct he makes the proper characteriſtic of an animal.

DUNG, in agriculture, &c. All kinds of Dung contain ſome matter, which, when mixed with the ſoil, ferments therein, and, by that fermentation, diſſolves the texture of the earth, and divides and crumbles its particles very much. This is the real uſe of Dung in agriculture, for, as to the pure earthy part of it, the quantity is ſo very ſmall, that it bears an extremely inconſiderable proportion to that of the earth it is intended to manure.

The fermenting quality of Dung is chiefly owing to the ſalts it contains, and yet thoſe or any other ſalts, applied immediately to the roots of plants, always deſtroy them. This proves that the buſineſs of the Dung is not to nouriſh but to divide and ſeparate that terreſtrial matter, which is to afford the nouriſhment to vegetables, through the mouths of their roots. And the acrimony of the ſalts of Dung is ſo great, that the niceſt managers of vegetables we have, (the floriſts) have wholly baniſhed the uſe of it from their gardens. The uſe of Dung ſhould be alſo forbid in kitchen gardens, for it is poſſible to ſucceed full as well without it; and it gives an ill taſte to all the excellent roots and plants, that are to ſtand in the earth in which it is an ingredient. The water of a cabbage raiſed in a garden, manured with Dung, if boiled, is of an intolerable ſtink; but this is not ſo much owing to the nature of the plant, as of the manure uſed to it; for, a field cabbage being boiled, the water has ſcarce any ſmell, and what it has, is not diſagreeable.

It is alſo a well known fact in the country, that a carrot, raiſed in a garden, has nothing of that ſweet flavour, which ſuch as grow in the fields have, but, in the place of this natural reliſh, the garden one has a compound taſte, in which the matter of the manure has no ſmall ſhare. And there is the ſame ſort of difference in the taſte of all roots, nouriſhed with ſuch different diet. Dung not only ſpoils the flavour of the eſculent vegetable, but it ſpoils the drinkables into the original compoſition of which it enters: they are obliged to uſe Dung to the poor vineyards of Languedoc, and the conſequence is, that the wine is nauſeous. The poor who only raiſe a few vines for the wine they drink themſelves, and cannot be at the expence of this manure, have the leſs of it, but then it is better by many degrees than the other; and it is a general obſervation which the French expreſs in theſe words, that the poor people's wine in Languedoc is the beſt, becauſe they carry no Dung into their vineyards. *Tull's horſehoeing Huſbandry.*

Another diſadvantage attending the uſe of Dung is, that it gives riſe to worms. It is for this reaſon, that garden carrots are generally worm-eaten, and field carrots ſound; and the ſame obſervation will hold good in other vegetables, in the field and in the garden. Vegetable and animal Dung are in fact only the putrefaction of earth, after it has been altered by paſſing through vegetable or animal veſſels. Vegetable Dung, unleſs the vegetable be buried alive in the ſoil, makes a much leſs ferment in it, than animal Dung does: but the Dung or putrid matter of vegetables is much more eligible and wholeſome for the eſculent roots and plants, than that of animals is. Venomous animals are found to be very fond of Dung, and are brought into gardens by the ſmell of the Dung uſed in them as manure. The ſnakes uſually frequent Dung-hills, and lay their eggs in them; and gardens, where Dung is much uſed, are always frequented by toads; whereas the fields where roots are planted, are much leſs infeſted by them.

However unneceſſary and prejudicial Dung is in gardens, it is however very neceſſary in the corn-fields, and little can be done without it in the old method of huſbandry. Dung is not ſo injurious in fields as in gardens; becauſe it is uſed in much ſmaller quantities in proportion to the quantity of ſoil, and cabbages, turnips, potatoes, and other things growing in fields, and intended only for the food of cattle, will not be injured by Dung, tillage, and hoeing all together; for the crops will by this means be the greater, and the cattle will like the food never the worſe. Dung is very beneficial in giving large crops of wheat; and it is found by experience, that the country farmers, at a diſtance from a large town, can never have ſo good crops by all their tillage, as thoſe who live in the neighbourhood of cities, where Dung is produced in great plenty, and eaſily had. The Dung uſed in fields, beſides its diſſolving and dividing virtue, is of great uſe in the warmth its fermenting gives to the young plants of the corn in their weakeſt ſtate, and in the moſt ſevere ſeaſons; the laſting of this ferment is not eaſily determined, becauſe the degrees of heat are very difficult to be judged of, when they become ſmall.

The farmers uſually underſtand, by the term Dung, not only the excrements of animals, with the litter, but every thing that will ferment with the earth, ſuch as the green ſtalks and leaves of plants buried under ground and the like, and every thing they add to it except fire.

The uſes of the Dungs of ſeveral animals are ſufficiently proved every day. They are uſed to repair the decays of exhauſted and worn out land, and to cure the ſeveral defects in different naturally bad ſoils; the faults of which are as different, as the nature of the different Dungs uſed to improve them. Some land is too cold, moiſt, and, heavy, and the other too light and dry: and, to improve and meliorate theſe, we have ſome Dung hot and light, as ſheep's, horſes, pigeons, &c. and other fat and cooling, as that of oxen, dogs, &c.

There are two remarkable qualities in Dung; the one is to produce a certain ſenſible heat capable of bringing about great effects. The other is to fatten the ſoil, and render it the more fertile. The firſt of theſe is ſeldom found in any other Dung, but that of horſes and mules, while newly made and a little moiſt. The great effects of this are ſeen in the kitchen garden, where it invigorates and gives a new life to every thing, ſupplying the place of the ſun; and to this we owe, in a manner, all the vegetable delicacies of the ſpring.

Beſide this, horſe-Dung is the richeſt of all improvements that can be had in any quantity for poor hungry lands; yet, when either too new, or when uſed alone, it is very prejudicial to ſome lands; and, if ſpread too thin on dry lands in ſummer, it becomes of very little ſervice, the ſun ſoon exhaling all its richneſs, and leaving it little more than a heap of ſtubble or dry thatch. And, though too much of it can hardly be uſed in the kitchen garden among colliflowers, cabbages, and the like, yet it is eaſy to over-dung land intended for corn, and gives riſe by that means to a very fatal quantity of weeds.

Horſe-Dung is always beſt for cold lands, and cow-Dung for hot ones; but, being mixed together, they make a very good manure for moſt ſorts of ſoils, and for ſome they are very properly mixed with mud.

Sheep's-Dung and Deer's-Dung differ very little in their quality, and are eſteemed by ſome the beſt of all Dung for cold clays; for this purpoſe ſome recommend the beating them to powder and ſpreading them thin over the autumn or ſpring crops, at about four or five loads to an acre, after the ſame manner as aſhes, malt duſt, &c. are ſtrewed. And, in Flanders and ſome other places, they houſe their ſheep at nights in places ſpread with clean ſand, laid about five or ſix inches thick, which, being laid on freſh every night, is cleaned out once a week, and, with the Dung and urine of the ſheep, is a very rich manure, and ſells at a very conſiderable price. It is principally uſed for ſtubborn lands; but Mr. Quintiney is of opinion, that it is the beſt of all manure for lands in general.

Hog's-Dung is by many recommended as the fatteſt and richeſt of all Dung, and is found, on experience, to be better than any other kind, for fruit-trees, apples, pears, and the like; it is alſo a very rich Dung for graſs, and is ſaid to do as much good in one load, as any other Dung whatever in two.

The Dungs of pigeons, hens, and geeſe are great improvers of meadow and corn land. That of pigeons is unqueſtionably the richeſt that can be laid on corn land; but, before it is uſed, it ought to be expoſed for ſome time out of the dove-houſe to the open air, to take off its fiery heat. It is in general very proper for cold clay lands, but then it always ſhould be well dried before it is laid on, becauſe it is apt to clod in the wet. It is beſt alſo to mix it with ſome dry earth to break its parts, that it may be ſpread the more regularly; and it is in itſelf ſo very rich and hot, as to bear ſuch an admixture, without greatly impoveriſhing it. This Dung is alſo by ſome recommended as better than any other for aſparagus and ſtrawberries, and for the propagation and culture of the tender garden flowers. The Dung of pigeons is alſo particularly recommended by Mr. Gentil for thoſe trees, whoſe leaves are apt to turn yellow, if they grow in cold ſoils; but for this uſe it ſhould firſt lie three years in a dunghil, and then be applied ſparingly in autumn, laying about an inch thickneſs of it at the root of the tree, and ſuffering it to remain there till the March following.

The Dung of poultry, being hot and full of ſalts, tends much to facilitate vegetation, and is abundantly quicker in its operation than the Dung of animals, which feed on the leaves of plants. It is an obſervation of Sir Hugh Plat, that one load of grains will enrich ground, more than ten loads of common Dung; and it is eaſy to infer from hence, that the ſame grain muſt needs be of greatly more virtue, when it has paſſed through an animal body. Human Dung is alſo a great improver of all cold and ſour lands, but ſucceeds beſt, when mixt with other Dungs or earths to give it a fermentation.

But, for all ſtubborn clayey ſoils, there is no manure ſo good as the cleanſing of London ſtreets; the parts of tough land will be more expeditiouſly ſeparated by this, than by any other compoſt, and, where it is to be had, it is of the greateſt value both for field and garden land. *Miller's Gard. Dict.*

Gooſe DUNG. This is a very valuable manure, and as uſeful to the farmer as pigeon's Dung, or that of any other fowl. The antients thought otherwiſe, and condemned it as prejudicial both to corn and graſs, and many are of the ſame opinion ſtill, but without any foundation in fact. Indeed where corn is high, and when graſs is ready to mow, theſe birds, if they got among it, will do great damage by treading it down with their feet; but their Dung, inſtead of being hurtful to the land, does it a great ſervice. Near Sutton in Nottinghamſhire, there is a barren piece of land given by the town, for a gooſe paſture; the geeſe have been kept in it many years, and their Dung has ſo enriched it, that it is one of the fruitfulleſt pieces of ground, in the whole country. There has been an opinion alſo, that cattle feeding on graſs, where theſe creatures had much dunged the ground, would ſuffer by it; but it appears from trial, that cattle are moſt fond of all of thoſe parts of paſtures, where the geeſe have dunged moſt; and that they ſuffer no alteration by it, except the growing fat upon it. The Dung of fowls in general is very enriching to land. Fig-trees, aſparagus beds, and ſtrawberries, and many curious flowers ſucceed better in earth manured with pigeon's Dung, than in any other; and Fowley iſland in Lancaſhire, a place ſo called from the abundance of wild fowl continually found on it, is ſo enriched with their Dung, that it fattens ſheep in a ſurprizing manner. *Mortimer's Huſbandry.*

DU'RION, in natural hiſtory, the name of a fruit common in China and the Eaſt-Indies, and eſteemed by the Indians the fineſt of all fruits; but the Europeans do not allow this, becauſe of its diſagreeable ſmell. The tree which bears it is large and much branched, and its wood is like that of the hazel. The leaves are of a very ſingular figure, being about ſix inches long, and ſixteen or eighteen inches broad: they terminate in a long and ſlender point. The upper ſide of the leaves is of a duſky green, the under ſide is whitiſh with ſome yellow ſpecks. The leaves grow on ſhort pedicles, which are joined to the ſtalks by a protuberance or oblong knot. The fruit grows to the large branches, adhering to their middles by a ſtrong woody ſtalk. It is of the ſize of an ordinary melon, and of a conic ſhape, pointed at the extremity, and is all over beſet with prickles reſembling thoſe of a hedge-hog: they are green, and very large and thick. When thoroughly ripe, the fruit opens at the extremity into five parts, and, the cracks or openings running by degrees to the top, the inner ſubſtance or pulp is diſcovered. This is of a whitiſh colour, and of a very agreeable flavour, which may not unaptly be compared to that of cream and ſugar; but it is of a more firm conſiſtence. This fruit contains in every compartment five large ſeeds perfectly reſembling the common cheſnut, but that they have no other covering than their own ſkins.

The courſe of vegetation is elegantly ſeen in diſſecting the pedicle which ſupports this fruit; for in this are ſeen the three different juices which ſerve to the nouriſhment of three different parts of the fruit. In cutting this pedicle tranſverſly, we firſt find, between the bark and the woody fibres, a yellowiſh, thick, and glutinous juice: this ſerves for the nutriment of the thorns. A ſecond juice diſcovers itſelf between the firſt woody fibres, which is white and more ſolid, and leſs glutinous. This gives nouriſhment to a thick ſkin of a ſilver white, which lines the pulpy part of the fruit. And, finally, in the center of the pedicle there runs a third, much whiter and ſofter than the former, which ſerves to the nouriſhment of the pulp, or ſoft and ſweet-taſted part of the fruit.

The fruit itſelf, were its ſmell as agreeable as its taſte, would vie with any fruit in the world; but its very diſagreeable ſcent requires time and cuſtom to enable any one to bear it; but uſe makes the natives wholly diſregard it. The ſmell is very like that of onions, that have lain in heaps till they are very rotten. The fruit is not only agreeable to the taſte, but of a very cordial virtue; but it will intoxicate and get into the head, if eaten in a large quantity, eſpecially ſuch of the fruits as are of a yellowiſh colour. The natives make debauches with it, as our poorer people do with ſpirituous liquors. But it is not ſo eaſily come at as thoſe, and therefore is very fatal to many families among them, who will ſell their liberties for a time to purchaſe enough of it for a debauch.

The Durion tree flowers in January. The flowers are of a duſky colour, and of the ſize of a nut. As ſoon as theſe fall, the fruit begins to appear. It afterwards increaſes ſlowly in ſize till the month of June, in which it begins to ripen. Others continually ſucceed theſe early ones during the whole ſummer, ſo that there is a ſucceſſion of them during that ſeaſon, and they do not begin to grow ſcarce till about the middle of October. *Mem. Acad. Scienc. Par.* 1699.

DU'TY (*Dict.*)— Duties, in regard to trade, are thoſe impoſts or taxes, which are laid on merchandizes at importation or exportation, which are commonly called the Duties of cuſtoms; the taxes of exciſe, alſo, are frequently diſtinguiſhed by the Duties of exciſe.

The principles on which all Duties and cuſtoms ſhould be laid on foreign merchandizes, which are imported into theſe kingdoms, are ſuch as tend to cement a mutual friendſhip and traffick between one nation and another; and, therefore, due care ſhould be taken in the laying of them, that they may anſwer ſo good an end, and be reciprocal in both countries: they ſhould be ſo laid as to make the exports of this nation, at leaſt, equal to our imports from thoſe nations wherewith we trade; ſo that a balance in money ſhould not be iſſued out of Great Britain to pay for the goods and merchandizes of other countries; in order that no greater numbers of our land-holders and manufacturers ſhould be deprived of their revenues ariſing from the product of the lands, and the labour of the people, by foreign importations, than by exportations to ſuch countries.

Theſe are the national principles, upon which all our treaties of commerce with other countries are to be grounded: and, as all ſtates and empires are daily making their utmoſt efforts for the advancement of commerce, and to prevent the importation of our manufactures into their kingdoms: as ſuch-like meaſures are the moſt effectual reſtraints and prohibitions upon our commerce, there ſeems no other way to redreſs the grievance, than by retaliating upon them, and ſupplying ourſelves, at leaſt, with their commodities in a degree of proportion diminiſhed equal to what they have leſſened in ours. For, if this policy is neglected, and traders are left to act at random, according to their own will, nothing is more certain than that they are taking ſteps gradually to ruin the nation, notwithſtanding the Duties of cuſtoms ſhould be daily increaſed by theſe augmented impoſts. So that the additional increaſe of the cuſtom-houſe revenue is not the criterion of an increaſe of national commerce and treaſure, but the infallible touch-ſtone of the reverſe.

But one fundamental branch of the ſupport of the royal revenue depending on the good plight and augmentation of the Duties ariſing on cuſtoms, it is no wonder that, ever ſince thoſe Duties have exiſted, every meaſure has been taken to improve and increaſe them. But let every judicious man conſider upon what principle of policy can this part of the public revenue poſſibly be increaſed. Does not this increaſe of revenue ariſe from the increaſe of foreign imports? And, as the importation and conſumption of theſe imports diminiſh, will not the cuſtom-houſe revenue decline?

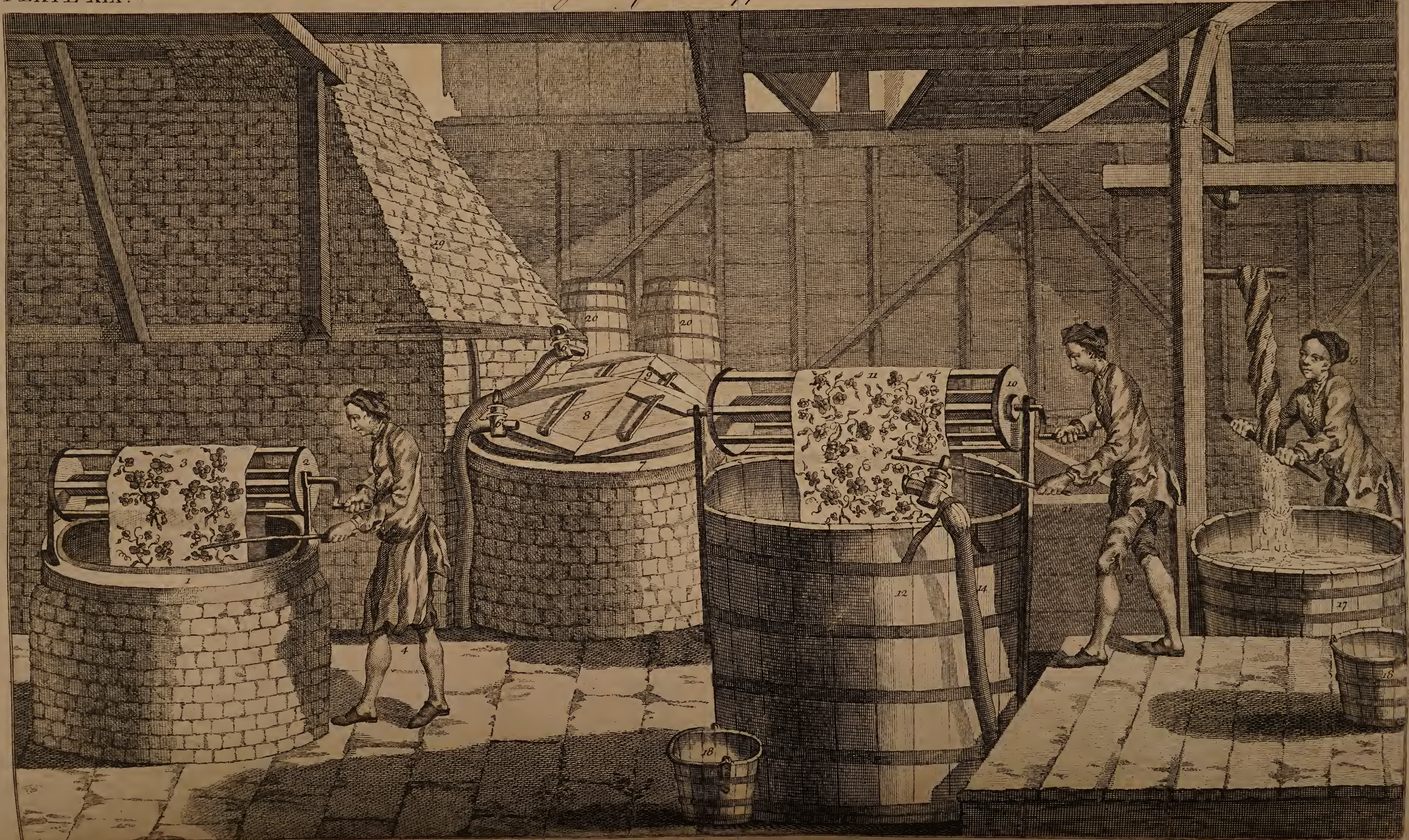
Now, ſince the increaſe of the conſumption of foreign productions and manufactures, among us, has an inevitable tendency to impoveriſh our own nation, and enrich others, the greater care that is taken to increaſe and improve the cuſtom-houſe branch of the revenue, can it have any other effect than to haſten the ruin, rather than promote the opulence of the kingdom? Unleſs our exports in value keep pace with our imports. As our exports, however, do not, according to the conſtitution of the public revenue, afford an increaſe of the Duties of cuſtoms any way proportionate to our imports, men in power have not thoſe inducements to rouſe and ſtimulate them ſo much in regard to the one, as they have in regard to the other.

Wherefore, ſince an increaſe of the public revenue, nay, the increaſe of the king's own royal revenue of the civil liſt, depends, in a great meaſure, upon the increaſe of our foreign imports, rather than our native exports; does it not appear, that the very fundamental conſtitution of the revenue, both generally public, and perſonally royal, depends on our purchaſing more of foreign commodities than in ſelling of our own; or, to ſpeak in the modern phraſe, now familiarly uſed in France, Spain, and Italy, more on a paſſive than on an active kind of commerce; that is, in buying more foreign commodities than we ſell of our own native ones?

In regard, likewiſe, to our Duties of exciſe, let it be candidly conſidered, how far they may affect the general commerce, and wealth, and power of the nation. Are they not laid even upon thoſe neceſſaries of life which affect the labour of the huſbandman and the farmer; and, conſequently, the country gentleman, as well as the artſman, mechanics, and manufacturers of every claſs, throughout the whole kingdom? The public, as well as the perſonal royal revenue of our ſovereign himſelf, doth alſo greatly depend on the keeping up, if not increaſing, the product of the exciſe funds; and the very being and exiſtence of theſe funds depend upon clogging and incumbering our native productions and manufactures: as this is the caſe, no one will preſume to ſay that the conſtitution of this, any more than the cuſtom-houſe branch of the revenue, is ſo laid, as neceſſarily to advance that commerce and navigation, which alone can uphold and ſupport the ſtate. It is true there are drawbacks allowed of the exciſe Duties upon the exportation of ſome commodities to foreign countries; ſuch as on beer, ale, &c. yet the Duties on ſoap and candles, and other neceſſaries of life, that are conſumed in our mechanic and manufactural arts, are not drawn back, but render the workmanſhip of thoſe artiſts dearer, in proportion to the weight of theſe taxes; which muſt unavoidably prove detrimental to our traffic, as it occaſions other nations to under ſell us.

As our intent is only to ſet things in that ſingle point of view which relates to trade, I ſhall conſider exciſes in no other light than as taxes on commodities, but attempt to ſhew the augmentative faculty of all ſuch taxes, and the great prejudices they do to trade; for whatever raiſes the neceſſaries of life, raiſes labour, and, of courſe, the price of every thing that is produced by labour. How our exciſes do really encumber our traffic will eaſily appear, they trebbling themſelves almoſt to the people for what they raiſe to the government; and it is to be greatly feared it would appear much more, if we could go to the bottom of the incumbrance; for it is to be conſidered that tradeſmen in a country, by their

PLATE XIX. *Engraved for the Supplement.* *Facing* Dye-house



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their mutual dependence on each other, are like wheels in a machine, in which, if one is touched, the others are affected.

Amidſt ſo many trading movers, to what degree the oppreſſion is increaſed, is not eaſy to ſay; nor can we be ſtartled at the largeneſs of ſuch computations; for, circulated chiefly among ourſelves, and going out by dribblets, we hardly perceive them, but yet are ſurprized to find wages and neceſſaries grow dearer and dearer, becauſe few uſe themſelves to conſider the immenſity of ſuch collected advances in ſuch ſums; if, however, we compare the difference of the prices of neceſſaries between England and France, we ſhall find that difference obviouſly accounting for the prodigious amount of the conſequences of our taxes; nor can it be a trifle that makes ſuch a fruitful country, as England is, ſo dear, and its trade declining: for our working people, being forced to purchaſe the neceſſaries of life dear, muſt work dear to live, until their willing working hands are tied up by foreigners, who live leſs taxed, and, of courſe, work cheaper; ſo that they muſt, and do, underſell us at all markets for manufactured goods, where they come in competition with us, and, in time, muſt and will ſtop all ſuch exports.

And we may appeal to the judgment of every honeſt man converſant in trade, whether he does not experience our trade to decline year after year, more eſpecially our woollen trade, which has been eſtimated to be as neceſſary to us as bread is to the life of man; for our dearer goods muſt lie unſold, or be ſold with loſs, which muſt ſtop, or break our merchants; they, our clothiers, and weavers, &c. they, their journeymen who muſt either ſtarve, turn beggars, thieves, or fly to our enemies, and help them to ruin us the faſter; which has certainly happened too much of late years.

DWARF-*Trees* (*Dict.*)—Theſe were formerly in much greater requeſt than they are at preſent; for, though they may have many advantages to recommend them, yet, the diſadvantages attending them greatly over-balance; and, ſince the introducing of eſpaliers into the Engliſh gardens, Dwarf-trees have been deſtroyed in moſt good gardens, for the following reaſons.

1. The figure of a Dwarf-tree is very often ſo much ſtudied, that in order to render the ſhape beautiful, little care is taken to procure fruit, which is the principal deſign in planting theſe trees.

2. The branches, being ſpread horizontally near the ſurface of the ground, render it very difficult to dig, or clean the ground, between them.

3. Their taking up too much room in a garden, eſpecially when they are grown to a conſiderable ſize; for nothing can be ſown or planted between them.

4. Theſe trees, ſpreading their branches near the ground, continually ſhade the ſurface of the earth, ſo that neither the ſun nor air can paſs freely round their roots and ſtems, to diſſipate noxious vapours; whereby the circumambient air will be continually replete with crude rancid vapours, which, being drawn in by the fruit and leaves, will render its juices crude and unwholeſome, as well as ill-taſted.

Theſe evils being intirely remedied by training the trees to an eſpalier, hath juſtly gained them the preference; however, if any one has a mind to have Dwarf-trees, notwithſtanding what has been ſaid, I ſhall lay down a few rules for their management.

If you deſign to have Dwarf pear-trees, you ſhould bud or graft them on quince-ſtocks; but as many ſorts of pears will not take, if they are immediately budded, or grafted on quince-ſtocks, ſome of thoſe ſorts which will take freely, ſhould be firſt budded on the quince-ſtocks; and, when theſe have ſhot, the ſorts you intend to cultivate, ſhould be budded into theſe: for free ſtocks are apt to make them ſhoot ſo vigorouſly, as not to be kept within bounds. Theſe grafts or buds ſhould be put in about four or ſix inches above the ſurface of the ground, that the heads of the trees may not be advanced too high; and, when the bud or graft has ſhot out four eyes, you ſhould ſtop the ſhoot, to force out lateral branches.

Two years after budding, theſe trees will be fit to tranſplant where they are to remain; for, though many people chuſe to plant trees of a greater age, yet they ſeldom ſucceed ſo well as young ones. The diſtance theſe trees ſhould be planted is twenty-five feet ſquare; for leſs will not do, if the trees thrive well. The ground between them may be cultivated for kitchen-garden herbs, while the trees are young; but you ſhould not ſow or plant too near their roots.

In order to train your trees regularly, you ſhould drive ſtakes into the ground round the tree, to which the branches ſhould be nailed down with liſt in an horizontal poſition; for, if they are ſuffered to take a perpendicular figure, while young, they cannot be afterwards reduced, without great violence, to any tolerable figure. The neceſſary directions to be afterwards followed are, not to ſuffer any branches to croſs each other; and always in ſhortening any ſhoots be ſure to leave the uppermoſt eye outwards, whereby the hollowneſs in the middle of the tree will be better preſerved; and be careful to rub off all perpendicular ſhoots in the middle of the trees, as ſoon as they are produced. The other neceſſary rules you will find under the article of PRUNING.

The ſorts of pears which do beſt in Dwarfs, are all ſummer and autumn fruits: for winter pears are not worth planting in Dwarfs, they ſeldom bearing well, nor are ever well taſted, and commonly are very ſtony; becauſe they are commonly grafted on quince-ſtocks.

Apples are alſo planted in Dwarfs, moſt of which are new budded or grafted on paradiſe-ſtocks; but, as theſe are for the moſt part of a ſhort duration, they are not profitable, and are fit only for ſmall gardens, as a matter of curioſity; producing fruit ſooner, and in greater plenty, than when they are upon crab or apple-ſtocks.

The diſtance theſe trees ſhould be planted, if on paradiſe-ſtocks, ſhould be ſix or eight feet: but, if on crab-ſtocks, ſixteen or twenty feet aſunder each way. The management of this being the ſame with pears, I need not repeat it.

Some perſons alſo plant apricots and plums for Dwarfs; but theſe ſeldom ſucceed well, as being of a tender conſtitution; and thoſe which will produce fruit on Dwarfs, are much more likely to do ſo, when trained on an eſpalier, where they can be much better managed; and, therefore, I judge it much the better method, as being more certain, and the trees will make a better figure.

DYE-HOUSE, a place where cloth, linen, &c. are dyed.

Explanation of *Plate* XIX, repreſenting part of the inſide of a Dye-houſe.

1. A copper containing the dye, which is kept boiling during the operation.

2. A winch by which the cloth, or linen, is turned in the copper; for the linen, one part of which is placed on the winch, is, by turning it round, made to come out and fall again into the dye in the copper without any fold in it, which would have been the conſequence, had the whole piece been put at once into the copper: but by this contrivance every part of the ſtuff is equally expoſed to the action of the dye.

3. The linen on the winch.

4. A man turning the winch, which cauſes every part of the linen to be equally affected with the action of the dye. The man keeps turning the winch all the time the linen is continued in the dye, but not conſtantly the ſame way; for, when he comes to the end of the piece, he turns the winch the other way, by which means the linen is again moved in the dye.

5. A pipe to ſupply the coppers with water.

6, 6. Cocks to the pipe.

7. Another copper covered with its lid, 8.

9. Lid of another copper, which could not be expreſſed in the view, it being behind that marked 7.

10. A winch for waſhing the linen, after it is dyed, in cold water.

11. The linen on the winch.

12. A tub containing cold water, in which the linen is waſhed.

13. A man turning the winch, in order to waſh the linen in the water.

14. A pipe for ſupplying the tub with water.

15. A man wringing the linen after it has been waſhed; after which it is hung up to dry, and then calendared.

16. The linen on a pin, or hook.

17. A tub that receives the water, which is wrung out of the linen.

18, 18. Two pails.

19. A common chimney to all the coppers.

20, 20. Tubs which contain the dye.

21. A back for waſhing the linen. Its uſe is the ſame with that of the tub before deſcribed; but, being generally much larger, ſeveral men can work at it, at one time; whereas only one can work at a tub.

DYING (*Dict.*)—The art of Dying is of great antiquity, as appears from the traces of it in the oldeſt ſacred as well as prophane writers. The honour of the invention is attributed to the Tyrians, though, what leſſens the merit of it is, that it is ſaid to have owed its riſe to chance. The juices of certain fruits, leaves, &c. accidentally cruſhed, are ſuppoſed to have furniſhed the firſt hint; and that coloured earths, and minerals waſhed and ſoaked with rain, gave the next Dying materials. But purple, an animal juice, found in a ſhell-fiſh, called murex, ſeems to have been prior to them all. The diſcovery of its tinging quality is ſaid to have been taken from a dog, which, having caught one of the purple fiſhes among the rocks, and eaten it up, ſtained his mouth and beard with the beautiful liquor, which ſtruck ſo ſtrongly the fancy of a Tyrian nymph, that ſhe refuſed her lover Hercules any favours, till he had procured her a mantle of the ſame colour.

Till the time of Alexander we find no other ſort of dye in uſe but purple and ſcarlet.—It was under the ſucceſſors of that monarch, that the Greeks applied themſelves to the other colours; and invented, or at leaſt perfected, blue, yellow, green, &c.—For the ancient purple, it has been long loſt, but the perfection to which the moderns have carried the other colours abundantly indemnifies them of the loſs. In this the French, under the auſpices of that excellent miniſter M. Colbert, ſeem to have outſtripped moſt of their neighbours.

Among the Romans, dye-houſes, baphia, were all under the direction of the comes ſacrarum largitionum; though they had each their peculiar præpoſitus, as at Alexandria, Tyre, &c.— The dyers of London make the 13th company of the city, incorporated under Henry VI. conſiſting of a maſter, warden, and livery.— At Paris, and in moſt of the great cities in France, the dyers are divided into three companies; viz. thoſe of the great dye, du grand & bon teint, who are only to uſe the beſt ingredients, and ſuch as ſtrike the ſureſt and moſt laſting colours.— Dyers of the leſſer dye, du petit teint, who are allowed to uſe the inferior ſorts of drugs, which only yield falſe and fading colours.— And ſilk, wool, and thread dyers.— All the higher-prized cloths and ſtuffs are reſerved to the dyers of the firſt ſort: thoſe of leſs value, particularly ſuch as are not rated at above 40 ſols the ell in white, are committed to the maſters of the petit teint. Blue, red, and yellow, are reſerved more peculiarly to thoſe of the grand teint; browns, ſallows, and blacks are common to both ſorts. As to black, it is begun by the dyers of the grand teint, and finiſhed by thoſe of the leſſer.— It ſeems there is a tradition among dyers, that Jeſus Chriſt was of their profeſſion; which we alſo find delivered in the goſpel of the infancy of Jeſus, though on what grounded we know not. But it is hence, the Perſian dyers, notwithſtanding all their Mahometaniſm, have choſen Jeſus for the patron of their art; inſomuch that, among them, a dye-houſe is called Chriſt's ſhop.

Dying *ingredients*, or the materia tinctoria, are beſt reduced under two heads:— colorata, or thoſe which properly give the colour.— And non-colorata, uſed to prepare the ſtuffs for better taking the dye, and to heighten the luſtre of the colours.

The colouring ingredients are of three ſorts, blue, yellow, and red.— To the firſt ſort belong indigo, woad, weld, wood-wax, and log-wood; to the ſecond, fuſtic; to the third, madder, brazil, cochineal, kermes, ſafflower, and ſanders.— To which may be added annotto, and young fuſtic, for orange-colours: laſtly, wood ſoot.

The art of Dying is indebted, for many of its valuable colours, to the vegetable kingdom; and may be much more ſo, if the world will be at the pains of enquiring into the properties of the plants that grow about the fields. Mr. Juſſieu obſerved, in the drying plants between ſheets of paper, in order to the making a hortus ſiccus in the common way, that ſome plants tinged the papers with colours the ſame with thoſe they naturally poſſeſs, and others with different ones; and that many plants in drying aſſumed a colour which was not natural to them. Alkanet, woad, the ſeveral ſorts of gallium, and ſome of the ſpecies anonis, tinge the papers between which they are dried to a yellowiſh or reddiſh colour, becauſe their ſtalks, or ſome other parts of them, are of that colour. The common ros ſolis, or ſun-dew, whoſe leaves are red, tinges the paper red alſo; and the ros ſolis of Portugal diffuſes this tinge through three or four ſheets of paper. The Alpine veronica, though green in itſelf, leaves its mark in red upon the paper; and many of the common leguminous plants always become black in the drying. The common mercury, which is green, while growing, becomes blue in the drying; and turnſole has the ſame change, though it is white in its natural ſtate.

One great reaſon of theſe changes of colour is, that all paper is impregnated with alum; and this ſalt may very eaſily extract, or even alter the colours of plants, whoſe juices it receives; and in ſuch caſes, where the alum is not in ſufficient quantity to do this, it is no wonder that it ſhould however ſo far affect the leaves as to turn them black.

On this principle, Mr. Juſſieu attempted, by means of alum, to ſeparate colours from ſeveral plants, not known or uſed at preſent among the dyers, which might prove ſerviceable to them. The firſt experiment made on this occaſion proved, that there were many plants not uſed at preſent, which afford colours not at all inferior to thoſe in common uſe. The experiments the ſame gentleman tried on the drugs uſed for Dying in the Indies, proved very plainly that they were no way ſuperior in many caſes to vegetables of our own growth; and that, in order to have the moſt lively colours from ſuch ſubſtances, it is always neceſſary to have recourſe to ſome ſalt.

Among the other drugs uſed abroad in Dying, there were ſent over to France, on this occaſion, certain yellow flowers of the radiated kind, which afforded on trial a very beautiful yellow dye; and Mr. Juſſieu found, on trying parallel experiments, that there were alſo yellow flowers in Europe of a like radiated kind, which were capable of affording a like beautiful yellow dye.

The flower which Mr. Juſſieu tried theſe experiments upon, was the common yellow corn marygold, the chryſanthemum ſegetum of Lobel. This plant flowers in the middle of July, and Mr. Juſſieu, drying its flowers between papers at that time of the year, found that they did not loſe their colour, as moſt others do in the operation, but became of a deeper yellow than before. Hence it was eaſy to judge, that this flower contained a matter proper for colouring; and, decoctions being made of it of different ſtrength, cloths of different kinds dipped into them became tinged to a light pale yellow, and keep this colour after being boiled in fair water. A little alum was after this added to the decoctions, and cloths dipped in theſe became much more finely dyed, the colour being greatly ſtronger and more lively. They alſo imbibed the colour much more ſpeedily from the decoctions; and, on boiling afterwards in water, they loſt no part of it, but remained as ſtrongly and as lively tinged as before. This experiment was afterwards tried by a dyer, under whoſe hands it ſucceeded much better than before with Juſſieu, who was unacquainted with the regular methods of the trade. The decoctions of the flowers gave a ſort of ſulphur colour; but linen, woollen, and ſilken things, which had been the day before ſteeped in alum water, received from this decoction a very beautiful and ſufficiently ſtrong yellow. Another decoction of the flowers, made ſtronger than the firſt, tinged a woollen cloth to a greeniſh lemon-colour; and the ſame decoction gave a bright gold-yellow to ſilk: and a piece of woollen cloth, before dyed blue with indigo, on dipping it in this decoction, became of a beautiful deep-green. A ſmall quantity of chimney ſoot added to the decoction made it tinge cloth of a yellowiſh-brown, and a ſmall quantity of roucou added to the ſimple decoction produced an olive-yellow.

The mixture of ſeveral other drugs, uſed to be added to the decoctions of the common luteola or dyer's weed to vary its tinge, produced the ſame changes with the decoction of this flower, and abundantly teſtified its value and uſe in the Dying trade. *Mem. Acad. Par.* 1724.

There is therefore great reaſon to believe, that the art of Dying might be carried to much greater perfection than it is at preſent, if the attempts to improve it were in proper hands, and the perſons employed in it could be enabled to ſet out with all the knowledge there is at preſent in regard to its ſeveral materials, and their manner of uſe, as a fund of real facts on which to ground future diſcoveries. This however ſeems too difficult to be brought about, for the people who exerciſe the art generally are acquainted only with a certain ſet of rules, which though they know not they follow, yet they will not depart from them, and eſteem every thing loſs of time that can be propoſed to them as improvements. They keep their knowledge alſo a cloſe ſecret from thoſe who might be expected to improve upon it; and uſually, one man trades only in ſome one part of it, without any knowledge of the reſt. Hence the difficulties attending the acquiring a knowledge of the firſt principles of the art are very diſcouraging, but they are not unſurmountable. The idea which preſents itſelf moſt naturally to us, as to the manner in which ſtuffs are dyed, is, that the colouring particles which ſwim in the liquor, immediately attach themſelves to the ſurface of the body that is plunged into it, and there adhere in ſo firm a manner, that there is no removing many of them without wholly taking off the ſurface of the body. The barely plunging a white ſubſtance into a coloured liquor is not however ſufficient for the Dying of it in many caſes. Indeed, there are only a few colours which will ſtrike with this eaſe and facility; and the others require that the matter to be dyed ſhould have firſt received the particles of another fluid, which is in moſt caſes a ſolution of alum and tartar in common water. And, according to the nature of the colour that is to be given the ſtuff afterwards, the alum is put in large quantities, or the ſtuff boiled in the liquor a longer or a ſhorter time. After boiling in this liquor, a ſtuff is in the proper condition to receive the greater part of the common colours; but, for blue, ſtuffs require no preparation at all; and, for ſcarlet, the liquor in which they are firſt boiled is made without alum.

The matter of the ſtuff to be dyed makes it neceſſary alſo to change the liquor in which it is boiled, or to vary the ingredients; and the greateſt naturaliſts, without a mechanical knowledge of Dying, would be amazed to ſee, that if a ſkain of white wool, and another of white cotton, be plunged together into the ſcarlet dye, and this even after they have both received the ſame previous boiling and preparation, the ſkain of cotton would come out of the liquor as white as it was put in, while the wool comes out tinged of a beautiful fire-colour. The dyer however ſees this every day without an admiration of the cauſe, and never troubling his thoughts about how it is done. He uſes it daily, to dye any thing woollen to a ſcarlet-colour, leaving a part white: in order to which, he knows, there requires no more than that the part, to be left white, ſhould be of cotton.

Mr. du Fay, ſuppoſing this to be owing to the cotton's imbibing, much more ſlowly than the wool, the liquor in which they are both previouſly boiled to make them receive the colour, as cotton is well known not to take wet ſo ſoon as wool, ordered a ſort of cloth to be wove, the warp of which was wool, and the woof cotton; and, ſending this to the fuller's, the two ſubſtances were ſo well blended together, that it became impoſſible for the one to receive the impregnation of any liquor without the other. With all theſe precautions however, the whole came out of the ſcarlet dye in the
ſame

ſame condition as if nothing had been done, the cotton remaining wholly white, and the wool being marked with fire-colour and white; ſo that it may be eſteemed a certain fact, that the colour of cochineal cannot be given to cotton by the means of acids; the ſame alſo holds good of kermes and gum-lac, both which are uſed inſtead of cochineal to dye in ſcarlet; but neither of theſe, any more than the cochineal, will dye cotton. It is not to be concluded from hence however, that cotton cannot be dyed ſcarlet by thin ſubſtances; the truth is, that it requires a different treatment; and, as wool, to take the ſcarlet dye, requires only to be firſt impregnated with tartar, cotton requires to be firſt impregnated with alum, as wool does, for the generality of other colours. The acid of ſea-ſalt, of vitriol, vinegar, and verjuice, all ſerve to dye wool to a ſcarlet with cochineal, but none of theſe will make it give any tinge to cotton, though alum alone can ſerve.

The ſame dye will give very different colours to the different parts of a cloth, which have been differently prepared. And this gentleman ſhewed before the Academy a piece of cloth, which he had carefully prepared in a different manner in the different parts, which being all plunged together into the dye, when taken out and dried, was found to be of a dirty red in that part where it had not been impregnated with any thing; and in the other parts, where it had been differently impregnated, was found of all the degrees of red, from a pale damaſk roſe-colour to the deepeſt ſcarlet, and this, while it had in every part been dipped an equal time in the ſame dye. This equally holds good of the other colours. And, in theſe experiments, the dirty colours given to ſuch parts of the cloth as have received no previous impregnation, will be waſhed away, and quite carried off, while the others remain in all their perfection.

Another circumſtance very worthy attention in the Dying of ſcarlet is this, that the dye is evidently compoſed of a clear or common water, in which the colouring particles are ſuſpended, and from which it is eaſy to ſuppoſe that they are ſeparated and applied to the ſtuff in Dying. As this is naturally ſuppoſed to be the caſe in regard to all colours, ſo it appears very evidently to be a fact in this, ſince the colouring particles adhere in ſuch quantities to the matter, and ſeparate themſelves ſo readily and perfectly from the water, that after an hour and half's boiling of the dye with the proper quantity of the ſtuff in it, the whole coloured matter ſhall be attached to the ſtuff, and the remaining liquor be only clear water; and what might appear wonderful is, that all the boiling in the world will never diſlodge any of the colour from the ſtuff, or occaſion its being received into the water again.

It might be ſuppoſed that this was wholly owing to the particles of ſalts, which had been imbibed into the ſtuff in its prior preparation; that theſe attracting the particles of the colour to the ſtuff, while the water of the dye had none of them to cauſe ſuch an attraction in it, they did not remain in it. But this appears not to be the caſe, but that the ſtuff will attract the colour, whether it be previouſly prepared, or the preparation and the Dying be all one act; ſince the dyers ſometimes dye ſcarlet at once in this manner, only plunging the ſtuff into a dye made of cochineal, a ſolution of tin mixed in a large quantity of water, with a ſmall quantity of ſal armoniac and cream of tartar. All theſe ingredients are mixed together before the ſtuff is put in, yet, after it has boiled about an hour and half, all the colour is in the ſtuff, and the liquor is become colourleſs as water. The event is the ſame in the dyes made of woad and of indigo for the Dying blue, and indeed in the greater part of other colours; but as the ingredients of theſe are not ſo pure as the cochineal, and there are uſually many heterogeneous particles among them, the liquor does not become ſo wholly colourleſs in theſe, as in the caſe of the ſcarlet. But the dyers, who well know, that ſo long as there is any colour left in the liquor, ſo long the ſtuff will be profited by remaining in it, always take ſmall quantities out of it, and, examining it by pouring it gently down againſt the light, they know when it is that the ſtuff has received all the tincture it can, by there being no more colouring matter ſuſpended in the dye.

Experience ſhews, that all colours do not attach themſelves with equal readineſs to the ſtuff, or remain equally firmly united to it. Woad, indigo, cochineal, kermes, and many other colours, never reach farther than the ſurface of the ſtuff. The liquor of the dye penetrates indeed perfectly through the body of it, but the colouring particles ſtopping at the ſurface become entangled there, and never penetrate, at leaſt, not in any great quantity, to the central part, which remains either quite white, or only very ſlightly tinged. This however only happens to ſuch ſtuffs as are thick, and of a very cloſe texture: others are coloured throughout. And this is only the caſe in regard to ſome dyes, not to all ſorts, ſince moſt of the wood-colours penetrate wholly through the ſtuff, be it ever ſo thick, and colour it equally every-where. Whence it ſeems probable, that the colouring particles of the woods are either more minute and fine, or much more intimately blended with the water, than thoſe of cochineal, indigo, and ſuch others as do not penetrate beyond the ſurface.

It might ſeem ſtrange, that the ſtuffs which are thus readily coloured on the ſurface, ſhould not afterwards, by the continued boiling of the water, have the colouring particles carried farther down into the body, as the water continually penetrates the whole from each ſurface to the center, and might naturally be expected to carry a part of the colouring particles in along with it. But, if we conſider the whole proceſs from the beginning, we find that the colouring particles are ſtrongly attracted by the ſtuff, and ſcarce at all by the water. Whence they almoſt immediately leave the water, and attach themſelves to the firſt part of the ſtuff they come in contact with, which is its ſurface; and, when once fixed there, it is no wonder that the particles of water, ever ſo long paſſing by them, do not attract or take them away from this ſurface, as they muſt do in order to carry them in; ſince we have before had proof, that their attraction to the water is greatly weaker than that to the ſtuff. And the difference between the wool and the cotton, the one receiving, and the other not receiving at all the coloured particles in its natural ſtate, or with the ſame impregnation by means of which the other does, ſeems reſolvable into the ſame principle, that though the attraction in wool be much greater in regard to the coloured particles than that of the water, and therefore it robs the water of them; yet the attraction in cotton being leſs than in water, the colouring particles remain in the water without any tendency to attach themſelves to the cotton.

In Dying, the ingredients uſed for the colours are well known to be of very different kinds. Some of them are ſuch as communicate a colour, which will a long time reſiſt the injuries of the air, and theſe are therefore called the good or ſtanding colours; and there are others which the bare expoſition to the air will deſtroy or deface in a very little time; theſe are therefore called the falſe or fading colours. In what manner is the action of the air upon theſe laſt to be explained? Does it take away, or carry off from the ſtuff, the very particles of the colours; or does it only break and deſtroy that beautiful and regular texture of each particle on which the colour depends? The dyers very often have recourſe to ſeveral ingredients, in order to produce one colour; and reaſon ſeems to urge, that one of theſe falſe or fading colours might be rendered laſting by mixing it with a permanent one: the dyers are alſo of this opinion. But it is nevertheleſs an erroneous one; for repeated experiments have proved, that one of theſe falſe colours fades as ſoon, when it is mixed with a ſtanding or laſting colour, as when it is uſed alone. There are but few colours on which this experiment can be tried, ſo as to come to a regular deciſion. One of the principal is the mixing a blue and a yellow, for the producing a green. In this experiment, if the blue and the yellow be both ſtanding or permanent colours, the ſtuff will perfectly hold its colours, and ſucceed alike, whether it be dyed firſt blue, and afterwards yellow; or firſt yellow, and afterwards blue. But, if one of the two colours be a falſe or fading colour, it is found that the green produced by the mixture will not ſtand, though the other be ever ſo good or permanent a colour.

There is a ſhorter way of trying the permanence of many colours of this kind, than that of expoſing them to the air, ſince in boiling only five minutes in a pint of water, in which there has been diſſolved half an ounce of alum, they will loſe as much colour as they would have done by being expoſed two days to the air in ſummer. Some colours require different methods of trial, but this ſerves for almoſt all. The ſhades of blue, yellow, red and green, purple and green, are the fineſt colours to experiment theſe things upon, as the ſame previous preparation or impregnation of the ſtuff ſerves for both, and both depend upon blue for their baſis, the purple being made of blue and red, and the green of blue and yellow.

It ſhould not ſeem ſurpriſing, if the ſtuff be firſt dipped into a dye of a ſtanding blue, and afterwards into a fading red or yellow, to turn it green or purple, that the action of the air, or boiling in alum water, ſhould carry off thoſe falſe colours, which had only been applied to the ſtuff, after it was before ſaturated with a ſtanding colour. But it might be expected, that when the ſtuff was firſt impregnated with them, and afterwards had the blue added upon them, that either the blue muſt be the colour that went off, or that they muſt all remain: but, in effect, nothing of this difference is found, but the blue remains, while the fading colours go off, however, or in whatever manner or order, they are applied. *Mem. Acad. Scienc. Par.* 1737.

The non-colouring ingredients are,—Certain reſtringent or binding materials, as galls, ſumac, alder bark, pomegranate peel, walnut rinds, and roots, ſapling bark, and crab-tree bark.—Certain ſalts, as alum, argol, ſalt-petre, ſal armoniac, pot-aſhes, lime, and urine.—Liquors, as well-water, river-water, aqua-vitæ, vinegar, lemon-juice, aqua-fortis, honey, and melaſſes.—Gums, as tragacanth, arabic, maſtic, and ſanguis draconis.—Smectics, or abſterſives, as ſoap, fullers-earth, linſeed-oil, ox-gall, &c.—Metals, as ſteel-filings, ſlippe, and pewter, to which add copperas, verdigreaſe, antimony, litharge, and arſenic.—Laſtly, bran, wheat-flower, yolks of eggs, leaven, cumin-ſeed, fenugreek-ſeed, argaric, and ſenna.

Of moſt of theſe ingredients ſome account may be found under their reſpective articles in the courſe of this book; but, with regard to their uſe and effect in Dying, it will be neceſſary to conſider them more particularly, and to bring together in one view.

Among the non-colouring drugs, then, from the mineral kingdom come, 1. Copperas, ſteel-filings, and ſlippe, the ſtuff found in the troughs of old grind-ſtones whereon edge-tools have been ground, which are uſed for all true or Spaniſh blacks, though not for the Flanders blacks.— 2. Pewter diſſolved in aqua-fortis, uſed for the new ſcarlet or Bow-dye.— 3. Litharge, though not owned or allowed, is uſed to add weight to the dyed ſilks. 4. Antimony uſed chiefly for the ſame purpoſe, though it alſo contains a tingent ſulphur, which by precipitation, &c. affords a great variety of colours.— 5. Arſenic uſed in Dying crimſon, on pretence of giving a luſtre.— 6. Verdigreaſe, uſed by linen-dyers, in their yellow and green colours.— 7. Alum.— 8. Bran and bran-water, whoſe flower, entering the pores of the ſtuff, levigates its ſurface, and thus renders the colour laid on it more beautiful; much as woods, to be gilded, are firſt ſmoothed over with white colours. — 9. Saltpetre, uſed chiefly in aqua-fortis, in the Bow-dye, to brighten colours by back boiling; for which purpoſe, 10. Argol is more commonly uſed.— 11. Lime or calk, uſed in the working of blue-fats.

Non-colouring ingredients of the animal kind, are,— 1. Honey.— 2. Yolks of eggs.— 3. Ox-gall: though this, and the two laſt, are only uſed by a few particular dyers to ſcowr, promote fermentation, and increaſe weight.— 4. Stale urine; uſed as a lixivium to ſcowr, alſo to help the fermenting, and heating of woad; though it is alſo uſed in the blue-fats inſtead of lime: in reality, as it diſcharges the yellow, wherewith blue and moſt greens are compounded, it is uſed to ſpend weld withal: yet it is known, that the urine or old mud of piſſing-places will dye a well ſcowred piece of ſilver of a golden colour; it being with this (not Bath water, as imagined) that the Bath ſixpences, &c. are prepared.

To the claſs of non-colouring ingredients, may alſo be added water, by dyers called white-liquor, which is of two ſorts.— 1. Well-water uſed in reds, and in other colours wanting reſtringency, as well as in Dying ſtuffs of a looſe contexture, as calico, fuſtian, and the ſeveral ſpecies of cottons: but naught for blues, and making yellows and greens look ruſty.— 2. River-water, ſofter and ſweeter than the former, and diſſolving ſoap better, uſed in moſt caſes by the dyers, for waſhing, rinſing, &c. their cloths after Dying.— 3. Liquor abſolutely ſo called, which is bran-liquor, made of one part bran, and fine river-water, boiled an hour, and put in a leaden ciſtern to ſettle: four or five days in ſummer will turn it too ſour, and unfit for uſe: its office is to contribute to the holding of the colour: it is known, that ſtarch, which is only the flower of bran, makes a clinging paſte, which will conglutinate paper, though not wood or metals. Accordingly, bran-liquors are uſed to mealy Dying ſtuffs, as to madder, which is rendered clammy and glutinous by being boiled in bran-water, and thus made to ſtick better to the villi of the ſtuff dyed.— 4. Gums, tragacanth, arabic, maſtic, and ſanguis draconis, are uſed in Dying ſilk, chiefly to give it a gloſſineſs, which may make it ſeem finer, as well as ſtiffer, and to increaſe its weight.

For the colouring ingredients, colorantia colorata, we have,— 1. Iron and ſteel, or what is made from them, which, we have obſerved, are uſed in Dying blacks; though how they contribute thereto is not ſo obvious: we know that green oaken boards become black by the friction of a ſaw; a green ſour apple, cut with a knife, turns of the ſame colour; the white greaſe wherewith the wheels of coaches are anointed, becomes likewiſe black, by means of the iron boxes wherewith the nave is lined, and the friction between the nave and the axle-tree; and that an oaken ſtick becomes black by a violent friction againſt other wood in a turning lath; and the black colour on earthen-ware is given with ſcalings of iron vitrified. From all which it ſeems to follow, that the buſineſs of blacking lies in the iron, and particularly in its uſtulation or friction. Be this as it will, copperas, the moſt uſeful ingredient for Dying black, is the ſalt of the pyrites wherewith old iron is incorporated. And, wherever this is uſed, ſome of the aſtringents are to accompany it.— 2. Red-wood chopped, and ground in a mill, is uſed for Dying cloth, rugs, &c. of the coarſer ſort. Its tincture, which is a ſort of brick-colour, is got out by long boiling it with galls, and the cloth along with it. It ſtands better than brazil.— 3. Brazil, chopped alſo, and ground, dyes a pink-colour, or carnation neareſt approaching cochineal: it it uſed with alum; with pot-aſhes it alſo ſerves for purples. It eaſily ſtains.— 4. Madder gives a colour near approaching the Bow-dye, or new ſcarlet: thoſe called baſtard-ſcarlets are dyed with it. It endures much boiling, and is uſed both with alum and argol, and holds well: the brighteſt dyes with madder are made by over-dying the ſtuff, and then diſcharging part of it by back-boiling in argol. It is uſed with bran-water inſtead of white liquor.— 5. Cochineal, uſed with bran-liquor in a pewter furnace, with aqua-fortis, gives the dye called among us, though improperly, ſcarlet in grain. Any acid takes off the intenſe redneſs of this colour, and turns it towards an orange, or flame-colour. With this colour the Spaniſh leather and wool, uſed by ladies, are dyed.— 6. Annotto gives an orange-colour, eſpecially to ſilks, linens, and cottons; for it does not penetrate cloth: it is uſed with pot-aſhes.— 7. Weld, by the help of pot-aſhes, yields a deep lemon-colour, though it is uſed to give all ſorts of yellows.— 8. Wood-wax, or green-wood, called alſo geniſta tinctoria, and the dyers-weed, has the like effect as weld, though its uſe is chiefly confined to coarſe cloths. It is ſet with pot-aſhes, or urine.— 9. Fuſtic is of two ſorts, young and old.— The former, chopped and ground, yields a kind of reddiſh orange-colour: the latter, a hair-colour, diſtant ſeveral degrees of yellow from the former. It ſpends with or without ſalts, works either hot or cold, and holds firm.— 10. Wood-ſoot, containing not only a colour, but a ſalt, needs nothing to extract its dye, or make it ſtrike on the ſtuff. The natural colour it yields is that of honey, but it is the foundation of many other colours on wool, and cloth only.— 11. Woad ground, or chopped with a mill for the purpoſe, is made up into balls, which being broken, and ſtrewed on lime or urine, is uſed with pot-aſhes, or ſea-weed, and gives a laſting blue. The lime, or calk, accelerates the fermentation of the woad, which in three or four days will work like a guile of beer, and be covered with a greeniſh froth or flower. An intenſe woad colour is almoſt black, that is, is of a damſon-colour. It is the foundation of ſo many colours, in its different degrees or ſhades, that the dyers have a ſcale whereby to compute the lightneſs and depth of this colour.— 12. Indigo is of the like nature, and uſed for the ſame purpoſe as woad, only that it is ſtronger.— 13. Logwood, chopped and ground, yields a purpliſh-blue: it may be uſed with alum: formerly it was of ill repute, as a moſt falſe and fading colour: but, ſince it has been uſed with galls, it is leſs complained of. The Dying materials are generally applied in decoctions made in water, more or leſs ſtrong, according to the occaſion; ſometimes by only dipping the ſtuff in the vat of dye; ſometimes by boiling it therein; and ſometimes by leaving it a day or more to ſteep.— For the alum, in Dying ſilks, it is always applied cold, in which ſtate alone it contributes to the brightneſs of the dye.

The art of DYING may be divided into as many branches as there are different colours to be communicated, and ſorts of different ſtuffs to be ſubjects of it.

DYING *of cloths, ſerges, druggets, and other woollen manufactures.*— For black, in cloths and ſtuffs of price, it is begun with a ſtrong decoction of woad and indigo, which give a deep blue; after which, the ſtuffs, being boiled with alum and tartar, or pot-aſhes, are to be maddered with common madder; then dyed black with Aleppo galls, copperas, and ſumac; and finiſhed by back-boiling in weld.— Scarlet is dyed with kermes and cochineal, with which may alſo be uſed agaric and arſenic.— Crimſon ſcarlet is given with cochineal-meſtich, aqua-fortis, ſal armoniac, ſublimate, and ſpirit of wine.— Violet-ſcarlet, purple, amaranth, and panſy-ſcarlet, are given with woad, cochineal, indigo, braziletto, brazil, and orchal.— For common reds, pure madder is uſed, without other ingredients.—Crimſon-reds, carnations, flame and peach-colours, are dyed, according to their ſeveral hues, with cochineal-meſtich, without madder, or the like.—Crimſon-red is prepared with Roman alum, and finiſhed with cochineal.— Peach colour muſt be back-boiled a little with galls and copperas, or the like.— Orange-aurora or golden-yellow, brick-colour, and onion-peel-colour, are given with woad and madder, tempered according to their reſpective ſhades. For blues, the dark are given with a ſtrong tincture of woad: the brighter, with the ſame liquor, as it weakens in working.—Dark-browns, minims, and tan-colours, are given with woad, weaker in decoction than for black, with alum and pot-aſhes; after which, they are maddered higher than black: for tan-colours, a little cochineal is added.—Pearl-colours are given with galls and copperas; ſome are begun with walnut-tree roots, and finiſhed with the former; though, to make them more ſerviceable, they did them in a weak tincture of cochineal.— Greens are begun with woad, and finiſhed with weld.— Pale yellows, lemon-colour, and ſulphur-colour, are given with weld only.— Olive-colours of all degrees are firſt put in green, and taken down again with ſoot, more or leſs, according to the ſhade required.— Feuillemort, hair-colour, muſk, and cinnamon-colour, are given with weld and madder.— Nacarat, or bright orange-red, is given with weld and goats hair, boiled with pot-aſhes. Fuſtic here is forbid, as a falſe colour.

DYING *of wools for tapeſtry*, is performed after the ſame manner as cloths, excepting blacks, which are only to be woaded, and then put in black, as above.

Black wools for cloths and ſerges may be begun with walnut-tree root, and walnut rinds, and finiſhed by dipping in a vat of black.

DYING *of ſilks*, is begun by boiling them with ſoap, &c. then ſcowring and waſhing them out in the river, and ſteeping them in alum-water cold.— For crimſon they ſcowr them a ſecond time before putting them in the cochineal vat.

Red-crimſon is dyed with pure cochineal-meſtich, adding galls, turmeric, arſenic, and tartar, all put together in a copper of fair water almoſt boiling: with theſe the ſilk is to be boiled an hour and a half; after which, it is ſuffered to ſtand in the liquor till next day.—Violet-crimſon is alſo given with pure cochineal, arſenic, tartar, and galls; but the galls in leſs proportion than in the former. When taken out, it is to be well waſhed, and put in a vat of indigo.— Cinnamon-crimſon is begun like the violet, but finiſhed by back-boiling, if too bright, with copperas; if dark, with a dip in indigo.— Light-blues are given in a back of indigo.— Sky-blues are begun with orchal, and finiſhed with indigo. For citron-colours, the ſilk is firſt alumed, then welded, with a little indigo.—Pale-yellows, after aluming, are dyed in weld alone.— Pale and brown aurora's, after aluming, are welded ſtrongly, then taken down with rocou diſſolved with pot-aſhes.— Flame-colour is begun with rocou, then alumed, and dipped in a vat or two of brazil.— Carnation, and roſe-colours, are firſt alumed, then dipped in brazil.— Cinnamon-colour, after aluming, is dipped in brazil and braziletto.— Lead-colour is given with fuſtic, or with weld, braziletto, galls, and copperas. But the galls, on theſe and other occaſions, are not to be uſed, which increaſes the weight to the damage of the purchaſer; for which reaſon, it is puniſhed in France as a fraud: in reality, few but black ſilks need galls.

Black ſilks, of the coarſer ſort, are begun by ſcowring them with ſoap, as for other colours: which done, they are waſhed out, wrung, and boiled an hour in old galls, where they are left to ſtand a day or two; after which they are waſhed again with fair water, wrung, and put in another vat of new and fine galls; then waſhed and wrung again, and finiſhed in a vat of black.— Fine black ſilks are only put once into galls, viz. the new and fine ſort, which has only boiled an hour; then they are waſhed, and wrung out, and dipped thrice in black, to be afterwards brought down by back-boiling with ſoap.

Dying *of thread*, is begun with ſcowring it in lye of good aſhes; after which it is wrung, rinſed out in river-water, and wrung again.— For a bright-blue, it is given with braziletto and indigo.— Bright-green is firſt dyed blue, then back-boiled with braziletto and verdeter, and laſtly woaded.—For a dark-green it is given like the former, only darkening more before woading.—Lemon, or pale yellow, is given with weld, mixed with rocou.— Orange and iſabella, with fuſtic, weld, and rocou.— Red, both bright and dark, with flame-colour, &c. are given with brazil, either alone, or with a mixture of rocou.— Violet, dry roſe, and amaranth, are given with brazil, taken down with indigo.— Feulemort, and olive-colour, are given with galls and copperas, taken down with weld, rocou, or fuſtic.— Black is given with galls and copperas, taken down and finiſhed with braziletto wood.

Dying *of hats*, is done with braziletto, galls, copperas, verdigreaſe, diſſolved and boiled in a copper capable of receiving, beſides the liquor, twelve dozen of hats on their blocks, or moulds. Here the hats are ſuffered to boil ſome time; after which, they are taken out, and ſuffered to ſtand and cool; then dipped again; and thus alternately, oftener or ſeldomer, as the ſtuff is of a nature to take the dye with more or leſs difficulty.

Proof of Dyes.— There are divers ways of proving the truth of Dyes, or examining the juſtneſs and legitimacy of their compoſition.— To diſcover whether a cloth have been duly treated by the dyer, and the proper foundation laid, a white ſpot, by the French called roſette, of the bigneſs of a ſhilling, ought to be left; beſides a white ſtripe between the cloth and the liſt.

Farther proof is had by boiling the dyed ſtuff in water, with other ingredients different according to the quality of the Dye to be proved. If the colour ſuſtain the teſt, i. e. do not diſcharge at all, or very little, ſo that the water is not tinctured by it, the Dye is pronounced good: otherwiſe, falſe.

Proof of the Dyes *of Silks*.— For red-crimſon the proof is made by boiling the ſilk with an equal weight of alum.— For ſcarlet-crimſon, it is boiled with ſoap almoſt of the weight of the ſilk.— For violet-crimſon, with alum of equal weight with the ſilk, or with citron-juice, about a pint to a pound of ſilk.— Theſe ingredients are to be mixed, and put in fair water, when it begins to boil; after which, the ſilks are alſo to be put in, and after boiling the whole for half a quarter of an hour, if the Dye be falſe, the liquor or the red-crimſon will be violet, in caſe it had been dyed with orchal, or very red, if with brazil.— That of crimſon-ſcarlet, if rocou have been uſed, will become of an aurora colour, or, if brazil have been uſed, red.— And that of violet-crimſon, if brazil or orchal have been uſed, will be of a colour bordering on red.— On the contrary, if the three ſorts of crimſon be truly dyed, their liquors will diſcover very little alteration.

A ſtill ſurer way to diſcover whether crimſon ſilks have been rightly dyed, is by boiling a piece of ſtandard dyed crimſon ſilk, kept for that purpoſe at Dyers-hall, after the ſame manner, and then comparing the tinctures of the two liquors.

To diſcover whether other colours have been dyed with galls, the ſilk is put in fair boiling water, with pot-aſhes, or ſoap, nearly of the weight of the ſilk; after ſome time, it is taken out; upon which, if it have been dyed with galls, the colour will be all vaniſhed, and nothing but that of the galls left, which is a ſort of feulemort, or wood colour.

The dying of ſilk with galls may alſo be detected by putting it in boiling water, with a gallon of citron juice; being taken out, and waſhed in cold water, and then dipped in a black dye, if galls have been uſed, it will turn black; if not, it will be of a brown-bread colour.

To diſcover whether black ſilk have been overdoſed with galls, ſteel filings, or ſlippe, it is boiled in fair water, with twice its weight of ſoap: if it be loaden with galls, it will turn reddiſh, otherwiſe it will keep its colour.

To diſcover whether black cloth have been firſt woaded, and maddered; a ſample of it, and, at the ſame time, a ſample of ſtandard black, kept for that purpoſe by the dyers company, is to be taken; and then as much Roman alum as is equal in weight to both, together with a like weight of pot-aſhes, is to be put over the fire in a pan of bran water: when it begins to boil, the two ſamples to be put in, and after half an hour to be taken out and compared. — The piece which has only been woaded will be found bluiſh, with ſomewhat of a dull green; if it have both woaded and maddered, it will be of a tan or minim colour; and, if it have been neither woaded, nor maddered, its colour will be dunniſh, between yellow and fallow.

For cloths dyed of a minim colour, the proof is to be made after the ſame manner as that of blacks.

To know whether ſcarlet or crimſon cloth have been dyed with pure cochineal, they are to be boiled with an ounce of alum to a pound of cloth.

For cloths of other colours, the proof is to be made in the ſame manner as that of blacks and minims.

Theory of Dying. — We cannot better cloſe this article, than with ſome general deductions, which may throw a little neceſſary light on the theory of Dying. As,

1. That all the materials, which of themſelves give colour, are either red, yellow, or blue; ſo that out of them, and the primitive fundamental colour, white, all that great variety, which we ſee in dyed ſtuffs, ariſes. — 2. That few of the colouring materials (as cochineal, ſoot, wood-wax, or woad) are, in their outward and firſt appearance, of the ſame colour, which, by the ſlighteſt ſolutions in the weakeſt menſtrua, they dye upon cloth, ſilk, &c. 3. That many of the colouring materials will not yield their colours without much grinding, ſteeping, boiling, fermenting, or corroſion by powerful menſtrua; as red-wood, weld, woad, annotto, &c.— 4. That many of the ſaid colouring materials will of themſelves give no colouring at all, as copperas, or galls, or with much diſadvantage, unleſs the cloth, or other ſtuff to be dyed, be firſt covered or incruſtated, as it were, with ſome other matter, though colourleſs, aforehand; as madder, weld, and brazil, with alum. — 5. That ſome of the colouring materials, by the help of other colourleſs ones, ſtrike different colours from what they would alone, and of themſelves; as cochineal and brazil. — 6. That ſome colours, as madder, indigo, and woad, by reiterated tinctures, will at laſt become black. — 7. That, though green be the moſt frequent and common of natural colours, yet there is no ſimple ingredient, which is now uſed alone, to dye green with upon any material; ſap-green, the condenſed juice of the rhamnus berry, being the neareſt; and this only uſed by country people. —8. There is no black thing in uſe which dyes black; though both the coal and ſoot of moſt things burnt, or ſcorched, be of that colour; and the blacker, by how much the matter, before it was burnt, was whiter, as in the famous inſtance of ivory black. —9. The tincture of ſome dying ſtuffs will fade even with lying, or with the air, or will ſtain even with water; but very much with wine, vinegar, urine, &c.— 10. Some of the dyers materials are uſed to bind and ſtrengthen a colour; ſome to brighten it; ſome to give luſtre to the ſtuff; ſome to diſcharge and take off the colour, either in whole, or in part; and ſome, out of fraud, to make the material dyed, if coſtly, to be heavier. — 11. Some Dying ingredients, or drugs, by the coarſeneſs of their bodies, make the thread of the dyed ſtuff ſeem coarſer; and ſome, by ſhrinking them, ſmaller; and ſome, by levigating their aſperities, finer.— 12. Many of the ſame colours are dyed upon different ſtuffs with different materials; as red-wood uſed in cloth, not in ſilks; annotto in ſilks, not in cloth; ſo that they may be dyed at ſeveral prices. — 13. Scowring, and waſhing of ſtuffs to be dyed, is to be done with appropriate materials; as ſometimes with ox-galls, ſometimes with fullers earth, ſometimes with ſoap: this latter being pernicious in ſome caſes, where pot-aſhes will ſtain or alter the colour. — 14. Where great quantities of ſtuffs are to be dyed together, or where they are to be done with great ſpeed, and where the pieces are very long, broad, thick, &c. they are to be differently handled, both in reſpect to the veſſels and ingredients. — 15. In ſome colours and ſtuffs the tingent liquor muſt be boiling; in other caſes bloodwarm, in ſome it may be cold. — 16. Some tingent liquors are fitted for uſe by long keeping; and in ſome the virtue wears away by the ſame.— 17. Some colours, or ſtuffs, are beſt dyed by reiterated dip-

pings ever into the ſame liquor at ſeveral intervals of time ; and ſome by continuing longer, and others leſſer whiles therein.— 18. In ſome caſes, the matter of the veſſel wherein the liquors are heated, and the tinctures prepared, muſt be regarded ; as that the kettles be pewter for Bow-dye.— 19. Little regard is had how much liquor is uſed in proportion to the dying drugs ; the liquor being rather adjuſted to the bulk of the ſtuff, as the veſſels are to the breadth of the ſame ; the quantity of Dying drugs being proportioned to the colour higher or lower, and to the ſtuffs both ; as likewiſe the ſalts are to the Dying drugs. Concerning the weight which colours give to ſilks, for in them it is moſt taken notice of, as being ſold by weight, and being a commodity of great price ; it is obſerved, that one pound of raw ſilk loſes four ounces by waſhing out the gums and natural ſordes.— That the ſame ſcowred ſilk may be raiſed to above thirty ounces from the remaining twelve, if it be dyed black, with certain materials. That the reaſon why black colour may be dyed the heavieſt is, that all ponderous drugs may be dyed black, being all of colours lighter than it ; whereas, there ſeem to be few or no materials wherewith to increaſe the weight of ſilk, which will conſiſt with fair light colours ; and perhaps white arſenic to carnations, is the only inſtance. Of things uſeful in Dying, eſpecially black, nothing increaſes weight ſo much as galls ; by means whereof black ſilks recover the weight which they loſt by waſhing out their gum : Nor is it counted extraordinary, that blacks ſhould gain about four or ſix ounces in the Dying upon each pound. — Next to galls, old fuſtic increaſes the weight about one half in twelve. —Madder about an ounce.—Weld half an ounce.—The blue fat, in deep blues of the fifth ſtall, adds no conſiderable weight. —Neither do logwood, cochineal, or annotto ; nor even copperas of itſelf, where galls are not.—Slippe adds much to the weight, and gives a deeper black than copperas, which affords a good excuſe for the dyers that uſe it.

Dying *of leather*, *ſkins*, &c.—Blue is given by ſteeping the ſubject a day in urine and indigo, then boiling it with alum : or it may be given by tempering the indigo with red-wine, and waſhing the ſkins therewith. Red is given by waſhing the ſkins, and laying them two hours in galls ; then wringing them out ; dipping them in a liquor made with liguſtrum, alum, and verdigreaſe in water ; and laſtly, in a dye made of brazil-wood boiled with lye.—Purple is given by wetting the ſkins with a ſolution of roche alum in warm water, and, when dry again, rubbing them with the hand with a decoction of log-wood in cold water. — Green is given by ſmeering the ſkin with ſap-green and alum-water boiled : to darken the colour, a little more indigo may be added. — Dark-green is alſo given with ſteel filings and ſal armoniac ſteeped in urine till ſoft, then ſmeered over the ſkin ; which is to be dried in the ſhade.— Sky-colour is given with indigo ſteeped in boiling water, and the next morning warmed and ſmeered over the ſkin. — Yellow, by ſmeering the ſkin over with aloes and linſeed oil diſſolved and ſtrained : or by infuſing it in weld. — Orange-colour is given by ſmeering with fuſtic berries boiled in alum-water : or, for a deep orange, with turmeric.

Dying, *or ſtaining of wood, for inlaying, vaneering*, &c.— Red is done by boiling the wood in water and alum ; then taking it out, adding brazil to the liquor, and giving the wood another boil in it.—Black, by bruſhing it over with log-wood boiled in vinegar, hot ; then waſhing it over with a decoction of galls and copperas, till it be of the hue required.— Any other colour may be given by ſqueeſing out the moiſture of horſe-dung thro' a ſieve, mixing it with diſſolved roche alum and gum arabic ; and to the whole adding green, blue, or any other colour deſigned : after ſtanding two or three days, pear-tree, or other wood, cut to the thickneſs of half a crown, is put into the liquor boiling hot, and ſuffered to remain till it be ſufficiently coloured.

Dying *of bone, horn, or ivory*. — Black is performed by ſteeping braſs in aqua-fortis till it be turned green : with this the bone, &c. is to be waſhed once, or twice ; then put in a decoction of log-wood and water, warm.—Green is begun by boiling the bone, &c. in alum-water ; then with verdigreaſe, ſal armoniac and white-wine vinegar ; keeping it hot therein till ſufficiently green.—Red is begun by boiling it in alum-water, and finiſhed by decoction in a liquor compounded of quicklime ſteeped in rain-water, ſtrained, and to every pint an ounce of brazil-wood added : the bone, &c. to be boiled herein till ſufficiently red.

E.

EAR *of fiſhes.*—All the cetaceous fiſhes have external meatus auditorii, or paſſages for hearing; but other fiſh have nothing of theſe external appearances, and ſeem neither to be intended by nature to make any ſounds, or to hear any. Though, ſound being a tremulation in the air, it may be felt by them as motion, though not diſtinguiſhed as ſound. It may eaſily be proved, that they do not hear our voices in ſpeaking, by walking near the ſide of a pond or river well ſtored with fiſh about the edges; if the body and its ſhadow be kept out of their ſight, they will never ſtart at the voice.

Yet, how far fiſhes are deaf and dumb, ſeems a queſtion not yet perfectly decided.

Ear, in gardening, a name given to ſeminal leaves of plants, or thoſe two green and ſucculent leaves which firſt appear from the ſeed, and are varied different in all reſpects from thoſe which follow:

Ear-*ſhell*, auris marina, in natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe: it conſiſts only of one ſhell, or valve, and is of a flatted ſhape, in ſome meaſure reſembling that of the human Ear, and has an extremely wide mouth, or aperture, at its baſe, the wideſt of that of all ſhells, except only the patella or limpet, which is all mouth below. *Plate* XVII. *fig.* 14.

EARTH, in geography (*Dict.*)—In the terraqueous globe we diſtinguiſh three parts, or regions, viz. 1. The external part, or cruſt, which is that from which vegetables ariſe, and animals are nouriſhed. 2. The middle, or intermediate part, which is poſſeſſed by foſſils, extending further than human labour ever yet penetrated. 3. The internal, or central part, which is unknown to us, though by many authors ſuppoſed of a magnetic nature; by others, a maſs, or ſphere of fire; by others, an abyſs, or collection of waters, ſurrounded by the ſtrata of Earth; and, by others, a hollow empty ſpace, inhabited by animals, who have their ſun, moon, plants, and other conveniencies within the ſame. Others divide the body of the globe into two parts, viz. the external part, which they call the cortex, including the whole depth or maſs of the ſtrata of the Earth: and the internal, which they call the nucleus, being of a different nature from the former, and poſſeſſed by fire, water, or the like.

The external part of the globe either exhibits inequalities, as mountains and vallies; or it is plain and level; or dug in channels, fiſſures, beds, &c. for rivers, lakes, ſeas, &c.

Theſe inequalities in the face of the Earth are by moſt naturaliſts ſuppoſed to have aroſe from a rupture, or ſubverſion of the Earth, by the force either of the ſubterraneous fires or waters. The Earth, in its natural and original ſtate, Des Cartes, and after him Burnet, Steno, Woodward, Whiſton, and others, ſuppoſe to have been perfectly round, ſmooth, and equable; and account for its preſent rude and irregular form, principally from the great deluge.

In the external, or cortical part of the Earth, we meet with various ſtrata, which are ſuppoſed to be the ſediments of various floods, the waters whereof being replete with matters of divers kinds, as they are dried up, or oozed through, depoſited theſe different matters, which in time hardened into ſtrata of ſtone, ſand, coal, clay, &c.

Dr. Woodward has conſidered the buſineſs of ſtrata with great attention, viz. their order, number, ſituation with reſpect to the horizon, depth, interſections, fiſſures, colour, conſiſtence, &c. and aſcribes the origin and formation of them all to the great flood, or cataclyſmus. At that terrible revolution, he ſuppoſes all the terreſtrial bodies of every kind to have been diſſolved and mixed with the waters, and ſuſtained therein, ſo as only to conſtitute one common maſs therewith. This maſs of terreſtrial particles, intermixed with water, he ſuppoſes to have been at length precipitated to the bottom, and that, according to the laws of gravity, the heavieſt ſinking firſt, and the lighter in their order. By ſuch means were the ſtrata formed, whereof the Earth conſiſts, which, attaining their ſolidity and hardneſs by degrees, have continued ſo ever ſince. Theſe ſediments he further concludes to have been at firſt all parallel and concentrical, and the ſurface of the Earth, formed thereby, perfectly ſmooth and regular: but, in courſe of time, divers changes happening from earthquakes, volcano's, &c. the order and regularity of the ſtrata was diſturbed and broke, and the ſurface of the Earth, by ſuch means, brought to the irregular form in which it now appears.

Earths, in natural hiſtory, are the various ſpecies and kinds of earthy matter found in digging, or lodged on the ſurface of the terraqueous globe. Theſe are either ſimple, or compoſed of entirely ſimilar particles; or compound, having a mixture of heterogeneous ones, as ſand, or the like, among them.

Earths are defined to be friable, opake, inſipid bodies; not inflammable; vitrifiable by extreme heat, diffuſible in water, and ſeparable from it by filtration.

The ſimple Earths are divided into two orders, and under thoſe into five genera. Of the firſt order are thoſe Earths which are naturally moiſt, of ſmooth ſurfaces, and of a firmer texture; and of the ſecond are thoſe which are naturally dry, of rough, duſty, ſurfaces, and of a looſer texture. Of the firſt of theſe orders there are three genera, the boles, the clays, and the marles; and of the ſecond there are two, the ochres and the tripelas. The ſeveral diſtinguiſhing characters of which are theſe.

Of the firſt order: 1. Boles are Earths moderately coherent, penderous, ſoft, not ſtiff, or viſcid, but, in ſome degree, ductile, while moiſt, compoſed of fine particles, ſmooth to the touch, eaſily breaking between the fingers, readily diffuſible in water, and freely and eaſily ſubſiding from it. See BOLE.

2. Clays are Earths firmly coherent, weighty, and compact, very ſtiff and viſcid, ductile to a great degree while moiſt, ſmooth to the touch, not eaſily breaking between the fingers, nor eaſily diffuſible in water, and, when mixed in it, not readily ſubſiding from it.

3. Marles are Earths, but ſlightly coherent, not ductile, ſtiff, or viſcid, while moſt, moſt eaſily diffuſible in, and diſunited by water, and by it reduced to a ſoft, looſe, incoherent maſs.

Of the ſecond order are, 1. Ochres. Theſe are Earths ſlightly coherent, compoſed of fine, ſmooth, ſoft, argillaceous particles, rough to the touch, and readily diffuſible in water.

2. Tripelas are Earths firmly coherent, compoſed of fine, but hard, particles, and not readily diffuſible in water.

The compound Earths are two; the loams, compoſed of clay and ſand; and the moulds, compoſed of earthy and putrified vegetable and animal matters.

Magnetiſm of the **Earth**. The notion of the magnetiſm of the Earth was ſtarted by Gilbert; and Mr. Boyle ſuppoſes magnetic effluvia moving from one pole to the other. See Works abr. Vol. I.

Dr. Knight alſo thinks, the Earth may be conſidered as a great load-ſtone, whoſe magnetical parts are diſpoſed in a very irregular manner; and that the ſouth pole of the Earth is analogous to the north pole in magnets, that is, the pole by which the magnetical ſtream enters.

He obſerves, that all the phænomena attending the direction of the needle, in different parts of the Earth, in great meaſure correſpond with what happens to a needle, when placed upon a large terella; if we make allowances for the different diſpoſitions of the magnetical parts, with reſpect to each other, and conſider the ſouth pole of the Earth to be a north pole, with regard to magnetiſm. The Earth might become magnetical by the iron ores it contains, for all iron ores are capable of magnetiſm. It is true, the globe might notwithſtanding have remained unmagnetical, unleſs ſome cauſe had exiſted capable of making that repellent matter producing magnetiſm move in a ſtream through the Earth.

Now the doctor thinks that ſuch a cauſe does exiſt. For, if the Earth revolves round the ſun in an ellipſis, and the ſouth pole of the Earth is directed towards the ſun, at the time of its deſcent towards it, a ſtream of repellent matter will thereby be made to enter at the ſouth pole, and come out at the north. And he ſuggeſts, that the Earth's being in its perihelion in winter, may be one reaſon why magnetiſm is ſtronger in this ſeaſon than in the ſummer.

The cauſe here aſſigned for the Earth's magnetiſm muſt continue, and perhaps improve it from year to year. Hence the doctor thinks it probable, that the Earth's magnetiſm has been improving ever ſince the creation, and that this may be one reaſon, why the uſe of the compaſs was not diſcovered ſooner. See Dr. *Knight's attempt to demonſtrate, that all the phænomena in nature may be explained by attraction and repulſion.*

Earth *of dew*, an Earth much valued by many of the chymical experimenters, and prepared in the following manner: a large quantity of dew is to be collected, and ſet in a wooden veſſel, in a cool ſhady place, covered with a canvas, to keep out duſt and flies; there will in time come on a putrefaction in the liquor. It is ſometimes three weeks, ſometimes longer firſt; during the time of this putrefaction, certain films are daily formed on the ſurface of the liquor, and theſe falling down to the bottom, one after the other, form, by degrees, a ſediment of a ſort of mud. This is to be thrown away, and the dew, when ſeparated from it, is to be filtred clear, and evaporated to a dryneſs; the remainder is a greyiſh Earth, which is the true Earth of dew; this is very light and friable, and is of a foliated ſtructure in the maſs, looking like ſo many leaves of brown paper, ſpread very thin and even over one another. *Phil. Tranſ.* N°. 3.

EARTH-*banks*, in huſbandry, &c. are a very common fence about London, and in ſeveral other parts of England. Where ſtones are not to be had cheap, theſe are to be preferred to all other fences, both for ſoundneſs and laſting.

The beſt manner of making them is this: dig up ſome turf in a graſſy place, a ſpit deep, or nearly to the breadth of the ſpade, and about four or five inches thick; lay theſe turfs, with the graſs outward, even by a line on one ſide, and on the backſide of theſe lay another row of turf, having a foot ſpace of ſolid ground on the outſide, to prevent the bank from ſlipping in, if it ſhould be any ways faulty. On the outſide of this make a ditch, or elſe let the ſides be lowered both ways with a ſlope two feet deep, and there will be no paſture loſt by the fence, becauſe it will bear graſs on both ſides.

The Earth that is dug out of the ditches, or from the ſlope, muſt be thrown in between the two rows of turf, till the middle is made level with the reſt. Then lay on two more rows of turf, in the ſame manner; and with more of the earth fill up, and make level as before. Let this method be continued till the bank is raiſed four feet high, or more if neceſſary, only obſerving, that, the higher it is to be carried, the wider the foundation muſt be made. As the bank is carried up, the ſides muſt not be raiſed perpendicular, but ſloping inward both ways, ſo that at the top it may be about two feet and a half wide. This ſort of fence, when made with leſs care, and faced with clay, is left naked, and ſerves very well in ſome places; but, when it is thus managed with the turf, the joinings of the ſeveral pieces are hid in a little time, by the growth of the graſſy part of the turf on each ſide, and it makes a beautiful fence, of as green and pleaſant a colour as the reſt of the field.

The great improvement upon this plan is the planting quickſets, or young white-thorn plants, in the middle of the top of the bank. The Earth on each ſide of theſe may be raiſed up with a ſort of wall, and the rain that falls all preſerved for the plants. This plenty of water, and depth of fine Earth, makes the young plants grow quicker and more vigorouſly than any other way; and the moſt beautiful of all hedges is propagated this way. When this ſort of hedges is young, there muſt be placed on each ſide of it a ſhort dry hedge, of about a foot high, to keep the ſheep from cropping theſe young plants, but this may be taken away after a little time.

There is one caution neceſſary in regard to the making theſe banks, which is, that they muſt never be made in a very dry ſeaſon, becauſe, if much rain ſhould follow, the Earth of the bank would ſwell and burſt out, or ſpoil the ſhape of the bank; but, if this ſhould happen, it is eaſily enough repaired. This beautiful fence may be made at a ſmaller price than thoſe unaccuſtomed to theſe things may imagine. In good digging ground, where men work for fourteen pence a day, it may be made and planted with quick for two ſhillings a pole. It may be made proper for the keeping in of deer, only by the ſmall addition of planting, at every eight or ten feet diſtance, a poſt a little ſlanting, with a mortiſe in it; let this ſtand about two feet above the bank, and into the mortiſes, all along, put a rail made of a bough of any tree; no deer will ever go over this, nor can they creep under it, as they often do, when a pale tumbles down. The quick, on the top of this bank, may be kept clipped, and will grow very thick, and afford the beſt ſhelter for cattle of any fence in uſe with us. *Mortimer's Huſbandry.*

Compound EARTHS, in natural hiſtory, are a claſs of foſſil bodies, uſually confounded with the genuine and ſimple Earth, as if ſubſtances of the ſame kind, but being of a very different nature and origin. They are foſſils compoſed of argillaceous and marly particles, ſeparated and divided by adventitious matter, and never found free from thoſe admixtures, or in the ſtate of pure ſimple marles or clays.

EA'RTHQUAKE.—Jamaica is remarkable for Earthquakes. The inhabitants, Sir Hans Sloane informs us, expect one every year. That author gives us the hiſtory of one in 1687: another horrible one, in 1692, is deſcribed by ſeveral anonymous authors. In two minutes time it ſhook down and drowned nine tenths of the town of Port-Royal. The houſes ſunk outright, thirty or forty fathoms deep. The earth, opening, ſwallowed up people, and they roſe in other ſtreets; ſome in the middle of the harbour, and yet were ſaved; though there were 2000 people loſt, and 1000 acres of land ſunk. All the houſes were thrown down throughout the iſland. One Hopkins had his plantation removed half a mile from its place. Of all wells, from one fathom to ſix or ſeven, the water flew out at the top with a vehement motion. While the houſes, on one ſide of the ſtreet were ſwallowed up, on the other they were thrown on heaps; and the ſand in the ſtreet roſe like waves in the ſea, lifting up every body that ſtood on it, and immediately dropping down into pits; and, at the ſame inſtant, a flood of water, breaking in, rolled them over and over; ſome catching hold of beams and rafters, &c. ſhips and ſloops in the harbour were overſet and loſt; the Swan frigate particularly, by the motion of the ſea, and ſinking of the wharf, was driven over the tops of many houſes. It was attended with a hollow rumbling noiſe like that of thunder. In leſs than a minute, three quarters of the houſes, and the ground they ſtood on, with the inhabitants, were all ſunk quite under water; and the little part, left behind, was no better than a heap of rubbiſh. The ſhake was ſo violent, that it threw people down on their knees, or their faces, as they were running about for ſhelter. The ground heaved and ſwelled like a rolling ſea; and ſeveral houſes, ſtill ſtanding, were ſhuffled and moved ſome yards out of their places. A whole ſtreet is ſaid to be twice as broad now as before; and, in many places, the earth would crack, and open, and ſhut, quick and faſt. Of which openings, two or three hundred might be ſeen at a time; in ſome whereof, the people were ſwallowed up; others the cloſing earth caught by the middle, and preſſed to death; in others, the heads only appeared. The larger openings ſwallowed up houſes; and out of ſome would iſſue whole rivers of waters, ſpouted up a great height into the air, and threatening a deluge to that part the Earthquake ſpared. The whole was attended with ſtenches and offenſive ſmells, the noiſe of falling mountains at a diſtance, &c. and the ſky, in a minute's time, was turned dull and reddiſh, like a glowing oven. Yet, as great a ſufferer as Port-Royal was, more houſes were left ſtanding therein, than on the whole iſland beſide. Scarce a planting-houſe, or ſugar-work, was left ſtanding in all Jamaica. A great part of them were ſwallowed up, houſes, people, trees, and all, at one gape: in lieu of which afterwards, appeared great pools of water, which when dried up left nothing but ſand, without any mark that ever tree, or plant, had been thereon. Above twelve miles from ſea, the earth gaped and ſpouted out, with a prodigious force, vaſt quantities of water into the air: yet the greateſt violences were among the mountains and rocks; and it is a general opinion, that, the nearer the mountains, the greater the ſhake; and that the cauſe thereof lay there. Moſt of the rivers were ſtopped up for twenty-four hours, by the falling of the mountains; till, ſwelling up, they made themſelves new tracks and channels, tearing up in their paſſage trees, &c. After the great ſhake, thoſe people who eſcaped, got on board ſhips in the harbour, where many continued above two months; the ſhakes all that time being ſo violent, and coming ſo thick, ſometimes two or three in an hour, accompanied with frightful noiſes like a ruffling wind, or a hollow rumbling thunder, with brimſtone blaſts, that they durſt not come aſhore. The conſequence of the Earthquake was a general ſickneſs, from the noiſome vapours belched forth, which ſwept away above three-thouſand perſons.

EA'RWIGS.—Theſe are very troubleſome vermin in a garden, eſpecially where carnations are preſerved; for they are ſo fond of theſe flowers, that, if care is not taken to prevent them, they will entirely deſtroy them, by eating off the ſweet part at the bottom of the leaves. To prevent which, moſt people have ſtands erected, which have a baſon of earth or lead round each ſupporter, which is conſtantly kept filled with water. See the article CARNATION.

Others hang the hollow claws of crabs and lobſters upon ſticks in divers parts of the garden, into which theſe vermin get; and, by often ſearching them, you will deſtroy them without much trouble; which will be of great ſervice to your wall-fruit; for theſe are great deſtroyers thereof. *Miller's Gard. Dict.*

E'BONY (*Dict.*)—Authors and travellers give very different accounts of the tree that yields the black Ebony: by ſome of their deſcriptions it ſhould be a ſort of palm-tree, by others a cytiſus, &c. The moſt authentic of them is that of M. Flacourt, who reſided many years in Madagaſcar as governor thereof. He aſſures us that it grows very high and big; its bark black, and its leaves reſembling thoſe of our myrtle, of a deep, duſky, green colour.

Tavernier aſſures us, that the iſlanders take care to bury their trees, when cut down, to make them the blacker. F. Plumier mentions another black Ebony tree, diſcovered by him at St. Domingo, which he calls *ſpartium portulacæ foliis aculeatum ebeni materiæ*. Candia alſo bears a little ſhrub, known to the botaniſts, under the name of ebenus Cretica.

Pliny and Dioſcorides ſay, the beſt Ebony comes from Ethiopia, and the worſt from India; but Theophraſtus prefers that of India. Black Ebony is much preferred to the other colours. The beſt is a jet black, free of veins and rind, very maſſive, aſtringent, and of a ſharp pungent taſte.

Its rind, infuſed in water, is ſaid to purge pituita, and cure venereal diſorders; whence Matthiolus took guaiacum for a ſort of Ebony. It yields an agreeable perfume, when laid on the coals: when green, it readily takes fire, from the abundance of its fat. If rubbed againſt a ſtone, it becomes brown. The Indians make ſtatues of their gods, and ſcepters for their princes, of this wood. It was firſt brought to Rome by Pompey, after his ſubduing Mithridates. It is now much leſs uſed among us, than anciently, ſince the diſcovery of ſo many ways of giving other hard woods a black colour.

As to green Ebony, beſides Madagaſcar and St. Maurice, it likewiſe grows in the Antilles, and eſpecially in the iſle of Tobago. The tree that yields it is very buſhy, its leaves ſmooth, and of a fine green colour. Beneath its bark is a white rind about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, though, ſometimes, ſtreaked with yellow veins. Its uſe is not confined to Moſaic work: it is likewiſe good in dying, as yielding a fine green tincture

As to red Ebony, called alſo grenadilla, we know little of it more than the name.

The cabinet-makers, inlayers, &c. make pear-tree, and other woods, paſs for Ebony, by ebonifing, or giving it the black colour thereof. This ſome do, by a few waſhes of a hot decoction of galls, and, when dry, adding writing ink thereon, and poliſhing it with a ſtiff bruſh, and a little hot wax. Others heat, or burn their wood black.

ECHINI'TES, or ECHINITÆ, in natural hiſtory, the name given by authors to the foſſil ſhells of the ſeveral ſpecies of echini marini, and to the ſtones formed in them. Of theſe there is almoſt an endleſs variety in the foſſil world. Many of thoſe which we find daily in our chalk-pits are the ſame with thoſe now known to us in their recent ſtate, or living in the ſea; but we have numbers of others, of which our imperfect knowledge of the animal world gives us no certain account, in their recent ſtate.

ECHINOPHO'RA, in botany, the name of a genus of plants the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of ſeveral petals, arranged in a circular form; and theſe are collected into an umbellated head, and contained in the circuit of one common cup, which finally becomes an unicapſular fruit, containing an oblong ſeed.

ECHINO'PUS, *globe thiſtle*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of a globoſe ſhape, and of the floſculous kind, being compoſed of a number of floſcules divided into ſeveral equal ſegments at the ends, and placed on the embryo ſeeds, but each having its peculiar ſquamoſe cup, which is fixed to the thalamus of the flower; and contains the embryo, when it has ripened into a ſeed.

E'CHO (*Dict.*)—Echo's are diſtinguiſhed into divers kinds, viz. 1. Single, which return the voice but once; whereof ſome are tonical, which only return a voice when modulated into ſome particular muſical tone. Others polyſyllabical, which return many ſyllables, words and ſentences.

Of this kind is that fine Echo in Woodſtock Park, which, Dr. Plott aſſures us, in the day-time, will return very diſtinctly ſeventeen ſyllables, and in the night twenty. See *Nat. Hiſt. Oxford.*

2. Multiple, or tautological, which return ſyllables and words the ſame oftentimes repeated.

In Echo's, the place where the ſpeaker ſtands, is called the centrum phonicum; and the object, or place, that returns the voice, the centrum phonocampticum.

At the ſepulchre of Metella, wife of Craſſus, was an Echo, which repeated what a man ſaid, five times. Authors mention a tower at Cyzicus, where the Echo repeated ſeven times. One of the fineſt Echo's we read of is that mentioned by Barthius, in his notes on Statius's Thebais, l. VI. v. 30. which repeated the words a man uttered ſeventeen times: it was on the banks of the Naha, between Coblents and Bingen. Barthius aſſures us, he had proved what he writes, and had told ſeventeen repetitions. And whereas, in common Echo's, the repetition is not heard till ſome time after hearing the word ſpoke, or the notes ſung; in this, the perſon who ſpeaks, or ſings, is ſcarce heard at all; but the repetition moſt clearly, and always in ſurprizing varieties; the Echo ſeeming ſometimes to approach nearer, and ſometimes to be further off. Sometimes the voice is heard very diſtinctly, and ſometimes ſcarce at all: one hears only one voice, and another ſeveral: one hears the Echo on the right, and the other on the left, &c.

Addiſon, and other travellers into Italy, mention an Echo in that country, ſtill more extraordinary, which will return the ſound of a piſtol fifty-ſix times, even though the air be very foggy.

ECLI'PSE (*Dict.*)—The learned M. Segner, profeſſor of mathematics at Gottingen, has contrived the following method of repreſenting ſolar Eclipſes by means of a terreſtrial globe.

In order to exhibit any Eclipſe of the ſun, a projection in plano of the imaginary arches and circles deſcribed on the illuminated hemiſphere of the earth is of great uſe: and, if in ſuch a projection the ſituation of the cities, iſlands, &c. on the ſurface of the earth be inſerted, and a circle deſcribing the poſition and magnitude of the lunar penumbra, and ſome leſſer concentric circles be added, thoſe parts of the ſun which at that time are obſerved by the interpoſition of the moon, are ſhewn at one view, and to what part of the world the Eclipſe is viſible.

But ſuch a projection is imperfect, becauſe it cannot exhibit the other phænomena which depend partly on the rotation of the earth, and partly on the motion of the moon; ſo that whoever would exhibit all the appearances of an Eclipſe by this method muſt draw ſeveral projections, which will be a work of much labour, and never worth the pains taken about it.

The rotation of the earth, indeed, makes no difference in the parallels or circles of latitude, and their projection is therefore always the ſame; but the meridians or circles of longitude are continually changed by the earth's rotation, and conſequently the projection of theſe circles and the ſituation of places on the globe muſt alſo be changed, as far as they depend on them; theſe conſiderations induced me to deviſe a clearer and more conciſe method of demonſtrating the doctrine of Eclipſes.

An artificial globe eaſily repreſents an hemiſphere illuminated. For, the pole being elevated above the horizon or depreſſed beneath it, ſo as to render that elevation or depreſſion equal to the declination of the ſun at the given time, or, which amounts to the ſame thing, let the ſun's place in the ecliptic be the zenith of the globe, the artificial horizon becomes the terminator of light and ſhade, or that which diſtinguiſhes the opake from the illuminated hemiſphere of the earth: and nothing remains to exhibit the illuminated hemiſphere, but to turn the globe on its own axis till it obtains that ſituation, which the time of day requires.

And thus the globe more eaſily and naturally performs what is very difficult to exhibit by projection. From this obſervation, I imagined that all the phænomena of Eclipſes of the ſun might be exhibited on a globe, that the lunar penumbra might be projected upon it, and a machine be contrived, by which its poſition might be repreſented for any time, and might be referred to places of the earth drawn on the globe. Invited by the eaſe and perſpicuity I apprehended in ſuch a demonſtration of the nature of Eclipſes, I ſet about the following machine deſcribed, *plate* XVII. *fig.* 15. which repreſents a common terreſtrial globe with the meridian and horary circle rectified. Two wooden brackets A B, *a b*, are fixed to the horizon, the length of each of theſe brackets ſomewhat exceeds a ſemidiameter of the globe. Both the extremities of theſe brackets A C D, *a c*, are ſo made that they may take in the horizon, and be fixed at any point of it by ſcrews, one of which appears at D.

On the oppoſite extremes of the brackets B, *b*, are fixed two wooden columns perpendicular to the horizon B E, *b e*, of an equal height with the ſemidiameter of the globe and breadth of the brazen meridian, ſo that a right line drawn through the ſummits of the columns may not touch the meridian.

The columns are covered with circular plates of braſs, perforated with iron axes, firmly connected to the plates of braſs. The lower parts of theſe axes are inſerted firmly in the columns, the circular plates are likewiſe fixed immoveable in a poſition parallel to the horizon of the globe.

The tops of the axes are ſmooth and poliſhed as well as the plates which receive the brazen wheels E F G, *e f g*, placed on the plates, in ſuch a manner, that, however they are moved round the axes, they continually keep parallel to the horizon. The diameters of theſe wheels are about three inches, and their peripheries have each a cavity to receive a thread. The wheel *e f g* is a little leſs than the other E F G, but the machine receives no detriment by this diſparity, for nothing particular is marked on *e f g*; it is therefore ſimply faſtened at *h*, to prevent it from falling off from the axis.

But the other wheel E F G has a circle inſcribed on it, divided into degrees, and the index H is fixed on to ſhew the number of their parts; which is fixed to the axis in ſuch a manner, as to move round it with ſome difficulty, but ſo that the motion of the wheel may not interrupt the motion of the index, nor the motion of the index interrupt that of the wheel. Therefore, a ſmall immoveable round plate is fixed between the index and the wheel; and the index is ſo faſtened to the axis, that it is preſſed on every ſide towards that immoveable round plate.

Three brazen radii, *i k*, *i l*, *i m*, are connected at *i*, containing the equal angles *k i l*, *l i m*, *m i k*; at *i* is a very ſmall perforation. The radii are elaſtic, and as thin as the ſtrength required will admit; their length is as near as poſſible equal to a fourth part of the diameter of the globe, and this part is applied to the other as a ſkeleton to produce the penumbra. Now, the radii have little holes at *l* and *m*, through which a thread is drawn and put round the wheels, as may be ſeen by *m*; E F G, *g f e l*, the extremes between *l* and *m*, are tied faſt: wherefore, the ſkeleton, alſo is rendered immoveable at that part of the thread which is included between *e l m* E; the third radius *i k* lies looſe on the part of the thread between *g* G, ſo that the wheel E F G, or *e f g*, being turned round the ſkeleton, may be moved backward or forward in a right line. By this conſtruction of the machine it may be diſcovered how many parts of the diviſion of the wheel E F G are equal to a diameter of the globe. The brackets A B, *a b*, are ſo diſpoſed, that, the ſkeleton being put in motion, its center *i* would paſs over the diameter of the globe: to this end, the horizon of the globe being placed in a ſituation parallel with the horizon of the earth, the plumb-line *i n* is let down from the center, to ſhew the points of the horizon over which this center would impend. Therefore, the center being brought forward the whole length of the diameter of the globe, the number of the parts of the wheel E F G may be noted, which paſſed in the mean time by the index H: and this muſt be carefully obſerved, becauſe the uſe of it recurs in exhibiting all Eclipſes. The following circumſtances muſt be changed according to every particular Eclipſe. Firſt, the diſk of the penumbra, which I endeavoured to effect in this manner: having found by the tables the ſemidiameter of the lunar penumbra on the diſk of the earth, and the horizontal parallax of the moon, for the Eclipſe I deſigned to exhibit, I reaſoned in this manner; as the parallax of the horizontal moon was to the radius of the diſk of the penumbra, ſo the ſemidiameter of the terreſtrial globe, I made uſe of, muſt be to a fourth term which expreſſed the radius of ſuch a penumbra as the ſize of the globe required.

That radius being divided into ſix parts (for the ſmallneſs of the machine prevented me from dividing it into twelve with convenience) I deſcribed concentric circles on thick cap paper, and, according to them, cut the paper into armillæ. I paſted the biggeſt of theſe on the ſkeleton *k l m*, ſo that the center of the armilla might be congruous to the center of the ſkeleton; the ſecond armilla I rejected, and paſted the third on the ſkeleton in the ſame manner as the firſt; the fourth I rejected, paſted on the fifth as before, omitting the inner circle, which produced the figure deſcribed between *k l m*, the uſe of which is to ſhew (every part of the machine being put into the diſpoſition herein after mentioned) the beginning and end of an Eclipſe, and the places marked on the globe which are perpendicularly under the exterior margin of the biggeſt armilla; thoſe parts which are placed under the interior margin of the ſame armilla exhibit an Eclipſe of two digits; thoſe parts which are under the exterior margin of the ſecond armilla, repreſent an Eclipſe four digits, and ſo on; thoſe parts of the globe which are under the center ſuffer a total Eclipſe; for I thought it ſufficient to repreſent the ſhade by the center itſelf, on account of its minuteneſs.

The machine muſt be put in this diſpoſition to exhibit every moment or progreſſion of the given Eclipſe. Having found by calculation the points of the terminator of light and ſhade, at which the center of the moon firſt enters into the earth's diſk, and departs out of it again, they are marked on the horizon of the globe, and the brackets A B, *a b*, *fig.* 15. are placed in ſuch a manner that, the wheel E F G being turned round, *i*, the center of the diſk of the penumbra *k l m*, may paſs over it, which the pendulum *i* ſhews whether it can or not. Then I find at what time the center of the penumbra is in any remarkable place, to ſhew where it firſt enters the diſk of the earth, and place the globe in ſuch a manner, with the help of the horary circle, that the part which appears above the horizon may repreſent the hemiſphere of earth at that time enlightened by the ſun. Then I turn round the wheel E F G, till the center of the penumbra *i*, at that remarkable place as in our example, becomes perpendicular to the terminator of light and ſhade; this I call its firſt poſition, and ſet H, the index of the wheel, to the beginning of the diviſion. Thus every part is properly adapted to the time, and will exhibit the phænomena of the Eclipſe propoſed.

Now, the horary motion of the moon from the ſun being taken out of the tables, I infer that, as the parallax of the horizontal moon is to this horary motion of the moon, ſo the number of the parts of the wheel E F G, which is equal to the ſemidiameter of the globe, is to a fourth term which ſhews how many parts are to be drawn through the place of the index to obtain the ſituation of the diſk of the penumbra an hour after or before the time which correſponds to its primary poſition; the diſk being placed in this poſition, and the globe being turned round upon its axis, the phænomena of the time given will be exhibited.

The poſitions for any other times are eaſily obtained, for, the number of the parts of the wheel being divided into half-hours, quarters, and months, a table may be formed only by addition and ſubtraction, by which it may be ſhewn how the diſk of the penumbra ought to be moved backward or forward to agree with the time. This being completed, the globe need only be turned round according to the time; but the wheel in ſuch a manner, that the index may ſhew the number aſcribed to the time. The firſt operation is performed more expeditiouſly by the uſe of an horary circle which is expreſſed in the figure, if the hours are marked in retrograde order, accommodated to the motion of the earth round its axis.

We have before obſerved that the parts of the globe placed perpendicularly under the diſk of the penumbra in any poſition might be diſcovered by the plumb-line. But theſe may be ſeen, at one view, by the ſolar rays reflected from a plane ſpeculum ſo diſpoſed that the rays may fall perpendicular to the horizon of the globe, which will project ſhades on the globe from the diſk of the penumbra reſembling thoſe penumbræ which the moon projects on the earth, and exhibit the phaſes of any Eclipſe.

ECTRO'PIUM (*Dict.*)—Sometimes this is a ſimple and original diſorder, and ſometimes it is only a ſymptom of ſome other, as of an inflammation, ſarcoma, tumour, or the like. This ſometimes owes its original to the contraction of the ſkin of the eye-lids, by the ſcar of a wound, ulcer, burn, &c. or to the induration and contraction of the ſkin, after an inflammation; and ſometimes it in a great meaſure proceeds from the injudicious uſe of aſtringent collyriums, or eye-waters. When the diſorder is become inveterate, it is not eaſily cured; while recent, it is to be attempted by relaxing and elongating the ſkin of the eye-lid, by the application of emollients, ſuch as the vapours of hot milk, or water, oil of almonds, mucilage of quince ſeed, and ointment of marſh-mallows. Theſe muſt be repeated every day, the ſkin of the eye-lid drawn frequently towards its right poſition, and, when the patient goes to bed, the eye-lids ſhould be brought together, and reſtrained in their proper poſture, by a plaiſter compreſs and bandage. But, if all this fail, and the caſe yet appear not incurable, manual operation muſt take place.

The operation is performed in the following manner: firſt, a ſemilunar inciſion is to be made in the external ſkin of the eye-lid, next its tarſus, or cartilaginous margin, making the angles of the inciſion, downward in the upper lid, and upward in the under, that by this means the ſkin may be elongated. If it does not appear ſufficiently let out by one inciſion, two or three more may be made, running parallel with the firſt, and at the diſtance of a ſmall packthread. When the eye-lid is thus ſufficiently elongated, the inciſion muſt be dreſſed firſt with dry lint ſtuffed into them, and afterwards with lint, armed with ſome vulnerary unguent, which will prevent the ſkin from growing together again, and will occaſion new fleſh to be formed in the place, which will elongate the ſkin. Laſtly, to forward the extenſion and cure, a piece of ſticking plaiſter ſhould be faſtened to the eye-lid, to keep it extended, and this muſt be continued till the eye will ſhut cloſe. When this caſe has continued from the patient's birth, the cure is very difficult, and it is a yet more hopeleſs caſe, when it happens to old people, from a weakneſs of the orbicular muſcle. *Heiſter's Surgery.*

EDGI'NGS, in gardening, the ſeries of ſmall, but durable, plants, ſet round the edges or borders of flower beds, &c. The beſt and moſt durable of all plants for this uſe is box, which, if well planted, and rightly managed, will continue in ſtrength and beauty for many years. The ſeaſons for planting this are the autumn, and very early in the ſpring. And the beſt ſpecies for this purpoſe is the dwarf Dutch box. The Edgings of box are now only planted on the ſides of orders, next walls, and not, as was ſome time ſince the faſhion, all round borders or fruit beds, in the middle of gardens, unleſs they have a gravel walk between them, in which caſe it ſerves to keep the borders from waſhing down on the walks in hard rains, and fouling the gravel.

In the laſt age, it was alſo a very common practice to plant borders, or Edgings, of aromatic herbs, as thyme, ſavory, hyſſop, lavender, and the like. But theſe are all apt to grow woody, and to be in part, or wholly, deſtroyed in hard winters. Daiſies, thrift, or ſea july flower, and chamomile, are alſo uſed by ſome for this purpoſe; but they require yearly tranſplanting, and a great deal of trouble, elſe they grow out of form; and theſe are alſo ſubject to periſh in very hard ſeaſons. *Miller's Gard. Dict.*

EEL, in ichthyology, the name of a well-known fiſh.

Though the learned world at this time generally allows, that Eels are produced, like other animals, by parents of their own kind, yet there remain many doubts, about the manner in which this is performed; ſome allowing the Eels to be like the generality of other animals of different ſexes, in the different individuals; and others affirming that they are all hermaphrodites, each having the parts of generation of both ſexes. Rondeletius affirms they are of different ſexes: and Mr. Allen, who has given a very curious paper concerning them, in our Philoſophical Tranſactions, is of the ſame opinion; and both ſay, that the parts of the ſexes may be diſcovered, on a careful inſpection, and ſome found to be males, and others females; but theſe parts are, in both ſexes, they ſay, buried in a large quantity of fat, and they are of opinion, that hence proceeded the miſtake of Ariſtotle and his followers, who, not being able to find theſe parts, concluded that they did not exiſt at all.

Among thoſe who allow the Eels to be produced, like other animals, from animal parents, which have the ſexes, ſome are of opinion that they are viviparous, and others, that they are oviparous; but a gentleman of our nation, Mr. Chartwynd, ſeems to have determined this great controverſy, by obſerving, that, if the aperture under the belly of the Eel, which looks red in the month of May, be cut at that time, the young Eels will be ſeen to come forth alive, after the operation. Mr. Allen alſo affirms them to be viviparous; but his obſervation, concerning the place of their conception, does not appear analogous to that care and induſtry of nature, in providing convenient receptacles for the fœtus; neither is it conſonant to reaſon, that, when nature has provided an uterus in all animals, not only the viviparous, but the oviparous, and even in inſects, that the Eel and the ſword-fiſh ſhould be without this part, as Bartholine ſuppoſes; much leſs that the guts, which are appointed by nature for the ſecretion of nouriſhment, and expulſion of the fæces, and which are in continual motion to anſwer theſe purpoſes, ſhould be deſtined in one ſingle animal to the reception of a fœtus. This gentleman mentions a ſlender gland lying near the bowels, and, in all probability, this was the uterus. For Mr. Lewenhoeck, who took much pains in examining this fiſh, ſays, that he found an uterus, not only in ſome, but in every Eel he examined, and he therefore concludes Eels to be hermaphrodites; nay, he goes ſo far as to ſuppoſe, that there are no male parts of generation, of the common form of thoſe in other animals; but that the office of theſe is performed by a liquor analogous to the male ſeed of animals, which is contained in certain glands, ſituated on the inſide of the uterus itſelf.

Nature having, in all animals hitherto diſſected, been found to have provided in the females not only an uterus, but alſo two tubes, which, from Fallopius, the perſon who firſt diſcovered them, are called Fallopian tubes, and which ſerve to convey the ovum from the ovary into the uterus, the ſyſtem of Mr. Allen, and thoſe others who ſuppoſe the bowels the ſeat of generation in Eels, is rendered highly improbable, by the want of ſuch parts as theſe. This gentleman obſerves, that he had ſeen the embryo's within the parent Eel, both in the egg and animal ſtate; that the eggs were always found to lie on the outſide of the inteſtines, and the young Eels within them. Now, as we have no idea how theſe embryo's ſhould get within the gut, from an egg on the outſide, any more than how an egg ſhould come in that place, the whole ſyſtem of this gentleman, though favoured by many people, ſeems built on ſo bad a foundation, as not to merit any longer the countenance of the world. It is probable, that all his obſervations were founded upon errors, for it is a very common caſe to find Eels ſubject to worms in their guts, ſuch as we have, and all the kinds that we are ſubject to; ſome of theſe might be eaſily miſtaken by the author of this ſyſtem for embryo Eels; and poſſibly the eggs he deſcribes on the outſides of the bowels, might be no other than ſmall lumps of fat.

The fine ſilver Eel may be catched with many ſorts of bait, and with great eaſe to the fiſher. Powdered beef is the very beſt bait for many places; next after this are lob-worms, minnows, or other ſmall fiſh, and, in the place of theſe, chicken's guts, and even fiſh garbage will do. The Eel, for the ſix winter months, remains conſtantly buried in mud, and even in warmer weather this fiſh ſeldom appears above the bottom by day light, ſo that night is the beſt time for fiſhing for it. The hooks may be baited, and thrown into the water at night, and the ends of the lines faſtened to the ſhore; and one general line may have a great many other ſhorter ones, with each its hook tied to it, depending on it. When theſe are laid in over night, they may be left to themſelves afterwards; and, when they are taken up in the morning, the Eels will be found hung. A very good method for large Eels is this: take five or ſix lines, each of them about ſixteen yards long, and at every two yards ſpace make a nooſe, and at every one of theſe nooſes hang on a hook, faſtened to a ſhort line of ſtrong ſilk; ſome uſe wire, but ſilk will anſwer the purpoſe, and give the fiſh leſs ſuſpicion; bait the hooks with miller's thumbs, loaches, minnows, and ſmall gudgeons; let the long line be drawn quite acroſs the deepeſt part of the brook or river, and the two ends faſtened down, with a peg driven into the ground on each ſide: theſe are to be laid in at night, and the ſportſman muſt either ſit up and watch them, or elſe be up very early to take them up, for otherwiſe many of the Eels, which were hung, will be got away again; and what is moſt provoking is, that thoſe are the largeſt which thus eſcape.

With proper management and attendance there will ſeldom fail being three or four Eels on each line. When there are very large Eels in any place, the beſt bait is a moderate-ſized roach: this muſt be faſtened to a ſtrong ſingle night line, and the hook muſt be hid in the mouth of the bait.

Eels have been obſerved to move directly upwards, and ſo to get over perpendicular obſtacles ſeveral feet above the ſurface of the water. They ſlide thus upwards with as great eaſe, ſeemingly, as if they had been going along the level ground. *See Phil. Tranſ.* Numb. 482.

Eel *Pout*, in ichthyology, the Engliſh name of the muſtela fluviatilis, a fiſh of the gadus kind, according to Artedi, and diſtinguiſhed from the others by the name of the bearded gadus, with two fins on the back, and with both jaws of the ſame length.

This fiſh is caught in the Trent, and many other of our rivers, and in ſome places called a barbot.

EEFLU'VIA (*Dict.*)—Some bodies are found to emit Effluvia for a great number of years, without any conſiderable loſs, either as to bulk or weight; as magnets, electrical bodies, ambers, and divers odorous bodies, the tenuity of whoſe emanant corpuſcles is incredible: not but that the loſs they ſuſtain by the continual emiſſion of Effluvia, may be made up to them by the reception of other ſimilar Effluvia of the ſame kinds of bodies, diffuſed through the air.

It is added, that theſe Effluvia are emitted in manner of radii, rays, in orbem, and that the circumference or bound of the activity of the radiation exhibits the ſame figure as is that of the radiant. This the aſtronomers ſufficiently prove, from the ratio of the refraction of the atmoſphere.

That Effluvia may conſiderably operate upon, and have great effects on bodies within the ſphere of their activity, is proved by Mr. Boyle, in an expreſs treatiſe on the ſubtility of Effluvia; where he ſhews, 1. That the number of corpuſcles, emitted by way of Effluvia, is immenſely great. 2. That they are of a very penetrating nature. 3. That they move with vaſt celerity, and in all manner of directions. 4. That there is frequently a very wonderful congruity, or incongruity, in the bulk and ſhape of theſe Effluvia, with the pores of the bodies they penetrate into and act upon. 5. That in animal and organical bodies, particularly, theſe Effluvia may excite great motions of one part of the frame upon another, and thereby produce very conſiderable changes in the œconomy. Laſtly, that they have ſometimes a power of procuring aſſiſtance in their operations from the more catholic agents of the univerſe, ſuch as gravity, light, magnetiſm, the preſſure of the atmoſphere, &c.

That Effluvia are emitted to very great diſtances, we have a notable proof in this: that our wines grow turbid in the hogſhead, preciſely at the ſame time when the grapes are at their maturity in other remote countries, whence the wine was imported. Beſide, that odoriferous Effluvia are, in many caſes, perceived at the diſtance of many leagues. Again, that the generality of Effluvia retain the proper colour, ſmell, taſte, and other properties, and effects of the bodies whence they proceed, and this even after they have paſſed through the pores of other ſolid bodies, we have abundant proof. Thus, magnetical Effluvia penetrate all, even the moſt ſolid bodies, without any change of their nature, or loſs of force. And the ſame we ſee confirmed in ſympathetic inks, and powders, the ſagacity of blood-hounds, &c.

The wonderful extenſion of Effluvia, and the ſmall diminution of the body they iſſue from, is one of the ſtrangeſt problems in phyſics. Mr. Boyle refers the doctrine of Effluvia to ſeveral heads, as to the ſtrange extenſibility of ſome bodies, while their parts yet remain tangible; the multitude of viſible corpuſcles that may be afforded by a ſmall quantity of matter; the ſmallneſs of the pores at which the Effluvia of ſome bodies will get in; and finally the great quantity of ſpace that may be filled as to ſenſe by a ſmall quantity of matter, where rarified or diſperſed. The efficacy of ſeveral Effluvia, and their acting on one another, is a ſecond thing as obſervable in regard to them. This is done by either the great quantity of corpuſcles emitted, or their penetrating or pervading nature, or elſe by their celerity, or other modification of their motion, or by the congruity or incongruity of their bulk and ſhape to the pores of the bodies they are to act upon; or by the motions of one part upon another, which they excite or occaſion in the body they work upon, according to its ſtructure; and finally by the fitneſs and powers which they have to make themſelves be acted upon by the more catholic agents of the univerſe, which then aſſiſt them in their working.

The determinate natures of Effluvia, according to the principal inſtances we have of them, are reducible to theſe three heads: 1. That, theſe Effluvia being, by condenſation, or otherwiſe, re-united, they appear to be of the ſame nature with the body that emitted them. 2. Their determinate nature may be ſometimes diſcovered by the difference that may be obſerved in their ſenſible qualities, foraſmuch as thoſe Effluvia which are endowed with them proceed from the ſame ſort of bodies, and yet, thoſe afforded by one kind of bodies being in many caſes manifeſtly different from thoſe which fly off from another, this evident diſparity in their exhalation argues, that they retain diſtinct natures, according to the nature of each body from which they proceed. 3. We may diſcover this different nature of Effluvia from their effects upon other bodies than the organs of our ſenſes, conſidering that the effects, which certain bodies produce in others by their Effluvia, being conſtant and determinate, and always different from thoſe which other agents produce by their emiſſions on the ſame or other ſubjects, the diſtinct nature of the corpuſcles, emitted on this occaſion, may be ſufficiently judged of, were it only from this. *Boyle on Effluvia.*

EFT, or Eff, in zoology, the name of a creature very common in all parts of England, and called alſo the newt, and the ſwift, and by others the common lizard, lacertus vulgaris. The beak of this creature is oval and obtuſe, its back of a ruſty iron colour; its feet have each five toes, and are armed with very ſharp though ſmall claws. That toe which is in the place of the fore finger with us is the longeſt of all, and that which anſwers to our thumb is placed lower. *Ray's Syn. Quad.*

EGGS *of flies.* After the congreſs with the male, the female fly is ſeldom ſo much as twenty-four hours before ſhe begins to depoſit her Eggs on ſome ſubſtance proper to give nouriſhment to the worms that are to be produced from them.

Theſe Eggs in general are white and oblong, but there are ſome of them which are ſingular, and vary from this form. The deſcription of one ſpecies of theſe may give an idea of the reſt, and it may not be improper to take, for this purpoſe, thoſe of the Eggs of the fly found on hog dung, and on other ſuch matters. This fly is of the claſs of the great blue fleſh fly, but differs from it in many particulars. Its body is more round, and a little hollowed on the belly ſide, eſpecially that of the male. The hinder end of the male is bent alſo into a ſort of hook. The wings croſs one another on the body, and exceed it in length. The male is yellow, often of a very beautiful, and ſomewhat reddiſh yellow. This colour is principally owing to a multitude of hairs with which the body is covered. The corcelet is of a paler yellow than the body, and has ſome ſlight tinge of brown with it. Is has only a number of black hairs on it, fewer, and placed more diſtant than thoſe of the body. The female has much fewer hairs, and is browner than the male.

The Eggs are but a little time in hatching, and the growth, and all the changes of the animal, take up but a little time. The creature is found to make its way out of the upper part of the Egg, and it is not more than three weeks from the laying the Egg that is taken up, before the creature is ſeen in form of a perfect fly, if a female, and ready to depoſit her's.

On the ſtalks of the common meadow graſſes, there are alſo frequently found the Eggs of flies depoſited in great numbers. Theſe, examined by the microſcope, have all the form of ſmall ſnow white boats, or rather of ſmall ſhips, with the decks ſtanding up above their ſides. The places where they are lodged, ſhew evidently the care of the creature which laid them; the fly is not known, but they always produce a ſmall white worm, with a variable head, and two hooks.

On other ſtalks of graſs, one may often ſee alſo yellow ſpots and blotches, which may naturally paſs with an incurious obſerver for maladies of the plants; but, when examined with the microſcope, all theſe appear to be, in reality, cluſters of Eggs of the ſame boat-faſhioned form, and amaſſed in different numbers; ſometimes alſo they are formed perfect and whole, and ſometimes with their ends eaten. Theſe laſt are ſuch Eggs from which the worms have made their way. Theſe worms are white, and have a variable head, armed with two hooks, but their changes are not known. *Reaumur, Hiſt. Inſect.*

EGGS *of gnats.* There are few creatures in the winged kingdom more prolific than the gnat. Its whole ſeries of changes, from the Egg to the perfect animal, is uſually accompliſhed in three weeks, or a month, and there are commonly ſeven generations of them in a year, in each of which every female is the parent of two or three hundred young ones, if all the Eggs come to good. Theſe Eggs are arranged by the animal in the form of a ſmall boat, and each ſeparate Egg is of the ſhape of a nine-pin; the thicker ends of theſe are placed downwards, they are all firmly joined to one another by their middles, and their narrower, or pointed parts, ſtand upward, and make the upper ſurface of the boat of the Eggs, as it were, rough or prickly.

When theſe Eggs are examined ſingly by the microſcope, they appear not exactly of the nine-pin ſhape; the larger end is rounded, and terminated by a ſhort neck, the end of which is bordered with a ridge which makes a kind of mouth. The neck of each of theſe is ſunk within the water on which the boat ſwims, for it is neceſſary that it ſhould keep on the ſurface, ſince, if wholly ſubmerged, the worms could never be hatched.

The arrangement of theſe Eggs, in ſuch nice and exact order, is a thing very worthy our admiration, and which cannot have been effected, but by the utmoſt care and caution in the creature, while in the act of laying them. It is only in the morning hours that the gnats are to be found laying their Eggs, and then they will be frequently found about the ſurfaces of waters, as are in a proper condition to give ſupport to their young. The female gnat here places herſelf on a ſmall ſtick, the fragment of a leaf, or any other ſuch matter uſually near the water's edge, and places her body in ſuch a manner, that the laſt ring but one touches the ſurface of the water; the laſt ring of all, where there is the paſſage for the Eggs, is turned upward, and every Egg is thruſt out vertically, and the creature, when it is almoſt diſengaged, applies it againſt the ſides of the already formed cluſter, to which it readily adheres, by means of a mucilaginous ſticking matter with which it is naturally covered, like the Eggs of many other inſects.

The greateſt difficulty to the creature is the placing the firſt laid Eggs in a proper poſition to receive the reſt, and ſuſtain themſelves and them in a proper direction; theſe ſhe, with great precautions, places exactly by means of her hinder legs, and, when a ſufficient number of them are thus arranged together, the reſt is eaſy, they ſerving as a ſupport to all the following. *Reamur's Hiſt. Inſect.*

EGRA *Salt*, Egranum ſal, a name given by Hoffman, and other writers, to a purging ſalt, extracted from the waters of Egra by evaporation. The waters of this place are in great eſteem for many diſeaſes, and are, by Hoffman himſelf, in ſome repects, preferred to the Pyrmont, as containing leſs ochre and calcarious earth. The ſalt is wholly of the nature of Glauber's ſalt, as is alſo that of many other ſprings thereabouts, and even in our own country; the nitrum calcarium of Dr. Liſter being plainly the ſame with this, or Glauber's ſalt, produced in the bowels of the earth by a mixture of a vitriolic acid with that alkaline earth, which is the baſis of ſea ſalt. This ſalt, or one analogous to it, is found alſo concreted into a ſolid form in the earth in many places. There are accounts of it in the Memoirs of the Paris Academy, in Spain, in France, and in ſome parts of the Eaſt; and, in England, we have earth which contains it. *Hoffman.*

ELATE'RIUM, in botany, *the wild cucumber.* — This plant has ſeveral rough ſtalks, which creep upon the ground, whoſe leaves are ſet on long hairy foot-ſtalks; they are pretty large, greeniſh above, and hoary underneath, ſomewhat triangular, and indented about the hedges, rough and hairy. The flowers grow on the rudiment of the fruit, being much ſmaller than the flowers of the garden cucumbers, of one ſingle pale yellow leaf, cut into five parts. The fruit is as big as a large olive, covered, all over, with harmleſs prickles, and full of a pulpy juice, containing ſeveral brown oval ſeeds, which, when ripe, upon handling, or gently preſſing, will ſquirt forth at the end with great violence. It is ſown in gardens, flowers in July, and the fruit is ripe in September.

It may be propagated by ſowing the ſeeds in the ſpring of the year in an open warm border; and, when the plants are come up, they may be tranſplanted into an open bed or borders, about ſix or eight feet diſtance from each other; for the vines will ſpread very far, eſpecially if the ground is good, in which they are planted; theſe produce their fruit in autumn, which if you ſuffer to fall off, and emit their ſeeds, will afford a plentiful ſupply of plants, without any farther care. The roots of theſe plants will abide ſome years. *Miller's Gard. Dict.*

In order to render the preparations of this plant more mild and gentle, Mr. Boulduc has been at incredible pains, and, in the courſe of his experiments, found that this plant has ſcarcely any ſulphureous principles; becauſe brandy and ſpirit of wine hardly act upon it at all, and becauſe the principles they draw from it are only ſalts, diſſolved and carried off, not by the ſulphur of theſe menſtruums, but by the phlegm they always retain. The wild cucumber, then, contains only ſaline parts, in which its virtues conſiſt: and, as it is a ſtrong purgative, we may, from this circumſtance, conclude, that ſalts are as properly purgatives as ſulphurs, though this quality is not ſo generally aſcribed to the former as to the latter.

Mr. Boulduc was convinced, that juices obtained by expreſſion have leſs virtue than decoctions and infuſions. In the former of theſe proceſſes, we leave, as uſeleſs, a maſs, which is not, in reality, ſo; and which contains principles of the plant, the union of which with the others would be neceſſary, either to correct or augment their qualities. By the latter of theſe proceſſes, that is, decoction or infuſion, every principle is equally drawn out; and, even though the compound ſubſtance ſhould be peccant with reſpect to ſtrength and acrimony, the principles united and mixed, drawn from it, are ſuch as were moſt eaſily diſengaged, and, at the ſame time, moſt mild and gentle.

After trying an incredible number of experiments, ſometimes on all, and ſometimes only on ſome of the parts of this plant, Mr. Boulduc, at laſt, fell upon a method of preparing, from the dry root, a ſimple decoction, or extract, preferable to what can be obtained from all the other parts, and which he has found, from experience, to be a very mild, and, at the ſame time, a very powerful hydragogue. The doſe is from twenty-four to thirty grains, in conjunction with a few grains of mechoacan or rhubarb, and ſalt of wormwood, incorporated with extract of juniper.

As the cucumbers, produced by this plant, do not ripen all at once, they muſt be gathered immediately before the preciſe moment of their perfect maturity, becauſe ſoon after they would fall, and ſpread their ſeeds, which would render them uſeleſs. Mr. Boulduc thinks, that the method of preparing the Elaterium uſed among the antients was highly difficult; and poſitively affirms, that it was loſt a long time ago. This art he has attempted to recover, and, by preſerving every thing that was eſſential and important in it, has found the means of preparing an Elaterium, not only as good, but apparently better than that of the antients; ſince ſix grains of it purge very well, and without violence. It muſt be exhibited in conjunction with ſome powder of rhubarb, and ſome alcaline ſalt.

But the moſt ſimple elaterium is that which he made, when he imagined, that moſt of the good vegetable remedies come, as it were, prepared from the hands of nature. Accordingly he dried the wild cucumber very well, and reduced it, together with its ſeeds, to a powder, which he found a very good hydragogue. *Hiſt. de la Acad. Royale, An.* 1719.

ELEA'TICS, a ſect of philoſophers of Elea, founded by Xenophanes, a Colophonian. He held all things to be incomprehenſible, but withal maintained many dogmatical aſſertions. He held that God is one, incorporeal, eternal, all ſight, and all hearing, no way reſembling man: that this God is all things; that whatſoever is, is eternal; that there are infinite worlds, and thoſe immutable and eternal; that there are four elements; that the ſtars are certain clouds, ſet on fire when they riſe, and extinguiſhed when they ſet; that all comets, falling ſtars, and the like, are clouds, kindled by motion; that the ſun is a fiery cloud, extinguiſhed in its eclipſes; that the moon is a cloſe, compact, and habitable cloud; that there are many ſuns and moons in the ſeveral climates of the earth; that the ſun promotes generation, but the moon contributes nothing to it; that the ſun goes forward in infinitum, but to us ſeems to move circularly by reaſon of the great diſtance; that the clouds are a vapour drawn up by the ſun; that the earth was firſt founded and rooted, as it were, in an infinite depth; that the ſoul is a ſpirit; and that all divination is falſe, &c.

ELECTRI'CITY (*Dict.*)—The effects of lightning and thoſe of Electricity appear very ſimilar. Lightning has been known to ſtrike people blind, the electrical ſhock has had the ſame effect on animals. Animals have been killed by both. The mariner's compaſs has ſometimes loſt its virtue by lightning; and by Mr. Franklin's experiments it appears, that polarity may be given and reverſed by Electricity. The late Mr. Stephen Gray obſerved ſeveral years ago, that the electrical ſeemed to be of the ſame nature with that of thunder and lightning. Others have ſince been of the ſame opinion. And indeed it appears, from various experiments, that the flame of Electricity has been juſtly called by Mr. Franklin, a mimic lightning, ſince it blinds and kills animals, and melts metals, &c. like natural lightning.

This analogy is now farther confirmed by the diſcovery made in France, in conſequence of Mr. Franklin's hypotheſis, of being able, by a proper apparatus, to collect the Electricity from the atmoſphere during a thunder ſtorm. For a pointed bar of iron, 40 feet high, having been placed upon an electrical body, and a ſtormy cloud having paſſed over the place where the bar ſtood, thoſe that were appointed to obſerve it drew near, and attracted from it ſparks of fire, perceiving the ſame kind of commotions as in the common electrical experiments. The like effect followed, when a bar of iron 99 feet high was placed upon a cake of reſin, two feet ſquare and two inches thick. For a ſtormy cloud having paſſed over the bar, where it remained half an hour, ſparks were drawn from the bar. Theſe were the firſt experiments made in France, and they have been ſufficiently varied and verified ſince; ſo that it ſeems now certain, 1. That a bar of iron, pointed or not, is electriſed during a ſtorm. 2. That a vertical or horizontal ſituation is equally fitting for theſe experiments. 3. That even wood is electriſed. 4. That by theſe means a man may be ſufficiently electriſed to ſet fire to ſpirit of wine with his finger, and repeat almoſt all the uſual experiments of artificial Electricity; for ſuch may that which is excited by friction be denominated.

It is, however, to be remarked, that theſe phænomena are attended with irregularities, and do not always ſucceed perfectly. Sometimes ſimple clouds, without thunder or lightning, produce more Electricity, than when there is loud thunder. Sometimes the Electricity does not ſhew itſelf but where there is lightning: in other caſes, the Electricity which ſeemed diſſipated during the rain, began again as ſoon as the rain ceaſed, although the thunder was very diſtant.

Mr. Franklin has contrived a very ingenious and eaſy way of trying experiments of this kind by means of an electrical kite, made of a large thin ſilk handkerchief, extended and faſtened at the four corners to two ſlight ſtrips of cedar, of ſufficient length for this purpoſe. This kite, being accommodated with a tail, loop, and ſtring, will riſe in the air like thoſe of paper. To the top of the upright ſtick of the croſs is to be fixed a very ſharp-pointed wire, riſing a foot or more above the wood. To the end of the twine, next the hand, is to be tied a ſilk ribband; and where the twine and ſilk join, a key may be faſtened. The kite, is to be raiſed when a thunder guſt appears to be coming on, and as ſoon as the thunder-clouds come over the kite, the pointed wire will draw the electric fire from them, and the kite with all the twine will be electrified; and the looſe filaments of the twine will ſtand out every way, and be attracted by an approaching finger. When the rain has wet the kite and twine, ſo that it can conduct the electric fire freely, it will ſtream out plentifully from the key, on the approach of a man's knuckle. At this key the phial may be charged; and from electric fire thus obtained ſpirits may be kindled, and all the other electrical experiments be performed, which are uſually done by the help of a rubbed glaſs globe or tube, and the ſameneſs of the electric matter with that of lightning may thereby be completely demonſtrated.

The electrical virtue having, in ſome caſes, accelerated and facilitated the motion of liquids through capillary tubes, the Abbé Nollet was led to ſuppoſe, that the electrical effluvia might alſo contribute to accelerate the growth of vegetables, and to increaſe the perſpiration of animals, and the experiments made by that gentleman ſeem to ſupport his opinion; though objections have ariſen, as to what he has advanced with reſpect to the acceleration of the motion of fluids through capillary tubes or ſyphons: for Mr. Ellicott ſeems to have proved, that this acceleration is not barely owing to the fluids being electrified, but that other circumſtances are neceſſary, in order to produce this effect. Mr. Ellicott obſerves, that if a veſſel of water is hung to the prime conductor, having a ſyphon in it of ſo ſmall a bore that the water will be diſcharged from it only in drops, on the water's becoming electrical by means of the machine, it will immediately run in a ſtream, and continue to do ſo, till the water is all diſcharged, provided the ſphere is continued in motion. And the true reaſon of the water's running in a ſtream in this caſe ſeems to be, that ſo long as the machine is in motion, there is a conſtant ſucceſſion of the electric effluvia excited, which viſibly run off from the end of the prime conductor in a ſtream; and as they are in like manner carried off from all bodies hung to it, thoſe effluvia which run off from the end of the ſyphon, being ſtrongly attracted by the water, carry ſo much of it along with them, as to make it run in a conſtant ſtream.

Mr. Watſon has given us a particular account of ſeveral curious phænomena of Electricity in vacuo in the Philoſophical Tranſactions, Vol. XLVII. p. 362, ſeq. The electrical effluvia, in their paſſage through an exhauſted glaſs tube, of almoſt three inches in diameter, afford a moſt agreeable ſpectacle in a darkened room. We may obſerve, not as in the open air, bruſhes or pencils of rays an inch or two in length, but coruſcations extending the whole length of the tube, that is, in his experiment, thirty-two inches, and of a bright ſilver hue. Theſe did not immediately diverge, as in the open air, but frequently, from a baſe apparently flat, divided themſelves into leſs and leſs ramifications, and reſembled very much the moſt lively coruſcation of the aurora borealis. At other times, when the tube has been exhauſted in the moſt perfect manner, the Electricity has been ſeen to paſs between two braſs plates, contrived ſo, that they might be placed at different diſtances from each other in one continued ſtream, of the ſame dimenſions throughout its whole length.

If the exhauſted tube be made part of the circuit before mentioned in Muſchenbroek's experiment, at the inſtant of exploſion, a maſs of very bright embodied fire may be ſeen jumping from one of the braſs plates in the tube to the other. But this is obſerved not to take place, when one of the plates is farther diſtant from the other than ten inches. If the diſtance be greater, the fire begins to diverge, and loſe part of its force; and this force diminiſhes in proportion to its divergency, which is nearly as the diſtance of the two plates.

But, though the vacuum here employed greatly exceeded that which is uſually made by common air-pumps, yet it was far from being perfect. Theſe experiments were therefore tried with a Torricellian vacuum, very ingeniouſly contrived by Lord Charles Cavendiſh. The apparatus conſiſted of a cylindrical glaſs tube of about three-tenths of an inch in diameter, and of ſeven feet and an half in length, bent in ſuch a manner, that thirty inches of each of its extremities were nearly ſtraight, and parallel to each other, from which an arch ſprung, which was likewiſe of thirty inches. This tube was carefully filled with mercury; and each of its extremities being put into its baſon of mercury, ſo much of the mercury ran out, until, as in the common barometrical tubes, it was in equilibrio with the atmoſphere. Each of the baſons containing the mercury was of wood, and was ſupported by a cylindrical glaſs of about four inches in diameter, and ſix inches in length; and theſe glaſſes were faſtened to the bottom of a ſquare wooden frame, ſo contrived, as that to its top was ſuſpended, by ſilk lines, the tube filled with mercury before mentioned; ſo that the whole of this apparatus, without inconvenience, might be moved together. The Torricellian vacuum then occupied a ſpace of about thirty inches. In making the experiment, when the room was darkened, a wire from the prime conductor of the common electrical machine communicated with one of the baſons of mercury, and, any non-electric touching the other baſon, while the machine was in motion, the Electricity pervaded the vacuum in a continued arch of lambent flame, and as far as the eye could follow it, without the leaſt divergency.

It is to be obſerved, that upon admitting a very ſmall quantity of air into the exhauſted tube, the phænomena diſappear; not ſo much from the ſmall quantity of air admitted, as from the vapours which inſinuated themſelves therewith. For theſe phænomena have been viſible, though in a leſs perfect degree, when a much larger quantity of air was left in the receiver, by omitting to exhauſt it as much as poſſible.

If the electrifying machine, and the man who turns the wheel thereof, are ſupported by electrics per ſe; and if a piece of wire be connected with the braſs cap covering the upper extremity of the exhauſted tube, or to the end of the long braſs rod, by the ſliding of which through a box of oiled leather, the upper braſs plate may be moved in the tube; and if the other end of the wire be faſtened to any part of the frame of the electrifying machine; when this is put in motion, the electrical coruſcations may be ſeen to paſs, as before, from one of the braſs plates contained in the tube to the other, and to continue, unleſs the air inſinuates itſelf, as long as the machine is in motion. If, under theſe circumſtances, the hand of a perſon ſtanding on the floor is brought near the ſides of the glaſs, the coruſcations will direct themſelves that way in a great variety of curious forms.

This experiment, in which the Electricity is ſeen puſhing itſelf on through the vacuum by its own elaſticity, is conſidered by Mr. Watſon as an experimentum crucis of the truth of his doctrine hereafter mentioned.

It may be obſerved in all theſe experiments, that a vacuum does not conduct Electricity ſo perfectly as metals or water. For, in the laſt experiment, a perſon ſtanding upon the floor, and applying his finger to the upper braſs cap of the tube, receives a ſmart ſtroke; and, in the former, ſnaps of fire may be drawn from the prime conductor. Theſe are arguments of ſome degree of accumulation, while the Electricity is paſſing through the vacuum; ſince nothing of this kind happens when metals, ſtanding upon the ground, touch the prime conductor.

Laws, &c. of ELECTRICITY.—Mr. Ellicott, from carefully obſerving the various phænomena of Electricity, thinks that the following concluſions, or general laws, may be juſtly deduced from the phænomena.

1. That theſe remarkable phænomena are produced by means of effluvia; which, in exciting the electrical body, are put into motion, and ſeparated from it.

2. That the particles compoſing theſe effluvia ſtrongly repel each other.

3. That there is a mutual attraction between theſe particles and all other bodies whatſoever.

That there are effluvia emitted from the tube when rubbed, and which ſurround it as an atmoſphere, is evident from that offenſive ſmell ariſing from them, from that ſenſation on the hands or face, when the tube is brought near either of them, and from thoſe ſparks of light, on a ſtill nearer approach of the finger to it.

That the particles of theſe effluvia repel each other, is proved by the cork balls, and the fibres of the feather repelling each other, when impregnated with them; and by the leaf-gold being repelled by the tube, and not returning to it again, until by coming near, or touching ſome non-electric body, the effluvia are drawn off from it. From this property it is, that theſe effluvia expand themſelves with ſo great a velocity, whenever they are ſeparated from the electric body; and, as they are likewiſe capable of being greatly condenſed, may we not from hence juſtly conclude they are elaſtic?

That there is a mutual attraction between theſe effluvia and moſt other bodies, appears from their collecting from the tube ſuch quantities thereof, as to endue them with the ſame properties with the tube itſelf, as is proved from ſeveral of the experiments above-mentioned.

Theſe principles being admitted, it will follow, that, the greater difference there is in the quantity of electrical effluvia in any two bodies, the ſtronger will be their attraction. For, if the effluvia in each are equal, inſtead of attracting, they will repel each other; and in proportion as the quantity of electric matter is drawn from one of the bodies, will the attraction between them increaſe, and conſequently be ſtrongeſt, when any one of them has all the electrical matter drawn from it.

The particles of theſe effluvia are ſo exceeding ſmall, as eaſily to pervade the pores of glaſs, as is evident, in that a feather, or any light bodies incloſed in a glaſs ball hermetically ſealed, will be put in motion on the excited tube's being brought near the outſide of it: and it has been generally thought that they paſs through the pores of the denſeſt bodies, and ſeveral experiments render this ſuppoſition not improbable, though none of them are quite concluſive.

Mr. Ellicott then proceeds to ſhew, in a very ingenious manner, how, from theſe principles, the phænomena of ſome of the more remarkable experiments of Electricity may be accounted for. But as what he ſays cannot, with juſtice to his reaſonings, be abridged, we muſt refer the curious to his eſſays before quoted; only adding, that we have ſeen a manuſcript of his, where he endeavours to account for the experiment of Muſchenbroek on theſe principles, in a manner that makes us wiſh to ſee the reſt of his experiments, obſervations, and reaſonings on this ſubject publiſhed.

Mr. Watſon has endeavoured to prove, that Electricity is not furniſhed from the glaſſes employed in the experiments, nor from the circumambient air. He thinks that Electricity is the effect of a very ſubtile and elaſtic fluid, occupying all bodies in contact with the terraqueous globe, and that every-where in its natural ſtate it is of the ſame degree of denſity; and that glaſs, and other bodies, which are called electrics per ſe, have the power of taking this fluid from one body, and conveying it to another, in a quantity ſufficient to be obvious to all our ſenſes; and that under certain circumſtances, it is poſſible to render the Electricity in ſome bodies more rare than it naturally is, and, by communicating this to other bodies, to give them an additional quantity, and make their Electricity more denſe; and that theſe bodies will thus continue until their natural quantity is reſtored to each; that is, by thoſe which have loſt part of theirs, acquiring what they have loſt, and by thoſe, to which more has been communicated, parting with their additional quantity. Both one and the other of theſe is, from the elaſticity of the electric matter, attempted to be done from the neareſt non-electric; and when the air is moiſt, this is ſoon accompliſhed by the circumambient vapours, which here may be conſidered as preventing, in a very great degree, our attempts to inſulate non-electric bodies.

Mr. Watſon's ſyſtem naturally leads him to aſk, by what denomination ſhall we call this extraordinary power? From its effects in theſe operations ſhall we call it Electricity? From its being a principle neither generated nor deſtroyed; from its being every-where and always preſent, and in readineſs to ſhew itſelf in its effects, though latent and unobſerved, till by ſome proceſs it is produced into action, and rendered viſible; from its penetrating the denſeſt and hardeſt bodies, and its uniting itſelf to them; and from its immenſe velocity; ſhall we, with Theophraſtus, Boerhaave, Niewentiit, s'Graveſande, and other philoſophers, call it elementary fire? Or ſhall we, from its containing the ſubſtance of light and fire, and from the extreme ſmallneſs of its parts, as paſſing through moſt bodies we are acquainted with, denominate it, with Homberg and the chemiſts, the chemical ſulphureous principle, which, according to the doctrines of theſe gentlemen, is univerſally diſſeminated? Whatever we call it, it ſeems certain, that this power has many ſurpriſing properties, and cannot but be of great moment in the ſyſtem of the univerſe.

ELECTRO'METER, an inſtrument contrived to meaſure the force of electricity.

M. d'Arcy, in the Memoirs of the Royal Academy of Sciences at Paris, has given us the following curious Electrometer.

Plate XX. *fig.* 5. is a large veſſel A B containing a glaſs bottle C D called the philoſophical egg: at the extremity of the neck of this bottle is fitted on the rod V, perfectly cylindrical, one line in diameter and twelve inches long. The veſſel A B is covered again at the top with a plate of braſs H which fits cloſe upon it; this plate has a large perforation at its center, and ſo has the veſſel, that the rod may paſs through at liberty. At the upper extremity of the rod is the ſmall circular plate of braſs L, fourteen lines one ſixth diameter. The veſſel A B being full of water, the egg is immerſed to a certain depth, which ought to be ſuch, that the inſtrument being at reſt, that is, not electrified, the lower extremity of the egg may be as near as poſſible to the bottom of the veſſel without touching it. That the egg and rod may always be in a vertical ſituation, the egg is ballaſted with mercury, by which means, the center of gravity being very low, the whole keeps itſelf perpendicular to the horizon, and proves by the leaſt poſſible motion of the egg, from its balance, that if it were not confined, it would go towards the ſides of the veſſels, and ſwim ſometimes on one ſide and ſometimes on the other; wherefore it was neceſſary to determine it to a center in the following manner. On the plate H are fixed fine ſilver wires in the form of a croſs, like thoſe in micrometers; this croſs is formed by double wires, which leave a ſmall ſquare ſpace in the center of the plate, which being larger than the diameter of the rod, permits it to aſcend and deſcend between the wires without any ſenſible friction, and yet reſtrain it from erring from its center: and this ſingular phænomenon ariſes, when the whole machine is ſtrongly electrified, the rod keeps in the middle of the wires almoſt without touching them, becauſe, being electrified as well as they are, it avoids them continually.

After this deſcription of the inſtrument, it is eaſy to conceive its uſe, eſpecially if we attend to this known principle in hydroſtatics, that a body immerſed in water ſwims on the ſurface or ſinks in it, in proportion as a volume of water, equal to that it poſſeſſes, is lighter or heavier than the body itſelf; from this principle it follows, that a volume of water equal to that of the egg, and that part of the rod immerſed in the water when the whole is at reſt, was equal to the egg, the little plate, and all the rod: conſequently, if the whole be elevated one inch, the power which will ſuſtain it at this height, will ſuſtain a weight equal to a volume of water of the thickneſs of the rod, and an inch above; becauſe the volume of water which the egg and rod then poſſeſs, is leſſened by this quantity. If, therefore, different powers ſuſpend it at 1, 2, 3, and 4 inches, &c. in height above the point of reſt, theſe powers will be, with regard to each other, as theſe numbers, double, triple, quadruple, &c. You will ſee in a moment that electricity produces the ſame effect upon the Electrometer, that is, it performs the function of a power which would ſuſpend it at 1, 2, 3, and 4 inches, &c. above its point of reſt; and, conſequently, that by means of this inſtrument we may eſtimate all its different degrees of force. Let us ſuppoſe, for example, the whole machine compoſed of the veſſel A B, the egg, &c. placed like that in *fig.* 6, on a recipient of glaſs or any other electric per ſe. Electrify the veſſel A B, the rod V and plate L will become electrified alſo. Now it is admitted that all electrical bodies repel each other; thus the little plate L and the rod V, being repelled by the great plate H, will neceſſarily riſe more or leſs in proportion to the ſtrength or weakneſs of the electricity. Electricity, therefore, will, as I have ſaid before, perform the function of a power, that will ſuſpend the inſtrument to a certain elevation; but as theſe powers are proportional to the elevations of the inſtrument above its equilibrium, or point of reſt, theſe elevations alſo will be in proportion to the different degrees of the force of electricity: this is therefore a true Electrometer. But this inſtrument is of much more extenſive uſe than barely this; for it may be employed in a great number of electrical experiments, to determine the laws of attraction,

traction, repulſion, tranſmiſſion, &c. in electrical bodies: diſcoveries equally important with that of menſurating the electrical force.

Method of uſing the Electrometer.—As electrical bodies have this inconvenience, that they cannot be approached, without deſtroying their electricity, it is evident, that, if we come ſo near the Electrometer as to judge of its motions with exactneſs, we ſhould deſtroy its electricity. This reaſon determined us, after a number of attempts, to make our obſervations in the following manner: we place a great lanthorn with a large wax candle, in a part of the room which projects its light through a hole on the Electrometers I, K (we have not drawn the lanthorn in the plate, for fear it might have cauſed ſome confuſion, and have therefore only exhibited the ſtream of light) behind theſe Electrometers is a very ſolid frame Q, all the part X is wood, but it may be of any opaque matter. In this frame are cut two rectangles or windows filled with glaſſes, on which are marked very exact diviſions with ſtrong Indian ink.

This frame is ſo diſpoſed that the projection of the Electrometers may fall upon the glaſſes, and the extremity of the rod D, being made in the form of a cone, projects a very nice ſhadow. Now, as theſe glaſſes are tranſparent, the obſervator, placed behind in F, ſees, in the moſt diſtinct manner, all the different elevations of the Electrometer, and can therefore judge of all its variations with the utmoſt exactneſs: for, the plane of the ſquare being perpendicular to the horizon, and Electrometer riſing and falling in a parallel plane, the elevations and depreſſions of the ſhadows are always correſpondent to thoſe of the Electrometers. The chains M ſerve to conduct the electricity from the bar of iron or any other electrified body to the Electrometers: the ſquare Q, inſtead of two windows, may have but one, that being ſufficient for the Electrometer: but we muſt at the ſame time make our obſervations on the inſtrument with which we made the experiments, and the Electrometer too, to be aſſured that the electricity is always equal, which cannot be done without comparing their ſhadows very accurately. The conſtruction of the Electrometer ſhews, it has all the eſſentials to an inſtrument of this kind.

1. As the electrical force is very weak, the inſtrument muſt be very nice and ſenſible of the leaſt impreſſion: therefore the weight of eight grains laid on the little plate makes it ſink above four inches.

2. As the electrical force is very ſubject to alterations, the inſtrument muſt be ſo contrived as to exhibit all its variations; a thouſand experiments have convinced us that the leaſt alteration, in the force of electricity, immediately affects this Electrometer. It is in ſhort univerſal, for the true Electrometer is the cylindrical rod V, which determines the quantity of electrical power by the number of its parts raiſed above the point of reſt: now it is not difficult to procure a cylindrical rod of a line diameter. It is true the diameter of the little plate L and its diſtance to H, the point of reſt, may cauſe ſome differences in the repulſion; but it is eaſy to obſerve all theſe proportions, ſo that any one may conſtruct an Electrometer, which will be operated upon, like ours, by the ſame power of electricity: this property ſeems to me one of the moſt remarkable in our inſtrument, like that of M. Reaumur's thermometer, which all Europe has admired. As I have ſaid our Electrometer might be uſed as an inſtrument, it may be proper to give ſome account of the experiments we have made. In order to diſcover whether electricity is in proportion to the bulk or ſurface of bodies, we applied ourſelves in the manner following: the inſtrument E ſerved for an Electrometer, the other I was deſigned to make the experiment on, above this laſt was ſuſpended perpendicularly, at the diſtance of ten inches, a cap or portion of the ſphere P S; this cap was of hammered iron, very thin, and of a very regular figure; it received its electricity from the electrical bar by a braſs wire, and, being ſuſpended on ſilk, preſerved it. The chain in *fig.* 6. extends to both inſtruments, but in this experiment it only communicated with the Electrometer, ſo that the inſtrument was not electrified. One perſon made his obſervation on the ſquare of the height of the Electrometer cauſed by the electricity, another obſerved the elevation of the inſtrument; and ſeveral repeated experiments confirmed us in the opinion that the elevation of the inſtrument was in proportion to the force of the electricity, and this we found to anſwer exactly, after having repeated the experiment above fifty times. We afterwards poured mercury into this cap till it increaſed the weight ſixty times, and found no ſenſible alteration in the experiment: this ſeems to ſhew that the attraction of electrical bodies is in proportion to their ſurfaces; but this is a mattter of doubt, for the fire and ſparks drawn from an electrical body may obſerve ſome other law. Certain it is that a piece of any metal muſt be of a certain thickneſs to extract ſhining ſparks from, otherwiſe you only procure ſuch a kind of fire as is extracted from electrified wood of any thickneſs; yet the ſparks we extract from the middle of a plate of iron are very ſtrong; and thoſe extracted from the cap, either with or without mercury, ſeemed to have no difference. We have, in ſhort, found by a multitude of experiments, that the gravity or levity of a body neither increaſe nor diminiſh its electricity.

I ſhall add another experiment we made to try whether an electrical body always tranſmitted the ſame quantity of electricity, of whatever volume it was. Every thing being diſpoſed as in *fig.* 6, except that the inſtrument with which we made our experiment, inſtead of communicating with the iron bar by a chain, had a communication with it by a very fine iron wire; we electrified the bar of iron, and made our obſervations on the Electrometer and the inſtrument: we afterwards ſubſtituted a much thicker wire in the room of the fine one, repeated the experiment, but did not find the leaſt difference in the reſult, though it was performed ſeveral times with wires of all the different ſizes, that could be procured.

The objections to our Electrometer are of three kinds, its certainty, univerſality, and the method of making uſe of it. It may be aſked in the firſt place, whether the egg immerſed in water be not more or leſs repelled by the bottom of the veſſel, which would affect the Electrometer, without any alteration in the electricity? I anſwer that a body totally immerſed in a fluid receives no motion from electricity, and this is a fact confirmed by experiments. 2. It may be aſked whether the bodies which tranſmit the electricity to the Electrometer, may not act differently on the Electrometer? The experiment I have produced of wires of different magnitudes tranſmitting the ſame quantity of electricity ſufficiently proves electricity to have the property of fluids, which always endeavour to preſerve a plain ſurface, whatever are the canals of their communication. Beſides, it follows from this property, that the leaſt change of electricity, in a body compoſing the maſs of thoſe which are electrical, equally influences the whole maſs; which ſolves another objection that might be made againſt the veſſels of glaſs on which we ſupport our Electrometer: it may be ſaid, that, being more or leſs dry, they might loſe their electricity, and the Electrometer ſink, though there was no alteration in the electrical bodies themſelves: but the laſt property I have mentioned proves, that electricity, like a fluid, endeavours to preſerve an even ſurface, and is therefore acted upon equally; and this is ſupported by a number of experiments.

It may in the laſt place be objected, that the inſtrument, notwithſtanding all I have ſaid about it, is too coarſe to be affected ſo nicely, and that we are therefore apt to draw falſe conſequences from it; but the following experiment will ſhew this objection intirely groundleſs.

The iron bar which receives the electricity of the globe was placed at the diſtance of above twenty inches from it; a communication was made afterwards between this bar and the Electrometer: and, the chamber being made very dark, we began to electrify. The electricity which the bar received by this method was ſo weak that we could ſcarce be ſenſible whether it was electrified or not, by trying to draw ſparks from it; and what were drawn, were ſo weak, they ſcarce deſerved the name, notwithſtanding which, our Electrometer which had a communication with the iron bar roſe above a degree. This ſufficiently demonſtrates the nicety of the inſtrument and how eaſily it is acted upon; this too might, if there was occaſion, be ſtill increaſed by leſſening the diameter of the rod.

The ſtrongeſt objection againſt the univerſality of our inſtrument is the different denſity of water in different climates: but I anſwer, if a rod be made which will deſcend four inches with the weight of eight grains, the Electrometer will be as correct as ours. It may be objected, that in a hot country ſuch a rod might be more repelled, becauſe it would be bigger than ours; but, as the rod is only repelled in proportion to its circumference, the difference can ſcarce be perceivable.

It may be imagined that different poſitions of the Electrometer, with regard to the frame and lanthorn, may change the apparent aſcent or deſcent, but a very ſimple experiment will bring theſe to a certainty. Your Electrometer, &c. being placed as before directed, load the little plate with eight grains, and ſee how many degrees that will make the Electrometer deſcend upon the frame; the ſum of theſe degrees, compared with the ſum of the degrees which the ſame weight would have made another Electrometer, on which the ſame experiment had been made, paſs through, will give their exact proportion. *Mem. de la Acad. Royale*, 1749.

ELEOSA'CCHARUM (*Dict.*)—After the chemiſts had ſhewn phyſicians, that the ſpirit reſiding in eſſential oils contained, in a ſmall volume, all the particular virtues of the plants; phyſicians prudently reflected, that they had hence an excellent inſtrument in their art; but the unctuous tenacity of the oil ſtill prevented its being uſed with ſafety, becauſe theſe oils, being extremely ſharp, and, by their tenacity, remaining fixed to one part, occaſioned inflammations. Hence they began to think of a method of rendering theſe oils miſcible with water, and uniformly conveying their intire virtues to the places intended; and this they found might be affected by the means of ſugar.

Grind, therefore, an ounce of dry loaf ſugar to an impalpable powder, in a glaſs mortar, with a glaſs peſtle; and, by degrees, add thereto a drachm of any eſſential oil, or half a drachm, if the oil be very tenacious; and continue rubbing them together, till all the oil is perfectly mixed, and drank into the ſugar. The oil, in this operation, uſually diffuſes a fragrancy to a great diſtance; the operation, therefore, ſhould be performed quick, and the mortar be covered with a cloth, ſurrounding the peſtle. If a little freſh white of an egg be added in the grinding, and mixed in with the ſugar and oil, the oil thus becomes more eaſily miſcible; but the mixture will not thus keep ſo long, without turning rancid. And thus ſugar, which is a very pure ſoap, or a true eſſential oily ſalt, divides the glutinous tenacity of the oil, interpoſes itſelf betwixt the principles thereof, unites them cloſely with itſelf, and makes an extemporaneous ſoap; which may thus be commodiouſly diluted with water, for medicinal uſes: for though this mixture is not ſo perfect as in an actual ſoap, or true eſſential ſalt, yet it ſuffices for uſe; nor is there reaſon to apprehend any inconvenience from the ſugar, in this preparation; for ſugar is unjuſtly ſaid to be unwholeſome, as there are no proofs extant thereof. On the contrary, it is a wonderful ſalt, that perfectly mixes with water, and ferments therewith into wine: and yet, what is exceedingly ſupriſing, it appears oleaginous, and perfectly inflammable in the fire; whence it is known to conſiſt of oil and ſalt.

If theſe Eleoſacchara be well prepared, dried, and put into clean glaſſes, exactly cloſed with glaſs ſtoppers, they may long be preſerved perfect; and, in this manner, very effectual medicines might be commodiouſly carried from place to place, and, upon occaſion, be directly uſed on a journey, by adding a little of the Eleoſaccharum to a glaſs of wine. An Eleoſaccharum might, alſo, be made, by grinding an eſſential oil with a fixed alcaline ſalt; by which means, alſo, a kind of ſoap is obtained: but alcalies thus deſtroy the grateful properties of the eſſential oils, and change their natural taſtes and odours. Such Eleoſacchara, alſo, would preſently reſolve in the air, and thence be eaſily ſpoiled. By the former method, therefore, phyſicians may prepare an excellent medicine, rich in virtues: for, if the Eleoſaccharum of mint be diſſolved in diſtilled mint-water, then ſtrengthened with the addition of the ſpirit of mint, and the mixture ſweetened with the ſyrup of the ſame plant, the whole virtues of mint may thus be obtained.

Remarks.

Hence appears the ſaponaceous property of ſugar, which fits it for breaking and dividing the bodies of oils, as if they were in a manner fermented with ſugar; and, at the ſame time, it does not diminiſh, but rather improves, the particular virtue of theſe oils: whence the ancients, who were unacquainted with ſugar, mixed oils with honey, for the like purpoſe. And hence we learn the virtue of ſugar in the body; where, being diluted with the natural juices, it affords a ſaponaceous lixivium, which, by the force of circulation, diſſolves unctuous and viſcous ſubſtances: whence it does not generate, but diſſolves phlegm; nor does it increaſe the bile, nor turn into it, but opens, thins, and divides it; though, by diſſolving the oils too much, it may occaſion leanneſs; as, by attenuating too much, it produces a weakneſs and relaxation of the parts, and is, therefore, often found prejudicial in the rickets and the ſcurvy. In the mean time, this production of nature and art is, as we above obſerved, very ſingular and extraordinary; for it intirely diſſolves in water, melts in fire, ſhoots like a perfect ſalt into perfect cryſtals, is manifeſtly fixed, and, if diſtilled in cloſe veſſels, affords an acid penetrating ſpirit: in an open fire it becomes wholly inflammable; it is fermentable, and thus convertible into ſtrong wine, which will afford alcohol; and, laſtly, it may be converted into ſharp vinegar. If it be called a ſalt, we may aſk how it comes to be inflammable in the fire: if an oil, how it comes to cryſtallize? If an eſſential ſalt, how it comes to ferment? So that, perhaps, in all nature there is no other body found, in which all theſe properties conſpire. *Boerhaave's Chemiſtry.*

E'LEPHANT (*Dict.*)—The Elephant is ſaid to have four venters, and lungs four times as big as an ox. His genital member is like that of a horſe, but leſs; and the teſticles lie inward about the reins. The fore legs are much longer than the hind legs, of ſhort joints, and of equal bigneſs, both above and beneath the knees; the ancle-bones are very low; he bends his hind legs as a man when he ſits, but not both together, and ſo, leaning on one ſide, ſleeps moſt commonly againſt a tree. Their feet are round like horſes, and as broad as a buſhel, having five diſtinct toes upon each foot, which are very little cloven, but without nails. They are for the moſt part of a mouſe colour, or darkiſh brown. See *Plate* XXII. *fig.* 6.

Taming of ELEPHANTS. The method of taking and taming this creature, in the iſland of Ceylon, is as follows: the natives pitch upon a proper place for a warren, or park, which is broad at the entrance, and grows narrow farther in, till, at the end, it is ſo narrow, that an elephant cannot turn himſelf, and it runs on of this narrowneſs ſo far, that twenty elephants may ſtand in it one behind another. When the incloſure of this warren is finiſhed, all the people of the neighbouring places aſſemble, and make a circumference round the woods, where they know there are elephants, which takes in, perhaps, ſixty miles. The men now ſtand at twenty-five yards diſtance, and kindle fires between them, and make all the noiſe they can, by ſhouting, blowing horns, beating drums, and the like, and, by degrees, approach nearer and nearer the warren. The elephants run from the fires and noiſe, and conſequently can go no where but towards the warren; the men, who every way ſurround them, except on the warren ſide, follow upon them in this manner, till they come together, and make a ring, and the Elephants are driven into the incloſure. When theſe creatures perceive that they are thus taken, they make reſiſtance, and often turn upon the men; but there are always near the warren fences of poles, lying flat upon the ground, which the hunters need only raiſe up, and they keep in the prey, ſo that they can neither eſcape, nor injure them; they then purſue the Elephants with fire-brands, and drive them into the narrow part where they cannot turn.

They are, from this place, taken one by one, and led to the ſtable, each between two tame Elephants bred for that purpoſe, the points of whoſe long teeth are cut; and theſe, if the wild Elephant be troubleſome, will lay hold of his trunk with theirs, and beat him with their teeth. A man, ſitting upon each of the tame Elephants, directs them by a ſtaff with a hook at the end, with which he occaſionally touches their heads, and orders them, as he pleaſes, without bridle, or any other furniture. When they are brought into the ſtable, they are led between two poſts, with ſtakes put athwart before their breaſts, and under their bellies, and are ſo tied that they cannot ſtir, nor lie down upon the ground; for, if permitted to lie down, they would become ſorrowful, refuſe to eat, and in ſome time die. They are here fed with the trunks of plantains, a food they much delight in; and, when they have been kept thus about ſix weeks, they become tame enough for ſale. If not ſold at that time, they feed them about ſix weeks longer with cocoa leaves, and they are, at the end of that time, perfectly tame as a ſpaniel, and will eat graſs with the oxen in the fields. *Philoſ. Tranſ.* N°. 277.

The Elephants of Ceylon have been ſo long hunted, that they now know man for their mortal enemy, and ſeldom fail to ſeize upon and kill him, whenever they meet him; but if a man lie upon the ground, and pretend to be dead, they never meddle with him. Several people have, in this iſland, lain aſleep while Elephants paſſed by them, and ſome have only pretended ſleep, and a perfect ſtillneſs has always been found to preſerve them, even though the creature came up to examine them.

ELI'XIR (*Dict.*)—ELIXIR *of aloes*, a name given, in the late London Diſpenſatory, to the medicine commonly known by the name of Elixir proprietatis, which is there alſo ordered to be made in the following manner: take tincture of myrrh, a quart; powder of aloes, and fine ſaffron, of each three ounces; digeſt them a due time, and then preſs off the tincture, and filtre it for uſe. *Pemberton's London Diſpenſatory.*

ELIXIR *paregoricum*, a name given, in the late London Diſpenſatory, to the Elixir aſthmaticum of Quincey; which is there ordered to be made thus:

Take flower of benjamin, and ſtrained opium, of each a drachm; camphire, two ſcruples; eſſential oil of aniſeeds, half a drachm; rectified ſpirit of wine, a quart; digeſt all together a proper time, and then ſtrain off the ſpirit. *Pemberton's London Diſpenſatory.*

ELLI'PSIS *in grammar* (*Dict.*)—F. Boſſu conſiders the Ellipſis, as a way of diſguiſing ſentences, by ſuppreſſing the word which ſhould make the particular application, and leaving the whole in a kind of ingenious ambiguity.

Thus, the Trojans, in Virgil, being reduced by Turnus to the laſt extremity, and ready to be deſtroyed, ſpy Æneas coming to aſſiſt them: upon which the poet ſays, Spes addita ſuſcitat iras. Which expreſſion ſignifies either, in particular, that the hope they conceive retrieves and augments their courage: or in general, that the hope of aſſiſtance at hand naturally raiſes courage, and gives new ſtrength.

If the poet had added a word, and ſaid, Ollis ſpes addita ſuſcitat iras, the paſſage had been expreſly reſtrained to the firſt ſenſe; and had ceaſed to be a ſentence, and commenced only the application of a ſentence. The ſuppreſſion of that word makes it a ſentence in form.

This that excellent critic looks on as one of the fineſſes of the Latin tongue; wherein it had vaſtly the advantage of the modern tongues. *Trait. du Poeme de Epieque.*

ELM-TREE, *ulmus*, in botany, a genus of trees whoſe characters are;

The flower conſiſts of one leaf, which is ſhaped like a bell, having many ſtamina, or threads, in the center: from the bottom ariſes the pointal, which afterwards becomes a membranaceous or leafy fruit, almoſt heart-ſhaped; in the middle of which is placed a pear-ſhaped ſeed veſſel, containing one ſeed, for the moſt part of the ſame ſhape.

Theſe trees are very proper to plant in hedge-rows, upon the borders of fields, where they will thrive much better than, when planted in a wood, or cloſe plantation; and their ſhade will not be very injurious to whatever grows under them; but, when theſe trees are tranſplanted out upon banks after this manner, the banks ſhould be well wrought and cleared from all other roots, otherwiſe the plants, being taken from a better ſoil, will not make much progreſs in theſe places. About Michaelmas will be a good time for this work, for the reaſons before aſſigned; but when they are planted, there ſhould be ſome ſtakes fixed in by them, to which they ſhould be faſtened, to prevent their being diſplaced by the winds; and part of their heads ſhould be taken off, before they are planted, which will alſo be of uſe in preventing their being eaſily overturned by winds; but by no means ſhould their leading ſhoot be ſtopped; nor their branches too cloſely cut off; for, if there are not ſome ſhoots left on to draw and attract the ſap, they will be in danger of miſcarrying.

Theſe trees are alſo proper to plant at a diſtance from a garden or building, to break the violence of winds; for which purpoſe there is not any tree more uſeful; for they may be trained up in form of an hedge, keeping them cut every year; which will cauſe them to grow very cloſe and handſome, to the height of forty or fifty feet, and be a great protection againſt the fury of winds: but they ſhould not be planted too near a garden, where fruit trees, or other plants, are placed; becauſe the roots of the Elm run ſuperficially near the top of the ground to a great diſtance, and will intermix with the roots of the other trees, and deprive them of nouriſhment. Nor ſhould they be planted near gravel or graſs walks, which are deſigned to be well kept; becauſe the roots will run into them, and ſend forth ſuckers in great plenty; which will deface the walks, and render them unſightly.

But, for large gardens, where ſhade is required, there is ſcarce any tree ſo proper for that purpoſe, being eaſy to remove, when grown to a conſiderable ſize; ſo that a perſon who is willing to have his plantations for ſhade in a ſhort time, may procure trees of one foot circumference in their trunk, which will be in no danger of ſucceeding, provided they are removed with care. And theſe will take root, and grow again, almoſt as well as young plants, which is what few other ſorts of trees will do; but then they ſhould be ſuch trees as have been thus regularly trained up in a nurſery, and have good roots, and not ſuch as are taken out of hedge-rows, as is by ſome practiſed, which ſeldom riſe with any tolerable roots, and conſequently often miſcarry; and this has been the occaſion of ſo many plantations of theſe trees failing; for although ſome of them may live a few years, yet few of them are of long duration, and they rarely increaſe much in their ſtems, but frequently grow hollow, their heart decaying firſt; ſo that they are ſupported only by their bark or ſhell, for a few years, and the firſt ſevere winter, or very dry ſummer, they are generally deſtroyed.

In planting of theſe trees, great care ſhould be taken not to bury their roots too deep; which is very injurious to them, eſpecially if they are planted on a moiſt loam or clay; in which caſe, if the clay is near the ſurface, it will be the beſt way to raiſe the ground in an hill, where each tree is to be planted, which will advance their roots above the ſurface of the ground, ſo that they will not be in danger of rotting in winter with moiſture.

When theſe trees are propagated by ſuckers taken from the foot of old trees, they are commonly laid into the ground very cloſe in beds, where, in dry weather, they may be frequently watered, to encourage their putting out roots. In theſe beds they are left two years; by which time, thoſe that live, will be well rooted, though a great many of them generally die; then they ſhould be tranſplanted into the nurſery.

There are ſome who raiſe the witch Elm from ſeeds, which it generally produces in great plenty, and are ripe in April. Theſe ſhould be ſown upon a bed of freſh loamy earth, and gently covered; in dry weather they ſhould be watered, and if the bed is ſhaded from the violent heat of the ſun, it will be of great ſervice to the ſeeds, for I always obſerve the plants to come up better in the ſhade, than when expoſed to the ſun. When the plants come up, they ſhould be carefully cleared from weeds; and after they have ſtood two years in the ſeed bed, they will be fit to plant out into the nurſery.

Sometimes the common Engliſh Elm will produce ſeed; but it is not ſo conſtantly fruitful as the witch Elm, which ſeldom fails to produce great quantities, when they have arrived to due maturity; which ſeeds will fall to the ground, and when they light upon a ſpot which is not diſturbed, the plants will come up in great plenty.

The timber of the common Engliſh Elm is generally preferred to the reſt; though that of the witch Elm is often as good, and is the largeſt tree, when planted on a kindly ſoil; but the Dutch Elm affords the worſt timber, and never will grow to the ſtature of either of the other ſorts; ſo that this ſhould not be cultivated for the timber; therefore the beſt way to be ſure of the kinds which a perſon would chuſe to propagate, is to have a nurſery of ſtools, in order to furniſh layers; for when they are grubbed up from hedge-rows, there will often be many ſorts intermixed, eſpecially if the people who go about to gather them, furniſh them; becauſe they take them indifferently, wherever they can procure them; ſo that when they are planted out thus blended together, there will be a conſiderable difference in their growths, which will deface the plantation.

Mr. Dodart, in a diſcourſe made before the Paris academy, on the great fecundity of vegetables, and their prodigious increaſe, choſe this tree as an example of it. He obſerved an Elm of about ſix inches diameter in the body, and about twenty feet high to the branches; he ordered one of the branches to be cut off, and, without reckoning the ſeeds which had been ſhaken off by the blows of the weapon, or loſt by the fall, he counted the reſt only which remained on. This branch was about eight feet long, and on this there were 16450 ſeeds. Counting in a very moderate way, there muſt be reckoned, at leaſt, ten ſuch branches as this, on an Elm of that growth. The product of theſe ten branches will be then 164500 ſeeds.

All the branches which are ſhorter than eight feet, on the ſame tree, taken together, on a moſt moderate computation, muſt be allowed to make a ſurface more than double that of theſe ten branches. The product of this ſurface of the ſhort branches, therefore, will be 329000.

An Elm may very reaſonably be ſuppoſed to live a hundred years, and as the Elm, here mentioned, was but of twelve years growth, it cannot be ſuppoſed, in that ſtate, to be yet arrived at its middle degree of fertility in ſeeds; therefore the ſmalleſt addition that can be made to the 329000, will bring it to at leaſt 330000, for the mean yearly product of ſeeds of the tree; and to know what is the whole product of an Elm in ſeeds, according to this computation, this ſum muſt be multiplied by a hundred, the number of years of the duration of the tree. Thus the ſmalleſt amount will be thirty-three millions of ſeeds, produced by an Elm originally raiſed from one ſingle ſeed. *Hiſt. Acad. Par.* 1700.

This, however, is no more than the natural produce of the tree, in its wild ſtate; we all know very well, that proper management will make trees yield abundantly more fruit than they naturally would. Thus, if this Elm, at a proper ſtage of its growth, had been lopped off at the head, it would have puſhed out infinitely more numerous branches; and a ſet of theſe would have appeared in a circle round the trunk, at about half an inch from the place where it was cut off, and this would have been the caſe in whatever part, or at whatever height, it had been cut. All the trunk of the tree, from the ground up to the beginning of the natural eruption of the branches, being then full of theſe rudiments of branches, placed in circles, and ſeparated by circular ſpaces of about half an inch deep, compoſes ſo many circles of branches, or rudiments of branches, as there are half inches in meaſure from the ground up to the firſt natural rudiments; all theſe rudiments are formed, therefore, all ready to appear in form of complete branches, and all contain, in miniature, their proportion of ſeeds, and any circle of them may be made to ſhoot out and appear, by only cutting off the trunk juſt above them; theſe are all, therefore, to be allowed really to exiſt, and all to be brought into the account of the providence of nature, in the fecundity of the tree, as all are formed and provided for it. There are therefore evidently contained, in the Elm, ſo many times thirty-three millions of ſeeds, as there are half inches in twenty feet, which was its meaſure from the ground to the firſt branches: that is to ſay, this tree contains actually in itſelf 15840000000 rudiments of ſeeds, or has ſo many bodies incloſed in itſelf, by each, or any one of which, it is capable of multiplying its ſpecies, and of producing ſo great and aſtoniſhing a number of trees. The imagination is ſtartled at being conducted to ſo amazing a ſcene by reaſon.

What are we to think then of the immenſity of the works of the great Creator of the univerſe, when we conſider that every one of theſe ſeeds contains in itſelf a tree, loaded with an equal number of ſeeds, and each of thoſe another tree, loaded in the ſame manner, and ſo on, beyond the utmoſt extent of our capacity; and that conſequently here is a geometrical proportion, or progreſſion of increaſe, the firſt term of which is 1, the ſecond 15840000000, the third the ſquare of that number, the fourth the cube, and ſo on to infinity. Reaſon and imagination are loſt together in the immenſity of ſuch a calculation? *Mem. Acad. Par.* 1700.

E'LOHA, in ſcripture, the ſingular of Elohi, one of the names of God.

E'LOHI, Eloi, or Elohim, in ſcripture, one of the names of God. But it is to be obſerved, that angels, princes, great men, judges, and even falſe gods, are ſometimes called by this name. The ſequel of the diſcourſe is what aſſiſts us in judging rightly concerning the true meaning of this word. It is the ſame as Eloha. One is the ſingular, the other the plural. Nevertheleſs Elohim is often conſtrued in the ſingular number, particularly when the true God is ſpoken of; but when falſe gods are ſpoken of, it is conſtrued rather in the plural. *Calmet. Diction. Bibl.*

E'LVERS, an Engliſh name for a ſmall ſort of eels, caught in ſome parts of the kingdom, particularly about Glouceſter and Tewkſbury. Theſe are, in reality, young congers, or ſea eels. They get up into rivers, while very ſmall. They are taken in prodigious numbers in the rivers, in dark nights, and are eſteemed a very delicate food. *Willughby's Hiſt. Piſc.*

E'LUL, one of the Hebrew months, anſwering pretty near to our Auguſt. There are but nine and twenty days in it. It is the twelfth month of the civil year, and the ſixth of the eccleſiaſtical. Upon the ſeventh or ninth day of this month the Jews faſt, in memory of what happened after the return of thoſe who went to view the promiſed land.

ELUTRIA'TION, in metallurgy, is the ſeparating the lighter matters from the mixed ores of metals, by means of great quantities of fair water. Solid bodies, not diſſoluble in water, are by this operation ſeparated from each other by water very well ſtirred, ſo that the lighter and the finer parts are carried away with the water, and the heavier and more ſolid remain at the bottom of the veſſels.

ELYCRY'SUM, in botany, the name of a large genus of plants, the characters of which are theſe: the flower is of the floſculous kind, being compoſed of ſeveral ſmall floſcules, divided into ſegments, arranged in a ſtillated form at the ends; theſe ſtand on the embryo fruit, and are contained in a common ſcaly huſk or cup, which is of a very gloſſy and ſplendid appearance, and of a gold or ſilver colour, or of ſome other gaudy tinge. The embryo's finally ripen into ſeeds, winged with down.

E'MERALD *Colour*, in the glaſs trade.—The way of giving this beautiful dye to glaſs is this: in the pots of melted metal, made of pulverine, and without mangane ſe, when the matter is well purified, put a little crocus martis calcined with vinegar. About three ounces of this crocus is enough for a hundred weight of glaſs; let it ſtand till thoroughly mixed, then put in to every hundred weight of metal two pounds of calcined braſs; this muſt be added at ſix different times, letting the metal ſtand two hours every time. When this is all in, make a proof of the metal, and, if it have any bluiſhneſs, add more crocus martis, a ſmall quantity at a time. When the whole is of a fine leek green, let it ſtand twenty-four hours to mix thoroughly, and then work it. *Neri's Art of Glaſs.*

EME'RUS, *ſcorpion ſena*, in botany, a genus of plants, whoſe characters are:

It hath leaves like thoſe of the colutea: the flowers are papilionaceous: the pods are ſlender, and contain two or three cylindrical-ſhaped ſeeds in each.

Theſe ſhrubs are eaſily propagated by ſowing their ſeeds, which they commonly produce in great plenty, in March, upon a bed of light ſandy earth, obſerving to keep the bed clear from weeds; and in very dry weather you muſt often refreſh the bed with water, which ſhould be given carefully, leſt the ſeeds ſhould be waſhed out of the ground by haſty watering. When the plants are come up, you muſt continue the ſame care; and the Michaelmas following, if your plants have thriven well, you may draw out the largeſt; which may be tranſplanted into a nurſery, at three feet diſtance row from row, and one foot aſunder in the rows. This will give room to thoſe plants which are left to grow in the ſeed bed; in which place they may remain another year, when they will alſo be fit to tranſplant into a nurſery; where they ſhould be trained up in the manner you deſign them to grow, either in round heads, or in rude plants. In one or two years more they will be fit to plant out, where they are to remain for good: in doing of which you ſhould be careful, in taking them up, not to break or wound their roots: nor ſhould they remain too long in the nurſery before they are tranſplanted: for they are ſubject to ſhoot downright roots, which, when cut off, oftentimes prove the death of the tree. In all other reſpects it muſt be treated like other flowering ſhrubs; amongſt which, this is commonly ſold at the nurſeries. It delights in a dry ſoil, and may alſo be propagated by laying down the tender branches; which will take root in about a year's time, and may then be tranſplanted into a nurſery, and managed in the ſame manner as the ſeedlings. *Miller's Gard. Dict.*

EMMENAGO'GA, (*Dict.*)—Under this term the great Hoffman alſo included thoſe medicines which excite a flux of blood from the hæmorrhoidal veins; as the roots of birthwort, zedoary, and the five aperient roots; the herbs mugwort, calamint, feverfew, penyroyal, baum, ſavin, polium montanum, rue, marjoram, roſemary, wall-flowers, ſaffron, bay-berries, juniper-berries; the gums bdellium, myrrh, galbanum and amber: among purgative ſubſtances, aloes, rhubarb, and bryony; as alſo aromatics, and animal ſalts; caſtor, and chalybeated preparations, which excel all others of the mineral and chymical kind.

The more theſe excretions are ſubſervient to life and health, the more it were to be wiſhed, with Hippocrates, that we had certain and efficacious medicines for regulating them, and by that means preventing and curing ſeveral very terrible diſorders. But as theſe excretions are principally the work of nature, and, in women, appear, return, and end, at certain periods; but are neither incident to all women, nor ſo periodical as the menſes; and as a certain redundance of blood, together with a certain ſtate of the veſſels of the anus and uterus, diſpoſed to a ſpontaneous evacuation, are requiſite, in order to theſe diſcharges; and as theſe evacuations may be obſtructed, or totally deſtroyed, by various cauſes; it muſt of courſe be a difficult taſk to fall upon effectual means of reſtoring theſe evacuations when ſtopped, or enlarging them when impaired; neither of which ends can ever be obtained without knowing the cauſe from which the misfortune proceeds.

But, ſuppoſing that there is a redundance of blood, the principal cauſe of this evacuation; ſuppoſing, alſo, that the veſſels of the uterus and anus are ſo diſpoſed, that they may be diſtended by a large quantity of blood flowing to them, and be capable of diſcharging this blood; yet, if the excretions are not duly carried on, either on account of obſtructions, or ſpaſmodic conſtrictions of the ſmall lateral veſſels of the arteries, in conſequence of which, the blood does not circulate naturally, or on account of a diminution of the ſpirituous principle of the blood, and the elaſtic contractile force of the heart and arteries; then the above enumerated medicines afford the deſired relief: for the capillary veſſels are excellently opened, and obſtructions removed, by the five aperient roots, birthwort, rhubarb, bryony, and wall-flowers, eſpecially if exhibited, by way of decoction, with ſome ſaline ſtimulus, ſuch as borax. This intention is alſo excellently anſwered by the gums exhibited with aloes, and other purgatives, in the form of pills. The ſmall and capillary ducts, when ſpaſmodically conſtricted, or preternaturally contracted, are excellently relaxed and opened by mugwort, which is of a demulcent nature, as alſo by yarrow, ſaffron, and caſtor. In order to reſtore the ſpirituous principle of the blood, ſtrengthen the ſolids, and confirm the tone of the fibres and veſſels, ſuch corroboratives are to be uſed, as operate by their fine volatile and oleous ſalt; among which we may reckon all aromatics, myrrh, the berries of the bay and juniper-trees, roſemary, penyroyal, baum, ſavory, ſavin, wall-flowers, calamint, amber, filings of ſteel, chalybeate tinctures, and volatile oleous ſalts.

When the evacuation is impaired, or rendered ſlow, by a redundance of blood which too powerfully reſiſts the elaſticity of the veſſels, the emmenagogues already mentioned, eſpecially thoſe of the hotter kind, are by no means to be exhibited; for by theſe the blood is thrown into violent commotions, and a train of formidable ſymptoms are frequently brought on. In this caſe, therefore, veneſection in the feet is to be recommended, ſince, by means of that alone, theſe ſalutary and critical evacuations are often happily reſtored.

Nor are the emmenagogues already enumerated proper, in caſes where there is a deficiency of blood, and laudable juices, as in perſons recovering from the ſhock of a diſeaſe, thoſe whoſe primæ viæ are ſtuffed with viſcid ſordes, or thoſe the villous coats of whoſe ſtomachs are lined with a viſcid mucus, and by that means digeſtion and chylification unduly carried on. In caſes of this nature, the principal intention of the phyſician ought to be, not only the regeneration of a good and laudable blood by nutritive gelatinous ſubſtances, and broths, eaſily convertible into blood and juices; but alſo, if neceſſary, the reſtitution of the digeſtion and elaboration of the chyle by emetics, gentle purgatives of a ſaline aperient nature, and bitter ſtomachics.

Theſe evacuations are frequently ſtopped by obſtructions and infarctions of the vaſcular ſubſtance of the anus in men, and the internal part of the uterus and vagina in women; in conſequence of which, they admit no blood, however ſtrongly propelled to them. In theſe caſes forcing medicines are not only ſuperfluous, but pernicious, unleſs the indurated and infarcted veſſels are previouſly relaxed and ſoftened by proper medicines. And this intention can neither be more ſpeedily nor efficaciouſly anſwered, than by baths, or fomentations, or vapour baths, ſo contrived, that a veſſel full of warm water, impregnated with mugwort, penyroyal, and chamomile flowers, may be placed under the abdomen in ſuch a manner, that the ſteam may aſcend and penetrate into the uterus and adjacent parts. This is to be done in a warm room, with the patient's body well covered; and, in order to keep the water warm, red-hot flints are now and then to be put into it. Frictions of the legs and thighs with warm cloths, eſpecially after bathing with ſweet water, alſo contribute very much to the production of this effect.

But, in thoſe diſorders ariſing from a ſuppreſſion, a defect, or irregularity of the menſes, or hæmorrhoidal diſcharge, nothing is more certain, ſafe, and effectual, than a prudent uſe of mineral waters, eſpecially the mild Caroline ſprings for internal, and thoſe of Toeplitz for external uſe, ſince by theſe all the intentions of cure are excellently anſwered; for, by drinking the former of theſe waters, the viſcid humours are attenuated and evacuated, and the obſtructions of the capillary veſſels removed, whilſt by bathing in the Toeplitz waters, which are highly light, and deſtitute of a conſtructing earthy principle, the ſtructure of the parts is removed, and the veſſels ſo enlarged, as readily to admit the blood, and again diſcharge it.

As in medicine it is a difficult taſk to keep the menſtrual diſcharges in a due and natural order, ſo it is ſtill more difficult to manage the hæmorrhoidal, when a large quantity of blood attempts its diſcharge by the veins of the anus, but does not find them diſpoſed for its evacuation; but the diſcharges of this kind are, among all other ſubſtances, moſt powerfully promoted by pills prepared of aloes, which, by their highly ſubtile, reſinous, and ſulpureous particles, not only excite a violent orgaſm in the whole maſs of blood and humours, but alſo, by ſtimulating the coats of the colon and rectum, by their tenacious, viſcid, and reſinous particles, excite a greater afflux of blood to theſe parts: yet, when the blood, after it has arrived here, cannot make its way through the veſſels, it partly protrudes them, like ſo many turbercles accompanied with pain; and partly, ſtagnating between the nervous coats of the inteſtines, and preſſing them, produces violent inflations, ſpaſms, and other terrible diſorders of the abdomen. *Frederic Hoffman.*

E'MPIS, in natural hiſtory, the name given, by authors, to a large ſpecies of gnat, found about rivers and ponds; it is diſtinguiſhed from all the other kinds, by a circle of white paſſing round the middle of its body.

EMPLA'STER (*Dict.*)—No part of the apparatus for dreſſing is of more importance than plaiſters; the nature of which is ſo well known, that it would be ridiculous to attempt a definition of them. There are various and almoſt innumerable kinds of plaiſters; the moſt conſiderable of which, together with their compoſition and preparation, are found in the ſeveral diſpenſatories; but eſpecially in the Pharmacopœia Auguſtana, the London Diſpenſatory, that of Brandenburg, and Lemery's Pharmacopée Univerſelle. Moſt of theſe plaiſters are ſpread upon linen cloth, leather, or ſilk, according to the different conditions of wounds, and the various ſtates of patients. When plaiſters are to be applied to hairy parts of the body, thoſe parts are previouſly to be ſhaved, that the plaiſter may adhere more firmly, and be removed more eaſily and with leſs pain to the patient. But, that they may be ſtill more commodiouſly applied, their form is to be adapted to that of the particular part, for whoſe relief they are intended. The bulk, as well as the figure, of plaiſters, is various; for their largeneſs ought always to correſpond to the wound, or part affected. As for the uſe of plaiſters, it is found to be very various and extenſive; for they not only ſerve to retain balſams, ointments, lint, tents, and other applications, to wounds, but alſo contribute very effectually to generate pus, to digeſt and maturate tumors, to conglutinate and cure wounds, to unite fractured bones, to heal burns, to alleviate pains, and to corroborate ſuch parts of the body as are weak and infirm.

It is to be remarked, that the beſt way of giving a plaiſter a good conſiſtence is a prejudice to many intentions; and that is done with litharge, or minium, and oil; for, when theſe are boiled, ſo as to incorporate, they make a body very ſuitable for this form, but when they are oppoſite in virtues to the warmer gums, which are frequently mixed with them. The other way, therefore, of giving a conſiſtence to this form, either with wax, reſin, or pitch, may be preferable as to intention or efficacy; but theſe alſo have their inconveniencies in other reſpects; for thoſe plaiſters which take in much wax, are difficult to ſpread, becauſe, when warm, they are not glutinous enough to ſtick well. Reſin likewiſe is troubleſome to ſpread, and, where it abounds, ſticks too much; and pitch of any kind, eſpecially when joined with turpentine, though made into a hard conſiſtence, yet will not hold its form in rolls, but run flat, as is commonly obſerved in the emplaſtrum cephalicum and adhæſivum; for which reaſon they are frequently confined in bladders.

In the preſcription of extemporaneous plaiſters, the greateſt regard is to be had to that particular conſiſtence which the part can moſt conveniently bear, whereupon the application is to be made. Thus plaiſters to the breaſt and ſtomach, eſpecially in the intentions of emollient or diſcutients, ſhould be yielding and ſoft, as the officinal emplaſtrum ſtomachicum magiſtrale; but to the loins, or any of the limbs, where warm diſcutients and ſtrengtheners are to be applied, an higher and more adheſive conſiſtence is to be ſought for. The emollient plaiſters likewiſe ſhould be laid on thick, and frequently repeated, if the ſymptoms continue; becauſe their better parts are ſoon ſpent. Diſcutients alſo, applied to hard tumors, require repetition; but the ſtrengtheners, which are on purpoſe contrived of a ſtrong adheſive conſiſtence, are permitted to lie on, till they grow dry, and come off ſpontaneouſly. In ſome flatulent tumors, where a plaiſter alone does not prevail, they are at intervals taken off, and diſcutient fomentations or lotions made uſe of; ſuch as are compoſed of bitters, carminatives, and take in lixivial ſalts, or alcaline ſpirits.

EMPLA'STRUM *attrahens*, the drawing plaiſter, a plaiſter ordered, in the late London Pharmacopœia, to ſupply the place of the melilot plaiſter, in the dreſſing of bliſters. The college are ſatisfied that the herb is of no ſort of uſe in the compoſition, and that very groſs abuſes are practiſed to give the green colour to the plaiſter; for which reaſon they have ordered the plaiſter to be now made in this manner: take yellow reſin, and yellow wax, of each three pounds; tried mutton ſuet, one pound; melt all together, and ſtrain, while it is hot. *Pemberton's Lond. Diſp.*

EMPLASTRUM *commune*, a name given, in the new London Pharmacopœia, to what has been long called diachylon plaiſter. The apothecaries had been long uſed to make this by a ſhorter way than was preſcribed them, and the college has now authorized that method, ordering it to be made of only a gallon of oil of olives, and five pounds of litharge, boiled together with about a quart of water, to keep them from burning till they are perfectly mixed, and have the conſiſtence of a plaiſter. *Pemberton's Lond. Diſp.*

EMPLASTRUM *ex ammoniacao cum mercurio*, a form of medicine, in the late London Diſpenſatory, ordered to be prepared in the following manner:

Take gum ammoniacum ſtrained, a pound; quickſilver, three ounces; ſimple balſam of ſulphur, a drachm. Rub the quickſilver with the balſam of ſulphur, till it no longer appears; then add, by degrees, the gum ammoniac melted, and almoſt cooled again, and make the whole into a plaiſter. *Pemb. Lond. Diſp.*

EMPLASTRUM *roborans*, the ſtrengthening plaiſter, a form preſcribed in the London Diſpenſatory, and ordered to be made thus: take of the common plaiſter two pounds, of frankincenſe half a pound, of dragon's blood three ounces; melt the plaiſter, and then add to it the other ingredients in powder. *Pemberton's Lond. Diſp.*

EMPYE'MA (*Dict.*)—When matter or pus is collected in the cavity of the breaſt, betwixt the lungs and the pleura, the diſorder is called an Empyema.

This is properly enough an Empyema; but the matter may happen, alſo, to be collected in the duplicatures of the mediaſtinum.

The diſorder above-mentioned ſuppoſes a previous purulent abſceſs within the breaſt; which, breaking, diſcharges its contents into the cavity of the thorax.

Theſe abſceſſes are ſeated, firſt, in the lungs; and are cauſed either by inflammations, ruptures of the veſſels, or conſiderable obſtructions by ſubſtances not eaſily reſolvable.

Secondly, in the pleura, ariſing either from an inflammation, a ſlight wound healed too precipitately externally, a contuſion, or rupture of the membrane.

Thirdly, in the diaphragm, when an unreſolved inflammation of this part ſuppurates, and breaks on that ſide next the breaſt.

Fourthly, in the mediaſtinum, when that part is, in like manner, inflamed.

Fifthly, in the pericardium, after an inflammation thereof.

An Empyema may be prognoſticated from an inflammation of any of the parts above-mentioned, which has not been reſolved by means of coction, revulſion, a criſis, or medicines; but which terminates with a ſhivering, a fever which increaſes in the evening, a wandering heat, a ſenſe of weight on the part, a difficulty of breathing, loſs of appetite, and thirſt.

An Empyema is known to be formed, firſt, from a duration of ſuch a diſorder, as is mentioned above, for twenty days, without a due expurgation by expectoration.

Secondly, by the diſcontinuance of the ſigns of an abſceſs in any of the before-mentioned parts.

Thirdly, from a new pain, together with a difficulty of breathing, and diſcharge of ſaliva, which ſoon after ceaſe.

Fourthly, from a dry cough, a weight on the diaphragm, an impoſſibility of lying on one of the ſides, a noiſe made by the fluctuating pus or matter upon motion, a ſlow fever, redneſs of the cheeks, hollowneſs of the eyes, heat at the extremities of the fingers, incurvation of the nails, and tumor of the abdomen.

The conſequences of the rupture of an abſceſs or vomica, ſo as to form an Empyema, are, firſt, a continual accumulation of pus or matter from the ulcer, not yet healed, nor deterged.

Secondly, a continual agitation, a degeneracy, fœtidneſs, putrefaction, and attenuation of the pus or matter, thus confined in a warm and moiſt place.

Thirdly, a difficult elevation of the diaphragm, and extenſion of the lungs: hence reſpiration is rendered ſhort, difficult, and not eaſily performed, unleſs in an erect poſture; danger of ſuffocation when the patient lies down, which, however, it is not poſſible for him to do on the unaffected ſide; a perpetual dry cough and anxiety.

Fourthly, a maceration, corroſion, and conſequent tabid ſtate of the lungs, pleura, diaphragm, mediaſtinum, pericardium, and of the heart itſelf; a hectic fever, attended with a ſmall and quick pulſe; redneſs of the cheeks; perpetual thirſt; utter loſs of appetite; extreme weakneſs and faintings.

Fifthly, hence an unfitneſs of all the fluids for nutrition, circulation, ſecretion, and excretion, whence a conſumption and atrophy, a reſolution of the fibres, a putrefaction of the liquids, and their diſcharge through the corroded lungs; or a ſanious and fatal diarrhœa, with nocturnal ſweats after ſleep, puſtules on the face, incurvation of the nails, a ſhining yellowneſs of the ſkin, and an Hippocratic countenance.

The operation for the Empyema generally implies an artificial opening made into the cavity of the thorax, by which we evacuate any fluid that lies there extravaſated, and is become dangerous by its weight and quantity. The fluids deſcribed as neceſſary to be voided by this operation, are blood, matter, and water.

When blood is the fluid, ſuppoſed to require evacuation by this method, it is always extravaſated through ſome wound of the veſſels of the lungs or thorax, and, being diſcharged in great quantities on the diaphragm, is ſaid to oppreſs reſpiration till let out by ſome convenient perforation, made in the moſt depending part of that cavity, which is the only kind of perforation into the thorax, diſtinguiſhed by the name of the operation for the Empyema: but, though this opening is univerſally recommended in the caſe here ſtated, yet we meet with few or no examples, where it has been practiſed for a mere extravaſation of blood; and I ſhould think it can hardly ever be adviſeable on this account: for, if we perform it immediately after the accident, and during the hæmorrhage, the opening made at the bottom of the thorax might probably make way for a dangerous effuſion of blood, which perhaps would otherwiſe be choked up and ſtopped for want of a ready iſſue; and, if we wait till the hæmorrhage ceaſes, it becomes needleſs, becauſe the blood not only, for the moſt part, finds ſome vent for the external wound, if left open, but is conſtantly ſpit up by the trachea; ſo that, had we no farther proofs of this abſorbent power in the lungs, we might from hence be perſuaded of the probability of its being more ſafely carried off ſo, than by any artificial opening we can poſſibly contrive in the thorax.

Or if it be thought that the extravaſated blood, being coagulated in the thorax, cannot be taken up by the veſſels of the lungs, yet, even in that caſe, the operation uſually practiſed will not anſwer the purpoſe; for, beſides the poſſibility of the lungs adhering to the pleura in the place of inciſion, which would abſolutely prevent any advantage from it, the depth and narrowneſs of the orifice, and its height above the diaphragm, on which the congealed blood is ſuppoſed to lie, will make the ſucceſs at beſt very precarious.

To empty the thorax, in a rupture of any veſſels which open into it, bleeding is very neceſſary, which not only ſtops the hæmorrhage, by abating the force of the circulation; but likewiſe, by unloading the veſſels of their contents, makes them more fit to receive the extravaſated fluid by abſorption: gentle evacuations and pectorals are alſo very ſerviceable, and a low diet is abſolutely neceſſary.

The rules laid down in ſome books for diſtinguiſhing if a wound penetrates, have led practitioners into miſchievous methods, by adviſing them to examine theſe wounds with the probe, or, for more certainty, the finger; which if rudely uſed ſometimes even tear into the thorax, always force or preſs the parts too much, and often ſeparate the lungs from the pleura, when they happen to adhere; all which violences will produce abſceſſes there, eſpecially if the part be afterwards dreſſed with large tents, or filled with any active injection, both which were formerly applied with a view to deterge the cavity of the wound, but now ſeem to be exploded in favour of more ſuperficial dreſſings, the advantage of which method, in my opinion, cannot be too much inculcated.

But what I have here advanced concerning the excellence of ſuperficial applications, without dilating the wound, to make way for the iſſue of the blood or ſucceeding matter, muſt be conſidered with regard to punctures or inciſions by ſharp inſtruments, not followed with a great diſcharge: for, where the wound is made by fire arms, the method of practice muſt be ſometimes altered; becauſe not only ſloughs and great ſuppurations enſue, but very often pieces of the ſhirt or coat are carried in with the bullet, which will perhaps require an enlargement of the wound, in order to be freely diſcharged; though, even upon this account, there will be no occaſion to make an opening at the bottom of the thorax, ſince the mere dilatation of the wound will more readily give vent to the pus and extraneous bodies, than an orifice made lower; becauſe the lungs, being inflamed by the wound, will generally adhere to the pleura, and break off the communication between the abſceſs and the cavity below it. In dreſſing the dilated wound, care muſt be taken to apply the doſſils with ſuch preſſure only, as ſhall be ſufficient to keep open the external orifice; and not to croud them into the thorax, ſo as to lock up that matter, which the very deſign of dilatation is to give a diſcharge to.

The ſecond circumſtance in which this operation takes place, is a rupture of matter from the pleura, mediaſtinum, or lungs, into the cavity of the thorax, where accumulating it at length proves fatal for want of a diſcharge. It is true that the caſe occurs but very ſeldom, where the operation is neceſſary; becauſe, in moſt abſceſſes of the thorax, the matter is uſually ſpit up as faſt as it is generated, and in the diſſection of ſuch, who have died of this ſpecies of conſumption, we rarely find much extravaſated pus in the cavity, though a great portion of the lungs is deſtroyed: however, as I have intimated, there are a few examples which require the operation, and theſe may be diſtinguiſhed by the following ſymptoms. The patient is obliged to lie upon the diſeaſed ſide, or, in caſe there is matter in both cavities of the thorax, on his back; becauſe the mediaſtinum can ſeldom ſupport the weight of the incumbent fluid, without ſuffering great pain; but this rule is not certain, it ſometimes happening that the patient can lie with eaſe on that ſide, where there is no fluid. Another ſymptom of extravaſated matter, is an evident undulation of it, ſo that in certain motions it may be heard to quaſh. For the moſt part too, upon careful enquiry, an œdema, or at leaſt a thickening of ſome portion of the intercoſtal muſcles, will be diſcovered. And, laſtly, if there be much fluid, it will be attended with a preternatural expanſion of that ſide of the cheſt, where it lies. When therefore theſe ſigns appear after a previous pleuretic or pulmonary diſorder, and the caſe has been attended with the ſymptoms of a ſuppuration, it is moſt probably owing to a collection of matter; though the patient will alſo labour under a continual low fever, and a particular anxiety from the load of fluid.

I have here deſcribed the abſceſs as breaking into the cavity of the thorax; but, generally ſpeaking, in any inflammation of the pleura or lungs, an adheſion of both enſues; in conſequence of which, nature finds a diſcharge outwardly, it being moſt frequent for abſceſſes of the pleura and intercoſtal muſcles, and not uncommon even for abſceſſes of the lungs, to break externally. In caſe of an adheſion, no farther operation is required than opening the tumor, when ſuppurated, with a lancet; and, if the diſcharge is ſo great as to forbid the healing the external ulcer, it may be kept open with a hollow tent; by which manner of treatment many have lived a long time with a running fiſtula.

The laſt ſort of fluid, ſaid to require iſſue from this operation, is water, which however very ſeldom collects in ſuch manner as to become the proper ſubject of the operation; for, if the dropſy of the thorax is complicated with an anaſarca, or even aſcites, it is certainly improper; and indeed it can hardly ever take place, but where the diſtemper is ſingle, and takes its riſe from the ſame ſort of diſorder in the lymphatics of the pleura, as the hydrocele does from thoſe of the tunica vaginalis. The ſymptoms of this dropſy are, a ſmall cough without ſpitting, a little ſlow fever from the diſturbance of reſpiration; ſometimes too the water, by a ſudden jerk, may be heard to ſquaſh, and, generally ſpeaking, its weight upon the diaphragm and mediaſtinum are ſo troubleſome as to oblige the patient to ſtoop forward when in an erect poſture, and to turn upon the affected ſide when he lies down; for the ſame reaſon, when there is water in both cavities of the thorax, he is forced to lie on his back.

The manner of operating, whether it be for the diſcharge of matter or water, is to pitch upon the moſt depending part of the thorax, which ſome have ſuppoſed to be between the eighth and ninth rib, and others, between the ninth and tenth, at ſuch a diſtance from the vertebræ, that the depth of the fleſh may not be an impediment to the perforation: this diſtance is determined to be about a hand's-breadth; and here with a knife, ſciſſars, or trocar, we are ordered to make the perforation; but, in doing it, there are a great many difficulties: in fat perſons, it is not eaſy to count the ribs, and the wound will be very deep, and troubleſome to make; it is hardly poſſible to eſcape wounding the intercoſtal artery, which runs in this place between the ribs; or, if you avoid it, by cutting cloſe to one of the ribs, a caries of the bone will follow from the preſſure of the tent employed afterwards: again, the inflammation of the wound may poſſibly affect the diaphragm, which is ſuppoſed almoſt contiguous to it, and this may prove of very ill conſequence; ſo that upon the whole, without any farther recital of objections to the Empyema thus performed, it cannot appear an adviſeable operation. But if the only advantage, propoſed by this ſituation of the wound, is from its dependency; the purpoſe of diſcharging the fluid will be as well anſwered, by an opening between the ſixth and ſeventh rib, halfway from the ſternum towards the ſpine; which, by laying ourſelves down, becomes in effect as depending an orifice, as the other in ſitting up; and, by opening in this manner, we avoid all the inconveniencies in the other method: for, in this part of the thorax, there is very little depth of muſcles; the artery lies concealed under the rib; and the diaphragm is at a great diſtance; ſo that none of thoſe miſchiefs can enſue I have ſuppoſed in the other method; which conſequently will give it the preference. The opening is beſt made with a knife, and ſhould be about an inch long through the ſkin, and half an inch through the ſubjacent muſcles: though, to make the inciſion with leſs riſk of wounding the lungs, it may be adviſeable to dilate it with the blunt-pointed knife after having made a ſmall puncture with a common knife. If it ſhould be objected, that the fluid cannot be diſcharged by this orifice, while we are erect, whereas, by making it in the lower part of the thorax, it will be continually draining; I think it may be anſwered, that, after it is once emptied, it will hardly in twelve hours be generated in greater quantity than what will lie upon the diaphragm below the opening made even by that operation, and conſequently cannot be more readily diſcharged by one orifice, than the other. The treatment of the wound will be according to the nature of the diſcharge; if, after a few days, there appears no drain, you may let the orifice heal up; but, if it continues, it may be kept open with a ſhort ſilver cannula, till ſuch times as an alteration, in that circumſtance, will give us leave to cicatrize with ſafety. *Sharp's Surgery.*

ENA'MEL (*Dict.*) — The workers in Enamel muſt be very cautious of the good or bad qualities of the oil of ſpike they employ to mix their colours with. It is a thing very ſubject to adulterations,

adulterations. Sometimes with ſpirit of wine ; ſometimes with oil of turpentine. In the firſt caſe it wants body, as there is uſually too much ſpirit added ; and, in the latter, the ſmoak of the turpentine, when heated, ſpoils the colours. A ſmall mixture of ſpirit of wine does well ; and the beſt method, for the nice artificer, is to refine the oil, and afterwards add to it ſuch a quantity of ſpirit as is found beſt.

The common matter, which is the baſis of all Enamels, is thus made : take fine lead, thirty pounds ; fine tin, thirty-three pounds ; calcine theſe together in a kiln, then ſift them ; boil this powder in water, in clean earthen veſſels, and pour off the water, which will carry with it the finer part of the calx ; put freſh water on the remainder, boil it again, and pour off in the ſame manner ; do this ſo long as the water will carry off with it any part of the calx. Recalcine the remaining matter, and waſh off its finer part in the ſame manner again ; then evaporate all the waters, which have waſhed off the finer calx, and keep the fire low, towards the end of the operation, that the calx may not be waſted ; this will be found, at the bottom, of an extreme fineneſs.

Take of cryſtal frit, made with tarſo, and this fine calx, each fifty pounds ; white ſalt of tartar, eight ounces ; powder and ſift theſe, and mix them well. Put this mixture into a new earthen pot, give it a fire for ten hours, then powder it, and keep it in a dry covered place. *Neri's Art of Glaſs.*

Azure ENAMEL. To make this, take of the common matter of Enamels, four pounds ; zaffer prepared, two ounces ; braſs thrice calcined, forty-eight grains. Mix all theſe well together, and melt them in the furnace in the uſual way. *Neri's Art of Glaſs.*

Black ENAMEL. To make the black Enamel, take of the common matter of Enamels, four pounds ; tartar, four ounces ; mangane ſe, two ounces. Grind and mix theſe powders well with the matter of the Enamel, then ſet them in a furnace in a large pot ; when melted and refined, caſt them into water, and, putting them again into the furnace, let them refine. *Neri's Art of Glaſs.*

Green ENAMEL. To make this, take of the common matter of Enamels, four pounds ; melt it, and caſt it into water, return it again to the furnace, and, when purified, add of braſs, thrice calcined, two ounces, crocus martis, made with vinegar, forty-eight grains. Mix theſe firſt in fine powder, and put this in at three ſeveral times ; when all is well incorporated, take it from the fire. *Neri's Art of Glaſs.*

Milk-white ENAMEL. To make this uſeful colour in Enamels requires no more than this : take the common matter of Enamels, ſix pounds ; mangane ſe prepared, forty-eight grains ; melt them in the furnace, caſt the whole into water, and afterwards return it again into the furnace, and, when refined, uſe it. *Neri's Art of Glaſs.*

Purple ENAMEL. To make this, take of the common matter of Enamels, ſix pounds ; of mangane ſe, three ounces ; braſs, thrice calcined, ſix ounces ; mix all well together, and ſet them in a furnace, let them refine, then caſt them into water, return the matter to the furnace again, and, when thoroughly melted, take it out for uſe. *Neri's Art of Glaſs.*

This mixture, with a ſmaller proportion of braſs, makes the red Enamel.

Violet-coloured Enamel. The method of making the violet-coloured Enamel is this : take of the common matter of Enamels, ſix pounds ; of mangane ſe prepared, three ounces ; of thrice calcined braſs, forty-eight grains ; mix the two powders well together, then mix the whole, put them into the furnace, and, when refined, caſt them into water, return the matter again to the furnace, and, when refined, take it out. *Neri's Art of Glaſs.*

Yellow ENAMEL. To make this, take of the common matter of Enamels, ſix pounds ; of tartar, three ounces ; of mangane ſe, ſeventy-two grains ; mix all well together, and put them into the furnace, in a large pot ; when refined, caſt them into water, then return them to the furnace again, and, when melted, take it out for uſe. *Neri's Art of Glaſs.*

ENCAU'STUM *Sacrum*, a name given, by many authors, to that fine red colour, uſed for illuminating the capital letters in ſome old manuſcripts. The Latin writers have got a way of calling all thoſe liquid paints, which may be uſed by means of a pen, by the general name of atramenta, and we call them inks. Thus the tincture of logwood, or brazil-wood, is called red ink ; the tincture of fuſtic, brown ink ; and the ſolution of gamboge, yellow ink. The Greeks expreſſed ink by the word melan, which ſignifies only black ; and the atramentum of the Latins is as plainly derived from atrum, ſignifying alſo black. The Greeks kept ſtrictly to this ſenſe of the word, and acknowledged only two kinds of ink, the graphicon, and the burſodepſicum ; the firſt uſed in writing, and the other in dreſſing of leather. Some ſuppoſe that they mentioned a third kind, under the name of melan Indicon, which many have been idle enough to imagine the ſame that we call by the name of Indian ink ; but they have uſed the word melan not as the ſubſtantive, or the name of ink, but as an adjective, expreſſing deep blue, as Theophraſtus uſes it, ſpeaking of the deep blue of the fine ſapphire, and others of the violet. This red colour, uſed in the illuminations, was never called ink by the Greeks. Procopius calls it baphe, ſome have called it coccus, and ſome cinnabar. It is ſaid that it was made of the purple colour, extracted from the murex, or purple fiſh, with ſome other additions. It is to be obſerved, that however well this colour, when laid on the parchment, or paper, might reſemble the colours of enamel, yet, it was as improper to call it Encauſtum, which ſignifies a colour burnt in, as in enamelling, as it would have been to have called it atramentum, or ink.

ENCU'RECK, in natural hiſtory, a venomous inſect, found in Perſia, and ſuppoſed, by ſome, to be a kind of tarantula. It neither ſtings nor bites, but lets fall its venom like a drop of water, which cauſes inſufferable pain in the part for a time, and afterwards ſo profound a ſleep, that, we are told, nothing can raiſe the patient from it, but cruſhing one of thoſe creatures on the part affected. It is nevertheleſs ſaid, that the ſheep eat theſe inſects without damage. *Olearius.*

ENDI'VIA *marina*, ſea endive, in natural hiſtory, the name of a ſpecies of ſea plant, deſcribed by count Marſigli : there are two ſpecies of it, the one having broad and jagged leaves, reſembling thoſe of the vine, the other much narrower. This laſt kind grows on ſtones, ſhells, pieces of wood, or any other ſubſtances, accidentally found at the bottom of the ſea. It ſeldom grows in very deep water, and thrives beſt in places where the ſea is calm and quiet. It is of a duſky greeniſh colour, variegated in ſome places with yellow. It exactly reſembles the ſhape of the endive common in our gardens, and its leaves are cut and fringed in the ſame manner ; but they are of ſo tender a ſubſtance, that a ſlight touch deſtroys them ; they are indeed tender and more delicate than any other known plant, either of the ſea or land. When this plant is examined by the microſcope, its ſurface is found to be compoſed of a great number of eminencies, and cavities, or little holes, between and among them ; and, when the leaves are cut tranſverſely, there are ſeen a great number of glandules in them. *Marſigli, Hiſt. de la Mer.*

E'NGINE (*Dict.*)—The following Engine for raiſing water by fire is an improvement of Savary's conſtruction (given under this article in the Dictionary) to render it capable of working itſelf, invented by Mr. De Moura of Portugal, F. R. S.

This Engine conſiſts of a receiver, a ſteam, and an injection-cock ; a ſuction and a forcing-pipe, each furniſhed with a valve ; together with a boiler, which, on account of its bulk and weight, was not ſent with the reſt ; but, as it may be of the common globular ſhape, and having nothing particular in its conſtruction, a deſcription of it will not be neceſſary, as alſo, the reſt of theſe parts already mentioned being eſſential to every machine of this kind, a further account of them may be diſpenſed with. What is peculiar to this Engine, is a float within the receiver, compoſed of a light ball of copper, which is not looſe therein, but faſtened to the end of an arm, which is made to riſe and fall by the float, while the other end of the arm is faſtened to an axis ; and, conſequently, as the float moves up and down, the axis is turned round one way, or the other. This axis is made conical, and paſſes through a conical ſocket ; which laſt is ſoldered to the ſide of the receiver. Upon one of the ends of the axis, which projects beyond the ſocket, is fitted a ſecond arm, which is alſo moved backward and forward by the axis, as the float riſes and falls. By theſe means, the riſing and falling of the ſurface of the water within the receiver communicates a correſpondent motion to the outſide, in order to give proper motions to the reſt of the geer, which regulates the opening and ſhutting of the ſteam and injection-cocks ; and ſerves the ſame purpoſe as the plug-frame, &c. in Newcomen's Engine. The particular conſtruction, and relation of thoſe pieces, will better appear by the figure and references, than can be done by a general deſcription.

A B, *plate* XVII. *fig.* 11. an arm, which is faſtened to *a b*, a conical axis, which goes through a conical ſocket in C, a triangular piece ſoldered to the receiver. This piece has this ſhape to give liberty to the arm to riſe and fall, that carries the float on the inſide. D E, is a ſmall ciſtern, ſoldered to the receiver, which, being kept full of water, keeps the axis and ſocket air-tight. This ciſtern is conſtantly kept full of water, by means of a ſmall leakage through the wooden peg *c*, which follows the pack-thread *c d* to the ciſtern.

e, Is a ſmall weight to counterpoiſe the float within.

f, Is a ſlider ; which, being ſet nearer to, or farther from, the axis, will riſe, or fall, a greater or leſſer ſpace, as may be required ; and is faſtened by the ſcrew *g*. This ſlider is furniſhed with a turn-about, *h i*, which is alſo faſtened by a ſcrew and nut at the end *i*, and ſerves to adjuſt the length of F G G H, a chain, which gives motion, by means of the ſhorter chain *k l*, to I K L, the balance, which opens and ſhuts the cocks ; and moves upon the ſmall axis L.

G G, are two pullies ſupported by two arms, that are faſtened to the ſide of the receiver, and give the chain a proper direction in order to move the balance.

M N, is the ſteam-cock ; the end N being ſuppoſed to be detached from a pipe that gives it communication with the boiler.

O, is the injection-cock, whoſe key is turned by the arm O *m*.

P Q, is the injection-pipe, communicating between the forcing-pipe above the valve, and the top of the receiver.

R S, is the arm, by which the key of the ſteam-cock is worked.

I K, two rollers annexed to the balance, which, by ſtriking upon the arm R S, open and ſhut the ſteam-cock, as the balance is moved backward and forward.

R *n o*, is the ſteam-cock's key-tail, which is furniſhed with two ſmall rollers, *n o*, which open and ſhut the injection-cock, by acting upon the arm O *m*, in ſuch a manner, that, when the ſteam-cock is opened, the injection is ſhut, and vice verſa.

T, is a bell of advice, which, moving along with the balance, continues to ring as long as the Engine is at work.

V, is a cock, which ſerves to diſcharge the air from the receiver, and is opened by hand, when neceſſary.

W, is a weight ſufficient to raiſe the balance to a perpendicular poſture, when it is inclined to the right, and alſo, to overcome the friction of the float, axis, pullies, chain, &c.

To put the Engine in motion, preſs down the arm A B, which will bring the balance over to the right ſide, and in its motion will open the ſteam-cock, and ſhut the injection; ſet open the cock at V, that the air may be diſcharged by the entrance of the ſteam into the receiver. This being done, ſhut that cock, and let go the arm; the weight W will bring over the balance to the left, and in its motion ſhut the ſteam-cock, and open the injection; this, preſently condenſing the ſteam into water, in a great meaſure, leaves a vacuum in the receiver. Things remain in this ſituation, till the preſſure of the atmoſphere has cauſed the water to mount through the ſuction-pipe into the receiver, where, as its ſurface riſes, it cauſes the float to aſcend; and, depreſſing the arm A B, raiſes the balance till it has paſſed the perpendicular; and, in its deſcent, which is done by its own gravity, the roller K lays hold of the arm R S, again opens the ſteam-cock, and ſhuts the injection. The receiver being now almoſt filled with water, the balance cannot return, till the ſurface of the water therein ſubſides, and ſuffers the float to deſcend. This is performed by the elaſticity of the ſteam, which, at the ſame time that it fills the receiver, drives out the water through the forcing-pipe; and, when the ſurface is deſcended ſo low, as to ſuffer the weight W to bring the balance beyond the perpendicular towards the left, it then falls of its own accord, and, in falling, the roller I lays hold of the arm R S, ſhuts the ſteam-cock, and opens the injection, as before.

When the Engine is deſired to be ſtopped, obſerve, when the balance lies to the right, to turn round the arm O *m* of the injection-cock, ſo that the tail of the ſteam-cock may miſs it in the next motion; ſo that, at the ſame time that the receiver is filled with ſteam, and the ſteam-cock ſhut, the injection not being opened, the motion will ſtop for want thereof. *Phil. Tranſ.* Vol. XLVII.

E'NGLISH *Tongue* (*Dict.*) — Mr. Welſtead is of opinion, that the Engliſh language is not capable of a much greater perfection, than it has already attained: we have trafficked, he obſerves, with every country for the enriching it: the ancients and moderns have both contributed to the giving it ſplendor and magnificence; the faireſt cyons that could be had from the gardens of France and Italy, have been grafted on our old ſtocks, to refine the ſavageneſs of the breed; we have laid aſide moſt of our harſh, antique words, and retained few but thoſe of good ſound and energy: the moſt beautiful poliſh is at length given our tongue that it will bear, without deſtroying and altering the very baſis and ground-work of it: its Teutonic ruſt is worn away, and little or nothing is wanting, either of copiouſneſs, or harmony. He goes on to argue the maturity and perfection of the Engliſh from another very extenſive principle, viz. by comparing the time and circumſtances of the improvements, made ſince the firſt refiners of it, with thoſe of the Greek, Latin, French, and other tongues, that confeſſedly have riſen to their height.

Every civilized nation, that author thinks, has its claſſical age; and he ſuggeſts, that the Engliſh are not far from it. So that what remains to be done for the Engliſh tongue, ſhould not be to advance, but to fix it where it is, and prevent its declining. There is in effect a point of perfection, which when a language has once arrived at, it cannot exceed, though it may degenerate from it; and thus it happened to the two fineſt languages the world has known.

It may ſeem odd to talk of fixing ſo unſtable a thing as language: the Greek liturgies of St. Baſil and St. Chryſoſtom, ſtill uſed in that church, the one for ſolemn, the other for common days, have been a long time unintelligible to the people: ſo much is the vulgar Greek degenerated from its original purity! Polybius teſtifies, that the articles of truce between the Romans and Carthaginians could ſcarce be underſtood by the moſt learned Roman antiquaries, 350 years after the time of their making. In effect, from the days of Romulus, to thoſe of Julius Cæſar, the Latin was perpetually changing; and what was wrote three hundred years before Tully, was as unintelligible in his time, as the Engliſh and French of the ſame period are now: and theſe two have changed as much ſince William the Conqueror, in about 700 years, as the Latin appears to have done in the like term.

Whether our language will decline as faſt as the Roman did, may admit of ſome doubt; there being many circumſtances in the affairs of the nation, which contributed to that corruption, that may not, in all probability, find place among us. — The French, for theſe fifty years paſt, has been poliſhing as much as it will bear; and appears to be now declining, by the natural inconſtancy of that people, and the affectation of ſome late authors to introduce cant words, which is the moſt ruinous corruption in any language. But, without ſome ſuch conſideration, there does not ſeem any abſolute neceſſity, why a language ſhould be perpetually changing.

We find examples to the contrary: from Homer to Plutarch, are above a thouſand years; and ſo long, at leaſt, Dr. Swift thinks, we may allow the purity of the Greek: the Grecians ſpread their colonies round all the coaſts and iſlands of Aſia minor and the Ægean ſea, where the language was preſerved entire for many ages after they themſelves became provinces to Rome, and were over-run by the barbarous nations. The Chineſe have books in their language above 2000 years old; neither have the frequent conqueſts of the Tartars been able to alter it. And the German, Spaniſh, and Italian, have admitted few or no changes for ſome ages paſt.

On ſuch conſiderations, that author moved the then prime miniſter, the earl of Oxford, to eſtabliſh a ſociety, or academy, for the ſettling, and aſcertaining, the purity of our tongue; to ſet a mark on the improprieties which cuſtom has made familiar, to throw out vicious phraſes and words, to correct others, and perhaps retrieve ſome others now grown obſolete, and to adjuſt the orthography, pointing, &c.

Without ſome ſuch means, he complains, that the fame any writer can expect will be ſo ſhort and ſcanty, as by no means to be a ſufficient motive to call forth and engage a man to exert his genius. Our language is chiefly confined to theſe two iſlands; and it is hard our authors fame ſhould be limited in time as well as place. Were it not for the bible and common-prayer, we ſhould hardly have been able to underſtand any thing written a hundred years ago.

It is a melancholy reflection, that Petrarch ſtill ſpeaks good Italian; whereas Chaucer, who lived a hundred years later, is not to be underſtood without a Saxon and French gloſſary. And what ſecurity has Pope himſelf, while things continue on their preſent footing, that he ſhall not in a like ſpace of time become as obſolete as Chaucer is?

Grammars and dictionaries, with whatever care and judgment they are compoſed, will prove but a feeble ſtay to a fleeting language, unleſs they have ſome extraordinary ſanction and authority. And, what is to be lamented, ſuch writings have contributed to the corruption almoſt as much as the perfection of our tongue.

ENGRA'VING *on precious ſtones*, is the repreſenting of figures, or devices, in relievo or indented, on divers kinds of hard poliſhed ſtones.

The art of Engraving on precious ſtones is one of thoſe wherein the ancients excelled; there being divers antique agats, cornelians, and onyx's, which ſurpaſs any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioſcorides under the firſt emperors of Rome, are the moſt eminent Engravers we read of: the former was ſo eſteemed by Alexander, that he forbad any body elſe to engrave his head: and Auguſtus's head, engraven by the latter, was found ſo beautiful, that the ſucceeding emperors choſe it for their ſeal. All the polite arts having been buried under the ruins of the Roman empire, the art of Engraving on ſtones met the ſame fate. It was retrieved in Italy, at the beginning of the fifteenth century; when one John of Florence, and after him Dominic of Milan, performed works of this kind no way to be deſpiſed. From that time, ſuch ſculptures became common enough in Europe, and particularly in Germany, whence great numbers were ſent into other countries; but they came ſhort of the beauty of thoſe of the ancients; eſpecially thoſe on precious ſtones; for, as to thoſe on cryſtal, the Germans, and, after their example, the French, &c. have ſucceeded well enough.

In this branch of Engraving, they make uſe either of the diamond, or emery. — The diamond, which is the hardeſt, and moſt perfect of all precious ſtones, is only cut by itſelf, or with its own matter.

The firſt thing is to cement two rough diamonds to the ends of two ſticks, big enough to hold them ſteady by, in the hands; and to rub or grind them againſt each other, till they be brought to the figure deſired. The duſt, or powder, rubbed off, ſerves afterwards to poliſh them; which is performed with a kind of mill, that turns a wheel of ſoft iron.

The diamond is fixed in a braſs diſh, and thus applied to the wheel, which is covered with diamond duſt, mixed up with oil of olives: and, when the diamond is to be cut facet-wiſe, they apply firſt one face, then another, to the wheel.

Rubies, ſapphires, and topazes, are cut and formed the ſame way, on a copper wheel; and poliſhed with tripoli, diluted in water.

As to rubies, emeralds, hyacinths, amethyſts, garnets, agats, and other of the ſofter ſtones, they are cut on a leaden wheel, moiſtened with emery and water; and poliſhed with tripoli, on a pewter-wheel. Lapis, opal, &c. are poliſhed on a wooden wheel.

To faſhion and engrave vaſes of agat, cryſtal, lapis, or the like, they have a kind of lathe, like that of the pewterers; excepting, that whereas the latter is to hold the veſſels, which are to be wrought with proper tools; the former generally holds the tools, which are turned by a wheel, and the veſſel held to them to be cut and engraved, either in relievo, or otherwiſe; remembering, from time to time, to moiſten the tools with diamond duſt and oil; or, at leaſt, emery and water.

To engrave figures or devices on any of theſe ſtones, when poliſhed, ſuch as medals, or ſeals, &c. they uſe a little iron wheel, the two ends of whoſe axes are received within two pieces of iron placed upright, as in the turner's lathe, to be brought cloſer, or ſet further apart, at pleaſure. At one end of one of the axes, are fitted the proper tools, being kept tight by a ſcrew. Laſtly, the wheel is turned by the foot; and the ſtone applied by the hand to the tool; and thus ſhifted and conducted, as occaſion requires.

The tools are generally of iron, ſometimes of braſs. As to their form it is various, but generally bears ſome reſemblance to chiſſels, gouges, &c. ſome have ſmall round heads like buttons, others, like ferrels, to take the pieces out; others flat, &c. Theſe tools are not applied directly againſt the ſtone, but, as it were, ſidewiſe; thus wearing, and as it were, grinding off the ſubſtance. And ſtill, whether it be figures, or letters, or characters, the manner of application is the ſame. The tools, as above obſerved, are to be frequently moiſtened with diamond duſt, and oil of olives. When the ſtone is engraven, they poliſh it on a wheel of bruſhes, made of hogs briſtles, with tripoli. For the larger and leſs delicate works, they have copper, or pewter tools, on purpoſe to poliſh the ground, or plain parts, with tripoli, &c. which they apply after the ſame manner, as thoſe wherewith the graving is performed.

Engraving *on ſteel*, is chiefly employed in cutting punches, matrices, and dies, proper for ſtriking coins, medals, and counters. See the article Coining in the Dictionary.

The methods of Engraving, with the inſtruments, &c. are the ſame for coins, as for medals and counters: all the difference conſiſts in their greater or leſs relievo; the relievo of coins being much leſs conſiderable than that of medals; and that of counters ſtill leſs than that of coins.

The engraver in ſteel uſually begins with punches, or punchions, which are in relievo, and ſerve for making the creux, or cavities of the matrices, and dies. Though, ſometimes, he begins immediately with the creux; but it is only when the intended work is to be cut very ſhallow. The firſt thing is to deſign his figures; then he moulds them in white wax, of the ſize and depth required; and from this wax he graves his punch.

This punch is a piece of ſteel, or at leaſt of iron and ſteel mixed; on which, before they temper or harden it, the intended figure, whether a head, or a reverſe, is cut, or carved in relievo. The inſtruments uſed in this graving in relievo, which are much the ſame as thoſe wherewith the finiſhing of the work in creux is effected, are of ſteel. The principal are gravers of divers kinds, chiſſels, flatters, &c. when the punch is finiſhed, they give it a very high temper, that it may the better bear the blows of the hammer, wherewith it is ſtruck, to give the impreſſion to the matrice.

What they call matrice, or matrix, is a piece of good ſteel of a cubic form, called alſo a die; whereon the relievo of the punch is ſtruck in creux. It is called matrix, becauſe, in the cavities or indentures thereof, the coins, or medals, ſeem formed, or generated, as animals are in the matrix of their mother. To ſoften this ſteel, that it may more eaſily take the impreſſions of the punch, they make it red-hot; and, after ſtriking the punch thereon in this ſtate, they proceed to touch up or finiſh the ſtrokes and lines, where, by reaſon of their fineneſs, or the too great relievo, they are any thing defective, with ſome of the tools abovementioned.

The figure thus finiſhed, they proceed to engrave the reſt of the medal, as the mouldings of the border, the engrailed ring, letters, &c. All which, particularly the letters, and graining, or engrailment, are performed with little ſteel punches, well tempered, and very ſharp. Add, that as they ſometimes make uſe of punchions, to engrave the creux of the matrix; ſo, on ſome occaſions, they make uſe of the creux of the matrix, to engrave the relievo of the punch.

To ſee and judge of the Engraving in creux, divers means have been deviſed to take the impreſſions therefrom, as the work proceeds. Sometimes they make uſe of a compoſition of common wax, turpentine, and lamp black; which, always retaining its ſoftneſs, eaſily takes the impreſſion of the part of the graving it is applied to. But, this only ſerving to ſhew the work piece-meal, they have had recourſe to other ways, to ſhew the whole figure. The firſt, by pouring melted lead on a piece of paper, and clapping the matrice thereon: the ſecond, with melted ſulphur, managed the ſame way: and the third, proper only where the graving is ſhallow, by laying a piece of ſoft paper on the graving, and over the paper a leaf of lead; when, giving two or three blows with a hammer on the lead, the paper takes the impreſſion of the work.

When the matrix is quite finiſhed, they temper it, rub it well with pumice-ſtone, and clean out the ſtone again with a hair-bruſh; and, laſtly, poliſh it with oil and emery. In this condition it is fit for the mill, to be uſed to ſtrike coins and medals.

ENNEAHÆ'DRIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek ἐννέα, nine, and ἕδρα, a ſide.

The bodies of this genus are ſpars, compoſed of nine planes, in a triagonal column, terminated at each end by a triagonal pyramid.

ENNEA'NDRIA *, in botany, a claſs of plants, with hermaphrodite flowers, and nine ſtamina, or male parts, in each.

* The word is derived from the Greek ἐννέα, nine, and ἀνὴρ, male.

The plants of this claſs are the bay-tree, rhubarb, &c.

ENNE'RIS, in the ancient ſhip-building, a name given to thoſe gallies, or veſſels, which hold nine tiers of rowers.

ENRI'CHING *Plants*, a term uſed, by the Engliſh farmers, to expreſs ſuch plants as are found to do good to land, rather than to exhauſt it, and in conſequenee of which the ſame piece of land will produce a good crop of corn, though it would, without the aſſiſtance of their having been planted on it, have yielded a very poor one. The myſtery of this difference between plants, ſome of which are found to burn up, that is, impoveriſh land, while others enrich it, and leave it fitter for ſucceeding crops than they found it, had been long a perplexing thing to account for. Though it was eaſy to conceive that ſome plants mights exhauſt the earth more, and others leſs, yet, it was hard to conceive, while all exhauſted it in ſome degree, how any could leave it better than they found it; but this was at length explained by Mr. Tull. This author, having obſerved, that breaking the earth, by digging, or horſe-hoeing, between the plants, gave them great increaſe, found that it was this practice that enriched the earth, and that, while corn and ſuch plants as ſtand cloſe, and cannot be hoed between, impoveriſh the ground, and ſuffer no means of enriching it again to be uſed, there were ſome other things, the crops of which, being planted thinner, gave room to the earth to be plowed, dug, or hoed between, and that theſe were the plants which were called the Enriching kind, by the farmers; and the whole ſecret lay in this, that the hoeing, plowing, or otherways breaking the earth between them, in order to kill the weeds, enriched the ground greatly more, in proportion, than theſe plants exhauſted it; and the conſequence was, that, though they had thriven very well, yet, the earth was left richer than before, notwithſtanding all that they had imbibed from it. See his *Horſe-hoeing Huſbandry*. On this obſervation, this excellent author ſeems to have founded the ſyſtem of what he calls horſe-hoeing huſbandry, concerning which he has written a large and uſeful treatiſe. He found that this ſtirring up of the earth enriched it ſo greatly, that, where it was uſed in a proper manner, the kind of plant need not be changed, but that the ſame earth would yield a ſucceſſive ſeries of crops of the ſame plant, and that even without dunging, or ever lying fallow, and every crop for a long time would be better than the former ones. The method of ſowing, to this purpoſe, is not by ſcattering the corn with the hand, but ſowing it in rows, and leaving large intervals between, the naked earth of which might be turned up by the hoe. *Tull's Horſe-hoeing Huſbandry.*

ENTA'LIUM, *the pipe-ſhell*, in the materia medica, a ſhell of the ſame genus with the dentalia, being a ſpecies of the tubuli marini. It is frequent in the Eaſt-Indies, and ſometimes is found on our own ſhores. The virtues aſcribed to it are the ſame with thoſe of the dentalium; but neither of them have any title to more than thoſe of alkaline abſorbents, like the other teſtaceous powders.

The modern Italians call all ſtones, metals, woods, cut in with lines or figures, or barely channelled, entaglia; from whence, and from the nearneſs of the word dentalium, the learned and ingenious Dr. Liſter conjectures the name Entalium to have its original. *Dale.*

ENTHU'SIASM (*Dict.*) — Mr. De Piles is of opinion that Enthuſiaſm contains the ſublime, as the trunk of a plant does the branches.

This is the Enthuſiaſm felt in poetry, oratory, muſic, painting, ſculpture, &c. But this Enthuſiaſm which belongs to the works of art, is very different from that attributed to the ſibyls and prieſteſſes of the oracles, and heathen gods; which was little elſe but fanaticiſm, and conſiſted principally in grimace, and contortions of the body.

There is a degree of aſſent, ſays Mr. Locke, which, with ſome men, has the ſame authority, as either faith or reaſon; and that is Enthuſiaſm; which, laying by reaſon, would ſet up revelation without it; whereby, in effect, it takes away both reaſon and revelation, and ſubſtitutes, in the room of it, the ungrounded fancies of a man's own brain, and aſſumes them for a foundation both of opinion and conduct.

Immediate revelation being a much eaſier way for men to eſtabliſh their opinions, and regulate their conduct by, than the tedious labour of ſtrict reaſoning; it is no wonder, that ſome have been very apt to pretend to it, eſpecially in ſuch of their opinions and actions as they cannot account for by the ordinary methods of knowledge, and principles of reaſon.

Hence we ſee, that, in all ages, men, in whom melancholy has mixed with devotion; or whoſe conceit of themſelves has raiſed them into an opinion of greater familiarity with God, than is allowed others; have often flattered themſelves with the perſuaſion of an immediate intercourſe with the Deity, and frequent communications from the divine ſpirit.

Their minds being thus prepared, whatever groundleſs opinion comes to ſettle itſelf ſtrongly upon their fancies, is an illumination from the ſpirit of God; and, whatſoever odd action they find in themſelves an inclination to do, that impulſe is concluded to be a call, or direction, from heaven, and muſt be obeyed. This we take to be properly Enthuſiaſm, which, though riſing from the conceit of a warm or overweening brain, works, where it once gets footing, more powerfully on the perſuaſions and actions of men, than either reaſon, or revelation, or both together; men being moſt forwardly obedient to the impulſes they receive from themſelves.

When men are once got into this way of immediate revelation, of illumination without ſearch, and certainty without proof, reaſon is loſt upon them; they are above it: they ſee the light infuſed into their underſtandings, and they cannot be miſtaken; like the light of bright ſun-ſhine, it ſhews itſelf, and needs no other proof but its own evidence: they feel the hand of God moving them within, and the impulſes of the ſpirit, and cannot be miſtaken in what they feel.—But, of this ſeeing and feeling, is it a perception of an inclination to do ſomething, or of the ſpirit of God moving that inclination? Theſe are two very different perceptions, and ſhould be carefully diſtinguiſhed.

If they knew the thing to be a truth, they muſt do it, either by its own ſelf-evidence, or by the rational proofs that make it out to be ſo: if they know it to be a truth, either of theſe two ways, they in vain ſuppoſe it to be a revelation: for thus all truths, of what kind ſoever, that men uninſpired are enlightened with, come into their minds. If they ſay, they know it to be true, becauſe it is a revelation from God, the reaſon is good; but then it will be demanded, how they know it to be a revelation from God? If they ſay, by the light it brings with it; they ſhould conſider, whether this be ſaying any more, than that it is a revelation, becauſe they believe it to be true; for all the light they ſpeak of, is but a ſtrong perſuaſion of their own minds, that it is a truth; which is a very unſafe ground to proceed on, either in our tenets or actions. True light in the mind is nothing elſe but the evidence of the truth of any propoſition: and, if it be not ſelf-evident, all the light it can have, is from the clearneſs of thoſe proofs upon which it is received.

God, when he makes the prophet, doth not unmake the man: he leaves his faculties in their natural ſtate, to enable him to judge of his inſpirations, whether they be of divine original, or no. If he would have us aſſent to the truth of any propoſition, he either evidences that truth by the uſual methods of natural reaſon, or elſe makes it known to be a truth which he would have us aſſent to by his authority; and convinces us, that it is from him, by ſome marks, which reaſon cannot be miſtaken in. The holy men of old, who had revelations from God, had ſomething elſe beſides internal light of aſſurance in their own minds, to teſtify to them, that it was from God. They had outward ſigns to convince them, of the author of thoſe revelations. And, when they were to convince others, they had a power given them to juſtify the truth of their commiſſion from heaven; and by viſible ſigns to aſſert the divine authority of the meſſage they were ſent with. Moſes ſaw the buſh burn without being conſumed, and heard a voice out of it. God, by another miracle, of his rod turned into a ſerpent, aſſured him likewiſe of a power to teſtify his miſſion, by the ſame miracle repeated before them to whom he was ſent.

ENTRO'CHUS, in natural hiſtory, the name of a genus of foſſils, of a very regular figure and ſtructure, ſuppoſed, by many authors, to be lapides ſui generis, and ſtones in their native ſtate. They are, however, in reality, the foſſil remains of ſome marine animal, probably either of the echinus, or of the ſtar fiſh kind, filled, like the foſſil ſpecies of the echini, with a plated ſpar. Our imperfect knowledge in the animal hiſtory has not yet been able to aſcertain to what creature they really belong; but their analogy with the other animal remains, found in the foſſil world, plainly evince, that they are of that origin. They are cylindric columns, uſually about an inch in length, and are made up of a number of round joints, like ſo many ſmall wheels, or ſegments of cylinders. Theſe joints, when found ſeparate, and naturally looſe, as they ſometimes are, are called trochitæ. They are all ſtriated, from the center to the circumference, and have a cavity in their middle, which is ſometimes found empty, but more frequently filled up with various matter, of the nature of the ſtratum, in which they have lain, or of other of the native foſſil ſubſtances.

Some of the Yorkſhire Entrochi are ſwelled or tumid in the middle, and go off tapering to each end, and ſome others reſemble the lapides Judaici. Theſe, however, are true Entrochi: They are jointed in the ſame manner with the reſt, and conſiſt of a ſmall ſtalk, or pedicle, formed of three or four joints, and on this an oval body is placed, broken off at both ends. Some of theſe have alſo been the natural ſummits or faſtigia of the bodies, for they have a little jointed button on the top, hollow, and not ſeeming to have been divided, or broken off from any thing elſe. *Phil. Tranſ.* N°. 100.

The hollows of the Entrochi are uſually filled up with earthy or ſtony matter, but ſometimes with another ſmaller Entrochus, ſo that they reſemble a pair of ſcrews, one nicely fitted into the other, and the one making a ſort of pith to the other, and having gone regularly through its whole length.

ENTROCHO-*aſteriæ*, in natural hiſtory, the name given by authors to a peculiar kind of Entrochus, differing from the common kind, in having a ſtellar cavity, inſtead of a round one, in its center.

ENTROCHUS *pyramidalis*, a name given, by ſome of the writers of natural hiſtory, to the ortho-ceratites, or tubulus marinus concameratus, a ſpecies of ſhell-fiſh, not known to us in its recent ſtate, but very common in the ſtones brought over from Sweden for pavements.

ENTROCHUS *ramoſus*, in natural hiſtory, the name of a foſſil body, the ſeveral parts of which reſemble the Entrochi; but, as they are joined together in this body, when perfect, they ſhew themſelves in their proper light, and a ſight of them, in this ſtate, is ſufficient to explode the opinion, advanced by ſome perſons, of the Entrochi being of a vegetable nature, or, as they have pleaſed to call them, rock plants.

E'PERON, in natural hiſtory, *the ſpur-ſhell*, ſo called from its reſembling, in ſome degree, the rowel of a ſpur. It is a ſpecies of ſnail, of the round mouthed kind, or claſs of the cochleæ lunares; all its volutæ are ſurrounded with double rows of prickles.

EPE'RVIERS, in natural hiſtory, a name given, by the French authors, to a claſs of butterflies, which make the ſixth in Reaumur's method.

EPHE'DRA, *ſea-grape*, in botany, a genus of plants whoſe characters are:

The root is perennial: the plant has the appearance of a ſhrub; and the ſtalks, branches, and leaves, reſemble thoſe of horſetail. The flower is male; has no petals, but conſiſts of teſticulated ſtamina, growing on a thin ſubſtance, the congeſtion of which furniſhes the floſcule with a ſort of calyx: theſe are the flowers which grow on the male or hermaphrodite plant. The fruit, which either grows on another part of the ſame plant, or on another plant which bears no flowers, is a red juicy berry; conſiſts of a pair of ſquamous or ſcaly ſubſtances, laid acroſs, upon a pair of others like them, and upon that a third, and over this a fourth pair, in like order as the firſt and ſecond, the ſeries gradually increaſing from the leaſt and loweſt ſcales to the uppermoſt and greateſt, which in a bifid cleft, a little gaping, contains two ſmooth oval ſeeds, gibbous on the back part, and flat on the other, and covered with a coriaceous membrane. *Boerhaave.*

EPHE'MERA (*Dict.*)—This fever is, properly, an attempt of nature to eaſe herſelf of a load of a plethora, either by an abſolute diſcharge of part of the blood by an hæmorrhage, or, by reſolving it into ſerum, and expelling it in that form, the ſecretory and excretory motions, being increaſed beyond their natural degree. The diary fever, properly ſo called, laſts only twenty-four hours; but this differs in nothing, except the time of its duration, from the ephemeron plurium dierum, which commonly laſts four days. To this it is to be added, that ſome authors have called the ſudor Anglicus Ephemera maligna, diary fever, as it generally deſtroyed the patient in the ſpace of one day.

The ſimple diary fever uſually ſeizes the patient without any preceding ſhivering, and immediately is attended with a degree of heat of the fleſh, which continues the ſame without intermiſſion or exacerbation, till the cloſe. This is uſually not very violent, and is always attended with pains in the head, ſometimes heavy and dull, ſometimes pulſative and very acute. Such perſons as fall into this fever, from drinking large draughts of cold liquors while they are hot, as is very frequently the caſe, always have a pain in the right hypochondrium. The face is red, and inflated in this diſeaſe, and there is a laſſitude and wearineſs in all the limbs; the pulſe is ſtrong and quick, the urine is of a deep orange colour, and depoſits a reddiſh ſediment.

Method of treatment. When the peculiar diſpoſition of the blood, and other accidents, render this fever worſe than it naturally would be, the proper courſe is to attemperate the violent emotions of the blood with nitrous, and the fixed antimonial medicines, and occaſionally, with the gentle acids, ſuch as lemon juice, and the like: And indeed, in all caſes of this kind, the frequent uſe of warm and weak liquors, with lemon juice among them, is highly to be commended. The free eruption of the ſweat, by which nature attempts to eaſe herſelf of the diſeaſe, is to be promoted by the gentle ſudorifics; nitre, crab's eyes, and a ſmall quantity of the juice of lemons, juſt enough to ſaturate the alkali of the crab's eyes, prove an excellent medicine, to be repeated in ſmall doſes every three or four hours; and, towards night, the ſudorifics ſhould be joined to theſe, ſuch as the contrayerva root, or the like. And when it is over, there ſhould be given a few doſes of ſome gentle purge, as an infuſion of rhubarb and ſena, or the like. Bleeding is unneceſſary in this fever. *Juncker's Conſp. Med.*

EPHE'MERON (*Dict.*)—This inſect is found about the mouths of the Rhine, and ſome other rivers in Germany, and ſeems a ſort of middle ſpecies between the May fly, common with us, and bred from the cadew worm, and the libella, or dragon fly. It has four wings, two long, and two ſhort; two ſhort horns, ſix legs, and two very long ſtraight hairs, iſſuing from the tail. They are ſeen flying about the ſurface of the water, about Midſummer, for three days, and no longer; they eat nothing, and their only buſineſs is to drop their eggs on the ſurface of the water, after they have copulated. Theſe eggs, ſinking to the bottom, produce a ſort of worms, or maggots; theſe ſoon hollow themſelves cavities in the clay, where they remain three years, growing every year about an inch in length. When the worm is come to its full growth, it riſes to the ſurface of the water, about ſix o'clock in the morning, and there iſſues from it this fly, which lays its eggs, and dies about ſix o'clock the ſame night; ſo that the life of the creature, in the fly ſtate, is only about twelve hours. *Swammerdam. Hiſt. Inſ.*

EPICERA'STICA, ἐπικεραστικὰ, from κεράννυμι, to mix, or attemperate. Medicines which attemperate or obtund the acrimony of the humours, and mitigate the uneaſy ſenſation of the parts thence ariſing. Among medicines of this kind, are reckoned emollient roots; as thoſe of the marſh-mallow, mallow, and liquorice.

The leaves of mallows, water-lily, the large houſe-leek, purſlane, and lettuce.

The ſeeds of barley decorticated, white henbane, lettuce, flax, white poppy, and rue.

The fruits, jubebs, raiſins, ſweet apples, ſweet prunes, ſebeſtens, ſweet almonds, and pine-nuts.

Among juices and liquors; almond-milk, ſtarch, barley-water, pinguious broths, the milk of the ſow-thiſtle, cremor of ptiſan, and the juices of the leaves of night-ſhade, and winter-cherry.

Among the parts of animals; the whites of eggs, butter, milk of all kinds, whey; the head and the feet of a calf, and alſo a ſheep's head, and broths prepared of them; jellies of hartſ-horn and ivory.

Among mucilages; the ſeed of fleawort, quinces, of the ſeed and root of marſh-mallows; of the ſeed of flax, mallows, and of the root of borrage.

Among oils; oil of olives, violets, ſweet almonds, expreſſed oils of the ſeed of gourd, white henbane, and white poppy. Among ointments; the unguentum roſatum and unguentum album camphoratum.

Among ſyrups; the ſyrups of violets, of apples, of marſh-mallows, of Fernelius, of liquorice, jubebs, poppies, and of purſlane.

Among the various ſhop preparations; the pulp of caſſia, diacodium, diapenidium, ſugar of violets, julap of violets, honey of violets. *Morellus, de Materia Medica.*

EPIDE'MIC (*Dict.*)—Pertinent to the preſent ſubject are the obſervations of the celebrated Boerhaave, on epidemical diſeaſes: we muſt remark, ſays this author, that though every particular diſeaſe of the fluids, in various epidemical conſtitutions, appear, to unattentive obſervers, the ſame with regard to their names, ſigns, and their conſequences in ſome meaſure, yet the ſame diſeaſes, appearing in one epidemical conſtitution, differ exceedingly from thoſe produced in another, with reſpect to their obſcure natures; their appearances not obſervable, except by the judicious; the various times of their increaſe, ſtate, coction, criſis, effect, event, and method to be purſued for the cure. Hence it is evident, that they require a different adminiſtration of the non-naturals, different treatment and medicines: this variety, however, in epidemical diſtempers, is ſo obſcure, that phyſicians have not yet been able to deduce it from any abuſe of the non-naturals: and yet there are many circumſtances which make it highly probable, that the cauſes reſide in the air, but depend more upon the inexplicable variety of exhalations contained therein, which, by their mixture with the fluids of the body, or their ſtimulus, injure the human machine, than upon any change in the ſenſible qualities thereof. But it is very ſurprizing, that theſe epidemical diſorders ſhould be principally propagated by contagion, received from one by another perſon unaffected.

Upon the invaſion of any unknown epidemical diſtemper, the phyſician will receive ſome information with reſpect to the cure: firſt, by reducing the diſtemper to ſome more known ſpecies, which it moſt reſembles.

Secondly, by obſerving its tendency at the vernal and autumnal equinoxes, at which ſeaſons it is generally moſt prevalent.

Thirdly, by attending to the ſpontaneous phænomena, which precede, accompany, or follow, the death or recovery of the patient, and the better or worſe ſtate of the diſorder.

Fourthly, by diligently remarking the benefit or injury received, from whatever the patients are unavoidably obliged to do; whatever is taken into; or diſcharged out of, the body.

Fifthly, by comparing the caſes of a great many patients labouring under the diſtemper at the ſame time.

Sixthly, by abſtaining from all remedies which are dubious, which exagitate and induce a conſiderable change in the humours, and thereby obſcure the genius of the diſeaſe.

From theſe circumſtances, duly attended to, the curative indication ariſes.

EPIME'DIUM, *barren-wort*, in botany, a genus of plants whoſe characters are:

The leaves are like thoſe of ivy, and grow three on the top of each branch: the ſtalk is divided into three branches at each joint, and the triple diviſion is continued in the ſubdiviſions: the calyx is compoſed of four leaves: the flower conſiſts of four petals, which are tubulated and hollowed into blind canals, and furniſhed with four ſtamina: the ovary is ſeated in the bottom of the calyx, and is furniſhed with an erect tube or pointal, which becomes an unicapſular bivalve pod, containing round flat ſeeds. *Boerhaave, Index alter.*

EPI'PHORA (*Dict.*)—Some confound this diſorder with a fiſtula lachrymalis, but improperly; ſince, in the latter, pure tears are not diſcharged, but tears, mixed with a purulent matter, flowing from a latent ulcer in the ſaccus lachrymalis. But, that we may the more eaſily and accurately diſcover the nature of both theſe diſorders, we ſhall, as briefly as poſſible, exhibit the ſtate, figure, and ſituation, of the lachrymal ducts or paſſages. In *Plate* XX. *fig.* 7. the letters *a a* repreſent the puncta lachrymalia in the eye-lids; and *b*, the caruncula lachrymalis. *Fig.* 8 and 9, repreſent the ductus lachrymalis of both eyes intire, ſeparate, and in ſuch a ſtate as they paſs from the eye-lids to the noſtrils. The letters *a a* exhibit the ſaccus lachrymalis; *b b*, the puncta lachrymalia, with their ducts or ſmall tubes, *c c c c*, running off to the ſaccus lachrymalis. The letters *d d* repreſent the naſal duct; and *e e*, its mouth, opening in the noſtrils. *Fig.* 10. repreſents the communication of theſe ducts with the eyes; *a a*, the puncta lachymalia; *b*, the caruncula lachrymalis, *c c*, the ducts running from the puncta lachrymalia to the ſaccus lachrymalis *d*; *e*, the naſal duct; and *f*, its extremity, opening into the noſtrils.

This diſorder may ariſe from various cauſes; for whatever prevents the courſe of the humours from the eye through the puncta lachrymalia and naſal duct to the noſtrils, produces an Epiphora, or weeping eye; for, ſo long as the eye or lachrymal duct are ſound and intire, that liquor diſcharged from the glandula lachrymalis, for moiſtening and cleanſing the eye, inſenſibly drops through the puncta lachrymalia, the ſaccus lachrymalis, and the naſal duct, into the noſtrils. A weeping eye, or the oculus lachrymans, is produced:

Firſt, when any tumor, or tubercle, ſuch as an encanthis, appears in the greater canthus, or that which is next to the noſe, and diſorders the puncta lachrymalia.

Secondly, when, after an exulceration, burn, or any other misfortune of the eye-lids, the puncta lachrymalia are cloſed up and obſtructed.

Thirdly, when the naſal duct is either obſtructed, or totally conglutinated; for, when the ſaccus lachrymalis is ſo full, that no more can enter therein, it muſt neceſſarily happen, that the humours, continually diſcharged in large quantities from the glandula lachrymalis, muſt run down the cheeks. The naſal duct is generally obſtructed, when it is either filled with a thick, viſcid, and glutinous matter, or when juſt by the noſtrils it is affected with an inflammation capable of conglutinating it.

Fourthly, an Epiphora may be produced by a polypus, a caruncle, or fleſhy excreſcence of the noſe; for theſe ſubſtances obſtruct and compaſs the ductus lachrymalis naſalis.

Fifthly, this diſorder may ariſe from a fiſtula lachrymalis.

Sixthly, from an inverſion of the eye-lids, or that ſpecies of diſorder called ectropium.

Seventhly, from an eroſion or defect of the caruncula lachrymalis.

Eighthly and laſtly, from a wound of the lachrymal ducts, and their agglutination by a bad cicatrice.

The prognoſtics, and method of cure, in this diſorder, are various, according to the different cauſes from which it may poſſibly proceed; for, if a tumor of the large canthus, a polypus of the noſe, a diſtortion of the eye-lids, or a fiſtula lachrymalis, ſhould produce an Epiphora, or weeping eye, the diſorder cannot be removed, till its reſpective cauſes are taken away. When the Epiphora ariſes from a conglutination of the puncta lachrymalia, we ought carefuly to examine, whether their ducts *c c*, in *fig.* 8 and 9, are totally conglutinated, or whether their mouths, *b b* are only cloſed up by a ſlender cuticle; for, when the ducts of the puncta lachrymalia are totally conglutinated, either by ſome internal cauſe, or cicatrices formed after wounds or burns of the lachrymal ducts, there remain little or no hopes of a cure. But, if a ſlender cuticle ſhould only block up the ducts of the puncta lachrymalia, which ſometimes happens, the moſt proper method is cautiouſly to perforate that cuticle with a needle, and then to paſs a hog's briſtle, or a piece of ſlender ſilver wire, anointed with oil of eggs, into the perforations. Various wires for this purpoſe are repreſented by *fig.* 11, 12, and 13, *Plate* XX. and theſe meaſures muſt be perſiſted in, till the mouths of the perforations are ſo effectually indurated as to prevent a future conglutination.

But if, in this diſorder, the puncta lachrymalia are ſound, and ſufficiently pervious, the naſal duct muſt neceſſarily be obſtructed. And this obſtruction, when proceeding from a glutinous matter, which, by long continuance, is not preternaturally indurated, is very often capable of being removed. For this purpoſe the patient is frequently every day to be laid upon his back, and have reſolvent liquors dropped into the greater canthus; then the ſaccus lachrymalis is carefully to be compreſſed with the fingers, leſt the humours, by remaining long in it, ſhould contract a certain acrimony, corrode the lachrymal ducts, and gradually produce a fiſtula lachrymalis. Among the reſolvent medicines ſuited to this intention, the moſt conſiderable are eſſence of aloes, prepared with the aqua ophthalmica; eſſence of the gall of the eel-pout; prepared nearly in the ſame manner; warm infuſions of the herbs hyſſop and Paul's betony; mineral waters ſuch as thoſe of Wiſboden, the Caroline ſprings, thoſe of Emſer, the Selteran, the Sedlitz, and other waters of a like nature, or any ophthalmic waters, to be frequently dropped warm into the eye, with an admixture of a ſmall portion of mineral ſalt, obtained from the abovementioned waters. Beſides theſe, it is expedient ſometimes to draw up the noſtrils an errhine, or mild ſternutatory, prepared of marjoram, lilies of the valley, marum, and other herbs of a like quality. Spirit of hartſhorn; or ſal ammoniac, may alſo be applied to the noſtrils. If all theſe medicines ſhould prove ineffectual, it will be expedient to uſe that new method of cure in a fiſtula lachrymalis, recommended by Anel, in which a certain ſlender ſilver probe, like thoſe repreſented in *Plate* XX. *fig.* 11, 12, and 13, is cautiouſly and dexterouſly paſſed to the noſtrils through the ſuperior punctum lachrymale, the ſaccus lachrymalis, and the lachrymal duct of the noſe. But, in performing this operation, the ſituation and ſtructure of the lachrymal ducts muſt be carefully adverted to; the operator's eye muſt be quick and diſcerning, his hand ſteady, and well accuſtomed to the niceſt chirurgical operations; otherwiſe he will hardly ſucceed in the operation. This method ought to be perſiſted in for ſome days; and every morning and evening, after introducing the ſilver probe or wire now mentioned, a ſmall quantity of the above recommended liquors is, by means of the ſmall ſyringe, repreſented in *Plate* XX. *fig.* 14, to be injected into the inferior punctum lachrymale, in order to cleanſe the lachrymal ducts, leſt the paſſage of the tears to the noſtrils ſhould again be obſtructed. When this ſpecies of diſorder continues long, it generally degenerates into a fiſtula lachrymalis, and is to be treated as ſuch. When an Epiphora ariſes from a total want of the caruncula lachrymalis, all attempts of relief are unſucceſsful; becauſe that gland cannot be reſtored. *Heiſter. Chirurg.*

EPIPLO'CELE (*Dict.*)—There have been a few inſtances where ſo great a quantity of the omentum has fallen into the ſcrotum, that, by drawing the ſtomach and bowels downwards, it has excited vomiting, and inflammations, in which caſe the operation of opening the ſcrotum is neceſſary: it is neceſſary alſo the rings of the muſcles ſhould be dilated, or otherwiſe, though you have taken away ſome of the mortified part of the omentum, the reſt that is out of its place, and ſtrangled in the perforation, will gangrene alſo. What I have here deſcribed as an inducement to the operation, ſhould, by the experience I have had, be the only one. There are a great many people, who are ſo uneaſy with ruptures, though they are not painful, that a little encouragement from ſurgeons of character will make them ſubmit to any means of cure; but, as I have ſeen two or three patients, who were in every reſpect hale and ſtrong, die a very few days after the operation, the event, though very ſurpriſing, ſhould be a leſſon, never to recommend this method of treating an Epiplocele, unleſs it is attended with inflammation, &c. *Sharp's Surgery.*

E'PITHEM (*Dict.*)—There are three kinds of Epithems; firſt, the liquid; ſecondly, the dry, or ſolid; and, thirdly, thoſe of the ſoft and poultice kind. The two former retain the general name of Epithem, and the latter is called cataplaſm, poultice, or malagma.

A liquid Epithem, called alſo ſometimes, a fomentation, is a medicated liquor, either ſimple or compound, applied either cold or hot, by the intervention of a proper vehicle, to the ſurface of the body; and calculated either for inducing ſuch a change on it, or the ſubjacents parts, as the intention of the phyſician ſhall require.

The liquors for theſe intentions may be water, milk, wine, vinegar, ſpirit of wine, liquid juices, oil, or urine, either ſimple by themſelves, or variouſly prepared, and mixed either with each other, or with other officinal and extemporaneous medicines, of whatever conſiſtence, ſuch as diſtilled waters of all kinds, vinegars, infuſed oils, decoctions, aromatic ſpirits, tinctures, eſſences, ſaline liquors, lixiviums, forge-water, lime-water, and, eſpecially, infuſions and decoctions prepared from theſe and other proper materials, expreſſed juices, emulſions, and mixtures of various kinds.

The choice of the phyſician, with reſpect to proper materials, is to be directed by the nature of the part to be changed, or to which the application is made, the malignant or benign nature of the ſymptoms, and the particular quality of the liquor to be uſed.

The ſame cautions are to be uſed in the management of theſe, as in that of ſuch forms for internal uſe: only, as in the former caſe, it is not neceſſary we ſhould regard the taſte, the ſmell, or the colour of the medicines; ſo, for this reaſon, we are to omit the ſugars and ſyrups uſed for correcting internal remedies.

A pretty thick conſiſtence is no diſadvantage to liquid Epithems, though, at the ſame time, when a deep penetration into the part affected is required, thoſe of a leſs thick conſiſtence are, when all other circumſtances are alike, to be preferred.

As a change of the part only to which the application is immediately made, is not always intended, but, ſometimes, alſo, of the viſcera and organs lying under it; ſo the ſubſtances moſt proper for applications of this kind are thoſe, whoſe virtues conſiſt in their volatile, highly fine, and penetrating principles, eſpecially when a change of the internal parts is intended: for this reaſon, ſubſtances of an earthy or ſtony nature, aſtringents, and materials of an inſpiſſating nature, can poſſibly be of no ſervice for this purpoſe; ſince, in conſequence of their thickneſs, they either cannot be abſorbed, or, by bracing up the mouths of the pores, prevent their own ingreſs. But, perhaps, better effects may be produced by adding ſome penetrating aromatic, or ſpirit, to gentle aſtringents.

It is alſo to be carefully conſidered, whether the nature of the part, to which the application is immediately to be made, is ſuch, as, without being injured, is capable of bearing the liquor, whether oil, water, ſpirits, or acrid fluids; leſt, whilſt we do ſervice to one part, we ſhould injure or hurt another.

EPU'LIS, ἐπȣλὶς from ἐϖὶ upon, and οὖλα, the gums, a ſpecies of tubercles growing on the gums, of which there are two kinds; for ſome are intirely without pain, whilſt others afflict the patient in a moſt terrible manner, becauſe they are of a malignant nature, and gradually degenerate into a cancer: tubercles of this kind are alſo in ſome meaſure diſtinguiſhed from each other by their different bulks and conditions; ſince ſome are as big as a large nut, and others no bigger than a ſmall one; ſome hard, others ſoft; ſome have a ſlender, and others a larger and broader root: when theſe tubercles are of the large kind, they not only diſtend and deform the jaws, but alſo prove a conſiderable obſtruction to maſtication and ſpeech, for which reaſon they require a ſpeedy and expeditious cure: now, no method of cure is more expeditious, than a total extirpation of theſe caruncles, as is uſual in other tubercles of a like nature: when, therefore, the roots are ſmall, a thread is carefully to be paſſed about them, with which they are to be tied pretty tight: but, when the inferior part of the tubercle is pretty large, the uſe of ſome gently corroſive medicine is proper; and this intention is excellently anſwered, by oil of tartar per deliquium, or a ſolution of ſal ammoniac. But in caſes of this nature we are abſolutely to abſtain from the more draſtic and poiſonous corroſives, ſince, for the moſt part, they not only excite violent inflammations, and exulcerations of the mouth, but may alſo produce the death of the patient, if they ſhould happen to be unfortunately ſwallowed: for this reaſon, in caſes where the milder corroſives are not ſufficient, it is more expedient and ſafe to ſeek the means of relief from the knife, whilſt theſe caruncles, being laid hold of by a pair of forceps, or a ſmall hook, are to be extirpated and cut out, either by the knife or a pair of ſciſſars: but this is to be done cautiouſly, leſt, by cutting out the whole ſubſtance of the gum at the ſame time, a caries ſhould be excited in the denudated bones of the jaw. The diſcharge of the blood is to be permitted for ſome time; but, if it ſhould continue too long, in order to ſtop it more eaſily, and cleanſe the blood out of the mouth, it is highly proper to make the patient often waſh his mouth with warm wine, eſpecially of the red and aſtringent kind, or with oxycrate, mixed with a little alum, till he has ſpit out all the blood: when the diſcharge of the blood is ſtopped, the wound is to be daily anointed, till healed, with oil of myrrh per deliquium, or eſſence of myrrh mixed with honey of roſes. If any part of the tubercle ſhould remain, or if it ſhould begin to appear afreſh, it is with all expedition to be conſumed by the corroſives already mentioned, or by blue vitriol, or any other corroſive medicine; or it may be again extirpated by means of the ſciſſars or knife. The actual cautery is by ſome recommended in caſes of this nature, and inſtances of cures happily performed by it alledged; but it is not only incommodious to apply, but alſo excites intolerable pain; it is however to be uſed when the tubercle cannot be repreſſed by other means. Meckren, in his twenty-eighth obſervation, gives us a ſingular inſtance of a cure of this diſorder, together with the deſcription of a knife, accommodated to this purpoſe. Scultetus, in his thirty-fifth obſervation, informs us, that, by means of a forceps uſed in eradicating polypuſes, he happily extirpated a caruncle of this kind, adhering to the gum of the anterior teeth, hard by the palate. Some years ago, I myſelf ſays Heiſter, ſaw ſuch a caruncle in the palate of a monk, behind the dentes inciſores; but, becauſe his misfortune was complicated with a ſpina ventoſa in the bones of the palate, and becauſe he would not ſubmit to the uſe of the actual cautery, the caruncle could not be totally removed; but the patient, gradually loſing his ſtrength, at laſt died. *Heiſter. Chirurg.*

EQUA'TION (*Dict.*)—Dr. Halley's method for the ſolution of Equations is thus: let the root z of any Equation be taken equal to $a \pm e$; where a is ſuppoſed to be taken near to the true value. Then from the quantity $a \pm e$ let all the powers of z, found in the propoſed Equation, be formed; and to theſe let their reſpective coefficients be prefixed. Let the power to be reſolved be ſubducted from the ſum of the parts of the firſt column, where e is not found; and let the difference be $\pm b$, then take the ſum of all the coefficients of e in the ſecond column, which call s: and having added all the coefficients of $e e$, the ſum of which is called t; the root ſought, z, will, in a rational form, $= a \pm \frac{s b}{s s \pm t b}$; and, in an irrational form, $= a \frac{\mp \frac{1}{2} S \mp \sqrt{\frac{1}{4} ss + bt}}{}$.

For inſtance, let it be propoſed to find a root of the Equation $z^4 - 3zz + 75z = 10000$, where 10000 is the reſolvend.

For a firſt ſuppoſition let $a = 10$; we ſhall therefore have the Equation

$$\begin{array}{l} z^4 = a^4 \pm 4a^3e + 6a^2ee \pm 4ae^3 + e^4 \\ -dzz = da^2 \pm dae - dee \\ +cz = +ca \pm ce \\ = 10000 \pm 4000e + 600e \pm 40e^3 + e^4 \\ -300 \pm 600e - 3e \\ +750 \pm e75e \\ -10000 \\ \hline +450 \mp \underset{s}{4015}e + \underset{t}{597}ee \mp \underset{u}{40}e^3 + e^4 = 0. \end{array}$$

The ſigns + and — with reſpect to e and e^3 are left doubtful, till it be known whether e be affirmative or negative; in which there is ſome difficulty, as in Equations having ſeveral roots, the homogenea comparationis, as they are called, are often increaſed by diminiſhing a, and on the contrary diminiſhed by increaſing a. But the ſign of e is determined by the ſign of the quantity b; for, the reſolvend being ſubtracted from the homogeneum formed from a, the ſign of $s e$, and, therefore, of the parts prevailing in its compoſition, will always be contrary to the ſign of the difference b. Hence it will appear whether e be affirmative or negative, or whether a has been aſſumed greater or leſs than the true root. But e is always equal to $\frac{\frac{1}{2}s - \sqrt{\frac{1}{4}ss - bt}}{t}$, as often as b and t have the ſame ſign; but, when they are connected with different ſigns, e becomes $= \frac{\sqrt{\frac{1}{4}ss + bt} - \frac{1}{2}s}{t}$. After that e has been found to be negative, e, e^3, e^5, &c. muſt be made negative in the affirmative members of the Equation, and affirmative in the negative members, that is, they muſt be writ with a contrary ſign: but if e be affirmative, then muſt e, e^3, e^5, &c. be affirmative in the affirmative members, and negative in the negative.

In the propoſed example we have 10450 inſtead of the reſolvend 10000, or $b = +450$; from whence it appears, that a was taken greater than the true root, and, conſequently, that e is negative. Hence the Equation becomes $10450 - 4015e + 597ee - 4e^3 + e^4 = 10000$; that is, $450 - 4015e + 597ee = 0$. Therefore, $450 = 4015e - 597ee$, or $b = ſe - tee$; the root of which is $e = \frac{\frac{1}{2}s - \sqrt{\frac{1}{4}ss - bt}}{t}$, or $\frac{s}{2t} - \sqrt{\frac{ss}{4tt} - \frac{b}{t}}$, that is, in the preſent caſe, $e = \frac{2007\frac{1}{2} - \sqrt{3761406\text{-}_4}}{597}$, from whence the approximated root is found to be $= 9.886$. Now, this root being taken for a ſecond ſuppoſition, and the operation being repeated, we ſhall have $a + e = z = 9.88626039364 95$, which is very exact, ſcarcely exceeding the truth by above 2, in the laſt figure.

This is ſufficient to give a notion of Dr. Halley's method: thoſe who deſire more examples, and farther inſtructions, may conſult the the Philoſophical Tranſactions, N°. 210, or Lowthorp's Abridg. vol. I, p. 85.

EQUATION *of the center (Dict.)*— This Equation not being conſtant, there is a place in the planet's orbit where it is greateſt. Hence ſeveral queſtions in aſtronomy ariſes; as, what is the greateſt Equation for every planet? To what mean anomaly does this Equation correſpond? Alſo, as the greateſt Equation is determined by the excentricity of the planet's orbit, it may be reciprocally requiſite to determine the excentricity by the greateſt Equation.

The rigorous ſolutions of theſe queſtions being no where extant, Mr. Euler has enquired into them, in Mem. de la Acad. de Berlin, Tom. II, p. 225. Where he ſolves the following problems.

1. To find the true and mean anomaly, correſponding to the planet's mean diſtance from the ſun; that is, when the planet is in the extremity of the conjugate axis of its orbit.
2. The excentricity of a planet being given, to find the excentric anomaly correſponding to the greateſt Equation.
3. The excentricity being given, to find the mean anomaly correſponding to the greateſt Equation.
4. From the ſame data to find the true anomaly correſponding to this Equation.
5. From the ſame data to find the greateſt Equation.
6. The greateſt Equation being given, to find the excentricity. Mr. Euler obſerves, that this problem is very difficult, and that it can only be ſolved by approximation and tentatively, in the manner he mentions. But, if the excentricity be not great, it may be then found directly from the greateſt Equation. Thus, if the greateſt Equation $= m$, and the excentricity $= n$, then

$$m = 2n + \frac{11}{48}n^3 + \frac{899}{5120}n^5 +, \&c.$$

Whence, by converſion,

$$n = \tfrac{1}{2}m - \frac{11}{768}m^3 - \frac{587}{2^{10}.\,15}m^5 -, \&c.$$

Where the greateſt Equation m muſt be expreſſed in parts of the radius, which may be done by converting the angle m into ſeconds, and adding 4.6855749 to the logarithm of the reſulting number; for this will be the logarithm of the number m.

The mean anomaly to which this greateſt Equation correſponds, will be, $x = 90° + \frac{5}{8}m - \frac{5}{2^9.\,3}m^3 - \frac{1}{2^9.\,5}m^5$ —, &c.

Whence, if to 90° we add $\frac{5}{8}$ of the greateſt Equation, we ſhall ſufficiently approximate to this mean anomaly.

Mr. Euler gives us a table, in which may be found the greateſt Equations, the excentric and mean anomalies, correſponding to theſe greateſt Equations, for every hundredth part of unity, which he ſuppoſes equal to the greateſt excentricity, or when the diſtance of the foci and the tranſverſe axis become infinite. The laſt column of his table alſo gives us the logarithm of that diſtance of the planet from the ſun, where its Equation is greateſt. By the help of this table, any excentricity being given, we may find the greateſt correſponding Equation, by interpolation. But the principal uſe of the table is, to determine the excentricity when the greateſt Equation is known, and Mr. Euler thinks the queſtion inſoluble without this help.

EQUISE'TUM, *marſh horſetail*, in botany, a genus of plants whoſe characters are:

The root is very creeping: the leaves are round, hollow, and articulated by a pyxidated inſertion, or after the manner of boxes, a leſs within a greater: the flower has no petals, is ſtamineous or thready, has a fungiform or muſhroom-like head, and is male in one plant. The fruit conſiſts of black rough grains, growing cloſe together on the plant, which bears no flowers.

The great horſetail has many hollow, whitiſh-green, ſmooth, and neatly channeled round ſtalks, having many joints at ſome diſtance one from another, the uppermoſt being always ſet-in or articulated in that next under it: they grow to be a foot and a half, or two feet high, taper, and ſcarce half an inch thick: They are ſurrounded, at every joint, with a great number of long, very ſlender, rough leaves, which, like the ſtalks, are jointed one within another, and ſtand ſo thick, that the whole ſtalk appears like a horſe's tail: early in the ſpring, before the ſtalks come up, there ariſe from the root ſeveral ſhort ſtalks, without leaves, but jointed as the others, having at their tops a browniſh round head like the top of an aſparagus, in which lies the ſeed: the root is long and ſlender, full of joints, and ſpreading much. It grows in ditches and marſhy grounds.

Horſetail is reſtringent, drying, and binding; good to ſtop bleeding in wounds, and all hæmorrhages in any part of the body, redundant catamenia, and the fluor albus, for ulcerations in the kidneys or bladder, and is uſeful in all kinds of ruptures. *Miller's Bot. Off.*

Horſetail has an herby ſaltiſh taſte; it is deterſive, and gives hardly any tincture of red to blue paper: its ſalt ſeems to reſemble that of coral; but it is mixed with a little ſal ammoniac and ſulphur: by the chemical analyſis, it affords ſeveral acid liquors, a little oil, a great deal of earth, no concreted volatile ſalt, but a little urinous ſpirit: its fixed ſalt does not eaſily diſſolve in the air, neither does it give an orange colour to the ſolution of corroſive ſublimate. *Martyn's Tournefort.*

Frederick Hoffman recommends a decoction or infuſion, by way of tea, made of this plant, as excellent in the ſtone; and Fuller gives a decoction thereof, intended againſt ulcers of the bladder.

E'QUUS, in natural hiſtory, the horſe. See the article HORSE.

ERE'TRIA *Terra*, *Eretrian earth*, in the materia medica, the name of a very peculiar kind of bole, dug in the Negropont, near the ancient Eretria, and once in great uſe as an aſtringent and a ſudorific.

The grey, or genuine Eretrian earth, is a fine and pure greyiſh-white earth, moderately heavy, naturally of a ſmooth ſurface, of a friable texture, eaſily crumbling to pieces between the fingers, but not ſtaining the ſkin in handling; it ſticks firmly to the tongue, but melts into a butter-like ſubſtance in the mouth; it burns to a perfect ſnow white, and efferveſces violently with aqua-fortis. But what abundantly diſtinguiſhes it from all other earths, is, that, if a little wetted and drawn over a plate of braſs or copper, ſo as to mark a line, the mark will, a little after, appear bluiſh.

ERI'CA, *common heath*, in botany, a genus of plants whoſe characters are:

The leaves are ſmall and ever-green, monopetalous, bell-ſhaped, naked, and often ſhaped like a pitcher. The ovary in the bottom of the flower becomes a roundiſh fruit, gaping in four places, divided into four cells full of ſmall ſeeds, and covered with the lower part of the flower as with a calyx.

The flower of this plant is of a very ſingular ſtructure. It is a little bell prolonged and double. The outer one, which is the longeſt, is formed by four petals, encompaſſing the other, which ſeems to be monopetalous, open only at the fore part, and cut into four equal ſegments. The cavity of this inner one is filled with eight chives, diſpoſed round a pointal, which does not exceed the thickneſs of a middling pin's head, and is raiſed with eight rounded ribs, and ſurrounded by a ſtyle, terminated with a button, which uſually juts out of the flower. Theſe parts are ſuſtained by a little empalement, like a cup, cut to the very baſe into four equal parts. This double flower is purple, as is alſo the ſtyle; but the chives are white.

The decoction of heath is diuretic. Cluſius affirms, that Rondeletius, the famous profeſſor of phyſic at Montpelier, uſed the oil of its flowers for tetters, with a great deal of ſucceſs. Tabernæmontanus ſays, that it is a ſpecific for theſe ſorts of diſeaſes; and that a fomentation, with the flowers of heath, eaſes the pain of the gout. For the ſame diſeaſe they prepare a vapour bath, with its leaves and flowers. *Martin's Tournefort.*

ERMI'NEUM *Animal*, the ermin, or creature whoſe ſkin is the ermin, ſo much eſteemed as a fine furr.

This creature is properly a ſpecies of weaſel, and is called by Mr. Ray, and other authors, muſtela candida, the white weaſel. It is in all reſpects like the common weaſel, and is all over of a pure ſnow-white, except the tip of the tail, which is of as beautiful a black; and that it has a little yellowiſh-grey about the eyes, and a mark, or ſpot, of the ſame colour, on the head, another on the ſhoulders, and a third near the tail. Its colour is, however, very different in degree and elegance, according to the ſeaſon of the year. It is frequent about rivers, and in meadows, in thoſe countries which produce it, and feeds on moles, mice, and other ſmall animals. *Ray's Syn. Quad.*

ERU'CA, *wild rocket*, in botany, a genus of plants, whoſe characters are:

The pod is full of roundiſh ſeeds, and the plant has a particular taſte, and a particular fœtid ſmell above all others.

This rocket has a long white root, with many fibres at the bottom; from which ariſe a great many ſtriated ſtalks a foot or two high, full of narrow, long, and deeply laciniated leaves. The flowers are pretty large and yellow, of four leaves a-piece, which are ſucceeded by long, narrow, angular pods, full of ſmall, hot, bitteriſh ſeed. The whole plant has an ungrateful, fœtid ſmell. It grows frequently upon old walls, as on the walls of the city of London, in great plenty, flowering great part of the ſummer.

This rocket is hot and dry, and much of the nature of the following; but is very rarely uſed in phyſic. *Miller's Bot. Off.*

This plant is of a ſtate altogether acrid and burning, mixed at laſt with a little bitterneſs; it gives a pretty deep tincture of red to the blue paper, and its ſmell reſembles that of fœtid oils rectified over quicklime; which makes us believe, that it contains a ſalt very acrid, which in ſome meaſure reſembles the ſal ammoniac, mixed with a great deal of fœtid oil and earth.

Thus it is no wonder, that the plant, of which we are ſpeaking, ſhould be aperitive, inciſive, and diuretic. Matthiolus affirms, that, being boiled with a little ſugar, it is good for the cough in children, which is generally occaſioned by glutinous matters, irritated in the bronchia and veſicles of the lungs. *Martyn's Tournefort.*

ERUCA, *garden-rocket.*—The common garden-rocket has a ſlender white woody root, of a hot biting taſte; the leaves ſomewhat reſemble muſtard in ſhape, but are much ſmoother; the ſtalks grow to be two or three feet high, cloathed with leſſer leaves, having on their tops many flowers of a whitiſh yellow colour, full of dark purple veins; the ſeed veſſels, which ſucceed them, are long, ſlender, and ſmooth, parted in two by a thin membrane, and opening at the ſides when the ſeed is ripe, which is very ſmall, of a reddiſh yellow colour, and a roundiſh ſhape, and hot taſte. It is ſown in gardens, and the ſeed is ripe in July.

Rocket is eaten frequently among other herbs as a ſallad, though many people diſlike it for its ſtrong ungrateful ſmell; it has the name of a provocative, and exciter to venery, and is likewiſe a good diuretic. Matthiolus commends the leaves, boiled with ſugar, to be given to children for a cough: I ſuppoſe he means, that they ſhould be made into a ſyrup. Camerarius ſays, that an equal part of the powder of rocket and cumin ſeed is a mighty preſervative againſt an apoplexy. *Miller's Bot. Off.*

ERU'CÆ *aquaticæ*, water caterpillars. It might ſeem incredible that there is any ſuch creature as a caterpillar, whoſe natural habitation is under water; but experience and obſervation prove that there are ſuch, and that they feed on the water plants as regularly as the common kinds do on thoſe at land. Theſe are not named at random, like many of the aquatic animals of the larger kinds, the ſea-wolf, and the ſea-horſe, &c. which might as well be called any thing elſe as wolves and horſes; but they are properly what they are called, and do not reſpire in the manner of the fiſh tribe, but by thin ſtigmata, as other caterpillars. Mr. Reaumur, in his obſervations, met with two ſpecies of theſe; the one upon the potamogiton, or pond-weed; the other upon the lenticula, or duck-meat. Theſe are both very induſtrious animals; but, the firſt being much the larger, its operations are more eaſily diſtinguiſhed.

This, though truly an aquatic animal, ſwims but badly, and does not at all love to wet itſelf. The parent butterfly lays her egg on a leaf of the potamogiton, and, as ſoon as the young caterpillar is hatched, it gnaws out a piece of the leaf of a roundiſh ſhape. This it carries to another part of the ſame leaf, and lays it in ſuch a manner, that there may be a hollow between, in which it may lodge. It then faſtens down this piece to the larger leaf with ſilk of its own ſpinning, only leaving certain holes at which it can put out its head, and get to gnaw any of the leaves that are near. It eaſily gets out, though the aperture be naturally ſmall, ſince a little force from its body bends up the upper leaf, and bends down the lower, both being flexile; and when the creature is out, it has a ſort of down that defends it from being wetted, and the natural elaſticity of the leaves, and of the ſilk, join the aperture up again, ſo that no water can get in. The leaves of this kind of plant are alſo naturally very ſlippery, and not eaſily wetted by water. It ſoon happens, that this habitation becomes too ſmall for the animal, in which caſe it makes juſt ſuch another, and after that, at times, ſeveral others, each being only made fit for it at the ſize it is then of. The changes of this creature into the chryſalis and butterfly ſtate are in the common method. The butterfly gets out of a chryſalis which was placed on the ſurface of the water, the lightneſs of the animal eaſily ſuſtains it on the water till its wings are dried, and it then leaves that element never to return to it again. *Mem. Acad. Par.* 1736.

E'RVUM, *bitter vetch*, in botany, a genus of plants whoſe characters are:

The pods are articulated, undulated on both ſides, as if knotted, and full of roundiſh ſeeds. The leaves grow by pairs, as if conjugated to a middle rib.

This vetch ſeldom grows to above a foot and an half, or two feet high; full of weak angular ſtalks, having many winged tare-like leaves, whoſe obtuſe pinnæ are more numerous and ſlender. The flowers grow at the ſetting on of the leaves, ſingly, in ſhape like the flower of a tare or vetch, but leſs, and of a white colour; and are ſucceeded by ſmall round pods, containing two or three large round white ſeeds, which ſwell out the pod, making it appear, as it were, jointed: it grows in Italy, and ſome parts of France; and flowers in June.

The powder of bitter vetch, mixed with honey, is accounted good to cleanſe the lungs of tough phlegm. It is a ſtrong diuretic, and expels the ſtone and gravel; but, if taken too frequently, it cauſes bloody urine: it is but ſeldom uſed. *Miller's Bot. Off.*

ERY'SIMUM, *hedge muſtard*, in botany, a genus of plants whoſe characters are:

It has a long, thin, ſlender pod, full of very ſmall round ſeeds; and it has a peculiar appearance.

The root of hedge muſtard is long, whitiſh, frequently crooked, and full of ſmall fibres. The ſtalk ariſes to be a foot and a half, or two feet high, tough, and pliant, branching out, uſually, on all ſides, like a ſhrub, or buſh. The lower leaves are long and narrow, cut into ſeveral jagged ſegments, ſet oppoſite to one another, with one more blunt at the end, and are ſomewhat hairy; the leaves, which grow on the ſtalks, have fewer ſegments, the upper many times but three, appearing like the head of an halbert; the flowers are yellow, very ſmall, and four-leaved, growing thick together at the lower end of the branches; which flowering gradually, and the ſtalk ſtill extending itſelf, the ſpikes of the ſeed-veſſels grow to a great length, being round, ſharp-pointed, clapping cloſe to the ſtalks, and are full of hot biting ſeed. It grows every-where, by the way-ſide, flowering good part of the ſummer.

Hedge muſtard is hot and dry, opening and attenuating, and, by its warming quality, is good to diſſolve thick, groſs, ſlimy humours in the lungs, to help a cough, and ſhortneſs of breath; and it is particularly recommended againſt an habitual hoarſeneſs, to recover the voice. Riverius praiſes a decoction of it, in wine, againſt the cholic. *Miller's Bot. Off.*

ERYS'IPELAS (*Dict.*)— Heiſter thinks that the grand intention, in the curing this diſorder, muſt be to dilute the inſpiſſated blood, and break and divide it where it ſtagnates and is obſtructed. Plenty of thin and weak drinks are therefore to be adminiſtered, by which a gentle and laſting ſweat may be excited, and the teſtaceous powders, and nitrous medicines, are frequently found alſo to have great and good effects. If the inflammation be but very ſlight, it is often cured by external warmth; but, when warmth alone does not prove ſufficient, cloths, with the rob of elder ſpread upon them, are found of great benefit, being laid on the part, and kept on by warm compreſſes, and the proper bandages. Ointments made of the middle green bark of elder are alſo very beneficial, and, notwithſtanding that many do not approve the practice, yet ſpirit of wine camphorated, with a mixture of ſaffron and Venice treacle, are found often of very great ſervice, applied warm with coarſe paper, or with linen rags: and a mixture of lime water and ſpirit of wine camphorated often does great ſervice. It ſometimes happens, that an Eryſipelas comes to ſuppuration; and from this generally ariſe the moſt untractable ſpreading and eating ulcers. In this caſe, the ulcer is to be carefully cleanſed, and dreſſed with ointments of ceruſs, red lead, or litharge, and plaiſters of the ſame ingredients; and muſt, at the ſame time, take internal remedies to ſweeten the blood, ſome gentle purges, and a ſtrict regimen in regard to diet. *Heiſter's Surgery.*

ES'CHATON, in muſic, the difference between the dieſis enharmonica and the hyperoche; that is, what remains, after taking the difference between the ſemitone minor and dieſis enharmonica from the latter.

Thus the difference between the ſemitone minor and the enharmonic dieſis is $\frac{25}{24} : \frac{128}{125} = \frac{3125}{3092}$, and this, taken from the dieſis, is $\frac{128}{125} : \frac{3125}{3072} = \frac{393216}{390623}$. This interval is about $\frac{53}{100}$ of a comma, as will eaſily appear by logarithms.

Mr. Henfling has taken notice of this interval. He calls it Eſchaton, from its being the leaſt and laſt interval that occurs in his ſyſtem.

ESPA'LIERS, (*Dict.*)—Eſpaliers of fruit trees are commonly planted to ſurround the quarters of a kitchen garden; for which purpoſe they are of admirable uſe and beauty: for, by laying out the walks of this garden regularly, which are bounded on each ſide by theſe hedges, when they are handſomely managed, they have a wonderful effect in ſheltering the kitchen plants in the quarters, and alſo ſkreening them from the ſight of perſons in the walks; ſo that a kitchen garden, well laid out in this manner, and regularly managed, will be equal to the fineſt parterre for beauty.

The trees chiefly planted for Eſpaliers are apples, pears, and ſome plums; but the two former are moſtly uſed: ſome plant Eſpaliers of apples grafted upon paradiſe ſtocks; but theſe, being of a ſhort duration, are not ſo proper for this purpoſe; therefore I ſhould rather adviſe the having them upon crab ſtocks, or (if in ſmall gardens, where the trees cannot be allowed to grow ſo high) upon what the gardeners call the Dutch ſtock; which will cauſe them to bear much ſooner, and prevent their growing too luxuriant.

In chuſing the trees for an Eſpalier, endeavour, as near as poſſible, to plant the ſeveral ſorts which are nearly of the ſame growth in one line, that the Eſpalier may be the more regular, and of an equal height, which greatly adds to their beauty; for, if you plant trees which ſhoot very unequally in the ſame line, it will be impoſſible to make the Eſpalier regular: beſides, the diſtance the trees are to be planted muſt be directed hereby; for ſome trees, viz. thoſe of a larger growth, ſhould be planted twenty-five or thirty feet aſunder; whereas thoſe of ſmaller growth need not be above ſixteen or eighteen feet diſtance from each other.

The width of the walks between theſe Eſpaliers ſhould (in a large garden) be fourteen or ſixteen feet at leaſt; and, if they are deſigned to be carried up pretty high, the diſtance ſhould be greater, that each ſide may receive the advantage of the ſun and air, which is abſolutely neceſſary, if you would have the fruit well taſted. And, if your ground is ſo ſituated, that you are at full liberty which way to make the Eſpaliers, I would adviſe the placing the lines from the eaſt a little inclining to the ſouth, and toward the weſt a little inclining to the north, that the ſun may ſhine between the rows in the morning and evening, when it is low; for in the middle of the day, when the ſun is advanced far above the horizon, it will ſhine over the tops of the Eſpaliers, and reach the ſurface of the earth about their roots; which is a matter of more conſequence than many people are aware of.

The ſorts of apples proper for Eſpaliers are the golden pippin, nonpareil, rennette griſe, aromatic pippin, Holland pippin, French pippin, Wheeler's ruſſet, Pile's ruſſet, with ſeveral others. The ſeaſon for planting, and the method of pruning and training theſe trees, you will ſee under the articles of APPLES and PRUNING.

The ſorts of pears proper for an Eſpalier are ſummer and autumn fruits; for ſome of the winter pears ſeldom ſucceed well in an Eſpalier. Theſe trees, if deſigned for a ſtrong moiſt ſoil, ſhould be upon quince ſtocks; but, if for a dry ſoil, upon free ſtocks. Their diſtance of planting muſt alſo be regulated by the growth of the trees, which are more unequal in pears than apples, and ſhould therefore be more carefully examined before they are planted. As for thoſe pears upon free ſtocks, the diſtance ſhould never be leſs than twenty-five feet for moderate-growing trees; but, for vigorous ſhooters, the ſpace of thirty or five and thirty féet is little enough, eſpecially if the ſoil be ſtrong, in which caſe they ſhould be planted at a greater diſtance. The particular ſorts of pears I would recommend for an Eſpalier, are the jargonelle, blanguette, poir ſans peau, ſummer boncretien, Hambden's burgamot, poir du prince, autumn burgamot, l'ambrette, gros rouſſelet, chaumontelle, beurre du roy, le marquiſs, creſſane, with many others of leſs note, always remembering, that thoſe pears which are of the melting kind, will do better in Eſpaliers than the breaking pears, which ſeldom ripen well on Eſpaliers: you ſhould alſo be careful of the ſtocks theſe are grafted on, for, if the breaking pears are grafted on quince ſtocks, the fruit will be ſtony. As to the method of planting, ſee the article PEAR; and, for pruning and managing, ſee PRUNING. I ſhall now give directions for making the Eſpalier, to which the trees are to be trained: but this I would not have done until the third year after the trees are planted; for, while they are young, it will be ſufficient to drive a few ſhort ſtakes into the ground on each ſide of the trees, to which the branches ſhould be faſtened in an horizontal poſition, as they are produced; which ſtakes may be placed nearer, or at a farther diſtance, according as the ſhoots produced may require, and will be ſufficient for the three firſt years; for, ſhould you frame the Eſpalier the firſt year the trees are planted, the poles would rot before the Eſpalier is covered. The cheapeſt method to make theſe Eſpaliers is with aſh poles, of which you ſhould have two ſorts; one of the largeſt ſize, which contains thirteen poles in a bundle, and the other ſize thoſe of half a hundred; the firſt or largeſt ſize poles ſhould be cut about ſeven feet and an half long; theſe are intended for upright ſtakes, and muſt be ſharpened at the largeſt end, that they may, with more eaſe, be driven into the ground; theſe ſhould be placed at a foot diſtance from each other in a direct line, and of an equal height, about ſix feet above ground; then you ſhould nail a row of ſtraight ſlender poles along upon the tops of the upright ſtakes, which will keep them exactly even, and continue to croſs the ſtakes with the ſmaller poles, and the tops which were cut off from the larger ones, at about nine inches diſtance, row from row, from the top to the bottom of the ſtakes. Theſe rows of poles ſhould be faſtened with wire, and the largeſt end of the poles ſhould be nailed to the upright ſtakes, which will ſecure the Eſpalier almoſt as long as the poles will endure; whereas, if your faſtening is not ſtrong, the poles will be continually diſplaced with every ſtrong wind. When your Eſpalier is thus framed, you muſt faſten the branches of the trees thereto, either with ſmall oſier twigs, or ſome ſuch binding, obſerving to train them in an horizontal poſition, and at equal diſtances; being careful not to croſs any of the branches, nor to lay them in too thick: the diſtance I would allow for the branches of pears and apples, ſhould be proportioned according to the ſize of their fruit; ſuch of them whoſe fruit is large, as the ſummer boncretien, monſieur John, and beurre du roy pears, and the rennet guiſe, Holland pippin, French pippin, and other large apples, ſhould have their branches ſix or eight inches diſtance at leaſt; and to thoſe of leſſer growth four or five inches will be ſufficient. But for further directions I ſhall refer to the articles of the ſeveral fruits; as alſo that of PRUNING, where the particulars will be ſufficiently explained.

But, beſides this ſort of Eſpalier made with poles, there is another ſort that is by many people preferred; which is framed with ſquare timbers cut to any ſize, according to the ſtrength thereof, or the expence the owner is willing to go to; theſe, though they appear more ſightly, when well fixed and painted, are not of longer duration than one of the former, provided it is well made, and the poles are ſtrong which are ſet upright; nor will they anſwer the purpoſe better, though they are vaſtly more expenſive; for the greateſt beauty conſiſts in the diſpoſing the branches of the tree, which, eſpecially in ſummer, when the leaves are on, will intirely hide from the ſight the frame of the Eſpalier: therefore all expence in erecting theſe is needleſs, farther than making proviſion to ſecure the branches of the trees in a regular order.

Fruit-trees thus planted, and well managed, are much preferable to thoſe trained up in any other figure, upon ſeveral accounts: as, firſt, theſe take up very little room in a garden, ſo as to be hurtful to the plants which grow in the quarters; and, ſecondly, the fruit upon theſe are better taſted than thoſe which grow upon dwarfs, the ſun and air having freer acceſs to every part of the tree, whereby the dampneſs ariſing from the ground is ſooner diſſipated; which is of ſingular advantage to fruit-trees. *Miller's Gard. Dict.*

ETRU'SCA *Terra*, in the materia medica, a kind of bole of which there are two ſpecies, the white and the red; theſe are called, by many authors, the terra ſigillata alba & rubra magni ducis, as they are brought to us ſealed with different impreſſions.

The white Tuſcan earth is a denſe and compact ſubſtance of a dull deadiſh white, which in drying acquires ſome degree of yellowneſs; it is of a ſmooth ſurface, and does not ſtain the fingers in handling. It is not eaſily broken, and but ſlightly adheres to the tongue, and freely melts into a ſubſtance like butter in the mouth. It makes a ſlight effervеſcence with acid menſtruums.

The red Tuſcan earth is an impure bole, very heavy and of a ſomewhat lax texture, and of a pale red colour. It is naturally of a ſmooth ſurface, breaks eaſily between the fingers, and is apt to ſtain the hands; it adheres ſtrongly to the tongue, and melts freely in the mouth, and has a ſtrongly aſtringent taſte, but leaves a ſandy harſhneſs between the teeth. It makes no efferveſcence with acid menſtrua. Theſe are the characters by which both theſe earths may be known from others of the ſame colour; they are both dug in ſeveral parts of Italy, particularly in the neighbourhood of Florence: they are kept in the ſhops there, and preſcribed with ſucceſs in fevers of many kinds, and in diarrhœas, dyſenteries, and the like caſes. *Hill's Hiſt. of Foſſils.*

EVAPORA′TION (*Dict.*) — The Evaporation of fluids is generally ſuppoſed an effect of heat, but experience proves that cold which is juſt a contrary cauſe is able alſo to produce the ſame effect, and that in a very conſiderable degree; the Evaporations of liquors in the ſevereſt froſts being at leaſt equal to thoſe when the air is in that degree which we call temperate. An ounce of water by weight being ſet out at ſix in the evening to freeze, Mr. Gauteron found that by eight o'clock the next morning, it was reduced to a ſolid lump of ice, and had loſt twenty-four grains in weight; and, this ice being thawed into water with all poſſible caution, the water weighed twelve grains leſs than the ice. The ſame experiment repeated ſeveral times always gave the ſame phænomenon, only in different degrees; the loſs of quantity being always greater, as the weather was more ſevere, or the wind higher. This effect is alſo different in different fluids. This gentleman ſet out to freeze at the ſame time an ounce of common water, the ſame quantity of nut oil, the ſame of brandy, the ſame of oil of turpentine, and the ſame of mercury. The water froze almoſt immediately and loſt ſix grains in weight; and the oil of nuts in the ſame time loſt eight grains; the brandy and the oil of turpentine loſt twelve grains each; but the oils of olives and the mercury ſeemed rather to have increaſed than diminiſhed in weight. The next morning, the loſs of the water was thirty-ſix grains; that of the nut oil was forty grains, though it had not been frozen; and the loſs of the brandy and oil of turpentine was fifty-four grains each, though neither had been at all frozen; the mercury and oil of olives remained as before. The greater cold and more rough winds always increaſed the Evaporation, and the leſſer cold and calmer weather made it leſs. Water, when reduced to the ſtate of ice, does not ceaſe to evaporate: for this ice of an ounce of water had loſt thirty-ſix grains from eight o'clock in the morning to three in the afternoon, and thirty-ſix more between that and eight at night; and during the night the Evaporation had not been continued in any leſs degree, and, upon the whole, an ounce of ice was found to loſe by Evaporation a hundred grains in twenty-four hours.

EUO′NYMUS, *the ſpindle-tree*, in botany, a genus of plants whoſe characters are;

The calyx is monophyllous, and quinquefid, or quadrifid; the flower roſaceous, tetrapetalous, and ſometimes pentapetalous, and furniſhed with four or five ſtamina. The ovary in the bottom of the calyx is furniſhed with a bifid tube, or pointal, and becomes an angulous, membranaceous fruit, divided into four or five cells, full of oblong ſeeds. *Boerhaave, Index alter, Part II.*

They ſay its fruit purges both upwards and downwards: the peaſants make uſe of the powder of its fruit, to kill lice; or elſe waſh their hair with the decoction of its ſeeds. *Martyn's Tournefort.*

It grows frequently in the hedges, and flowers in May. The fruit is in uſe, but of a noxious quality, and not to be taken inwardly without danger; externally uſed, it is an emollient and reſolvent, kills lice, and deterges furfuraceous heads. *Dale.*

EUPATORIOPHA′LACRON, *naked-headed agrimony*, in botany, a genus of plants whoſe characters are:

It is a corymbiferous plant, which in ſome ſpecies has radiated flowers, whoſe flowers are hermaphrodite, and the half-florets are female; but, in other ſpecies, the flowers are produced in a diſk, and are for the moſt part hermaphrodite. The ovaries have naked heads, and are placed on a woolly placenta. All theſe parts are contained in a flower-cup, which is divided into many parts to the placenta. To theſe notes muſt be added, the leaves growing oppoſite on the branches.

EUPATO′RIUM, *hemp agrimony*, in botany, a genus of plant, whoſe characters are:

Its root is fibrous and perennial; the leaves grow two, three, or four together at intervals; the calyx is long, ſmooth, and ſcaly. The flowers form an umbella, furniſhed with many long bifid capillaments, or threads.

This ſpecies of Eupatorium has a ſpreading ſtringy root; from which ariſe reddiſh ſquare ſtalks, two or three feet high, ſomewhat woolly, having at each joint two leaves, divided into three long narrow ſerrated hemp-like ſections, green above, and whitiſh underneath. The flowers grow on the tops of the ſtalks in cluſters, umbelwiſe, each being ſomewhat ſlender and naked, compoſed of ſeveral fiſtular flowers, of a purple colour, divided into five parts at the top, and paſſing away into down. It grows by rivers and ditch-ſides, and flowers in July.

Schroder commends this as a very good vulnerary plant, uſed inwardly, but eſpecially outwardly, uſeful to correct an ill habit of body, and cure coughs and catarrhs; though Geſner, upon trial, found the root to be a ſtrong purger. It is but ſeldom uſed. *Miller's Bot. Off.*

EUPHRA′SIA, *eye-bright*, in botany, a genus of plants, the characters of which are theſe:

The leaves are ſmall, conjugated, roundiſh, and ſerrated; the the flower monopetalous, anomalous, perſonated, bilabiated, the upper lip erect and multifid; the lower divided into three parts, each bifid; the fruit is an oblong bicapſular pod.

Eye-bright has a ſmall woody root, full of fibres, from which ſprings, uſually, one ſtalk, branched out into ſeveral ſmaller, ſomewhat of a reddiſh brown colour. The leaves are ſmall, ſet on by pairs, oppoſite, without foot-ſtalks, hard, and veiny, roundiſh but indented at the ends.

The flowers grow at the tops, among the leaves, ſmall and white, and gaping or galeated, with a yellow ſpot in the middle, and ſeveral black ſtripes running lengthways; after the flowers are fallen, come ſmall, long, flattiſh ſeed-veſſels containing very ſmall ſeed. Eye-bright grows in fields and commons, and flowers in July. The whole plant is uſed.

This plant is famous for all diſorders and diſtempers of the eyes, eſpecially for dimneſs of ſight, and to ſtrengthen it when weak and decayed, either given in the juice, or a decoction of the powder of the leaves. A powder made of two ounces of eye-bright, and half an ounce of mace, is very much commended for the ſame purpoſes, eſpecially after proper evacuations.

Some commend it as good againſt the jaundice. *Miller's Botan. Offic.*

It is very bitter, and gives a faint tincture of red to the blue paper; which makes us conjecture, that the ſal ammoniac, though involved in a great deal of oil and earth, may predominate in this plant. It diſſolves the humours, diſpoſes them to circulate, and carry off the obſtructing particles. Every body agrees, that it clears, ſtrengthens, and even reſtores the ſight. The powder is given from one drachm to three, in a glaſs of fennel, or vervain-water. The uſe of the conſerve, alone, or mixed with worm-wood-leaves, continued for a long time, is good for the ſame purpoſes. Arnaldus de Villa nova, in his treatiſe concerning Medicinal Wines, very much commends that of eye-bright. In vintage-time they put this plant in muſt, and drink it, when it is well clarified. Pena and Lobel prefer the uſe of the powder to the wine: they affirm that one of their friends in Switzerland, who had but a ſlight defluxion in his eyes, had like to have loſt his ſight by drinking eye-bright wine, for three months. *Martyn's Tournefort.*

EXCHA′NGE.—Under this article, in the Dictionary, we have given an account of the trade of money carried on between one place and another by means of bills of Exchange; but there is another kind of Exchange extremely worth our notice and conſideration, and this is a negociation by which one merchant transfers to another whatever effects he has in a foreign country, at a price agreed on.

We muſt particularly remark two things in the tranſaction of this affair, the transfer, and the value of the transfer.

The transfer is made by a mercantile contract called a letter of Exchange, which intimates the effects thereby ceded or granted.

The value of this transfer is a compenſation of the value between one country and another: this they call the value of Exchange; this is divided into par and courſe of Exchange or currency.

An exact equality of the money of one country to that of another is the par of the value of Exchange.

When the circumſtances of commerce alter the par of this compenſation, the variations which reſult from theſe circumſtances make and determine the courſe or value of Exchange.

The value of Exchange may be defined, in general, a preſent compenſation of the coins of two countries, in proportion to their reciprocal debts.

To render what has been ſaid more perſpicuous, it will be neceſſary to conſider Exchange in different views, and all its parts. We ſhall conſider Exchange as a transfer which one merchant makes to another of effects he has in foreign parts, the nature, end, and conſequences of it: and then explain the origin of the value of Exchange, or compenſation of coins, its eſſence, par, currency, the propriety of this currency, and the commerce that reſults from it.

The firſt commerce among men was tranſacted by way of Exchange. Trade grew more extenſive, and mutual wants increaſed with the number of commodities. Every nation ſoon found they had fewer commodities to exchange, than they had neceſſities to relieve: or, what they had to barter, was not wanted by the nation with which they trafficked. To ſupply their wants, and remove this inconvenience, they had recourſe to ſome certain pieces to repreſent the value of merchandiſes.

That theſe pieces might be durable and capable of being divided into parts of different value without loſs, they fixed upon metals, and thoſe the moſt rare, to make the transfer more eaſy and commodious.

Gold, ſilver, and copper, became the mediums of buying and ſelling: different quantities of theſe metals, in every ſtate, had a value in proportion to their weight and fineneſs, which every government impoſed arbitrarily; every legiſlator ſtamped theſe bits of metal with what impreſſion he pleaſed, and theſe pieces were called monies.

As commerce extended itſelf, mutual debts multiplied, by which means the transfer of theſe metals, in lieu of merchandiſes, became difficult, and men were driven to find out ſome method of repreſenting monies by ſigns.

Every country buys in, and ſells out, merchandiſes, and conſequently becomes both at once debtor and creditor: to pay theſe reciprocal debts, they concluded it ſufficient to transfer the reciprocal credits between two countries mutually, or even between ſeveral countries that correſponded together. It was therefore agreed, that monies ſhould be repreſented by an order which the creditor ſhould give in writing to the debtor, to pay the value to the order of the bearer.

The multiplicity of reciprocal debts is therefore the origin of Exchange, conſidered as the transfer that one merchant makes to another of the effects he has in a foreign country.

As Exchange ſuppoſes a reciprocal debet, its nature conſiſts in the Exchange of this debet: if the debet were not reciprocal, the negociation of Exchange would be impracticable, and the payment for the merchandiſes muſt neceſſarily be made by a transfer of money.

The end and deſign of Exchange is, conſequently, to avoid the riſk, and ſave the expence of transferring money.

The conſequence is, that bills of Exchange repreſent money ſo effectually, that there is no difference between the one and the other. An example will ſet theſe propoſitions in a clearer light.

Let us ſuppoſe Peter of London debtor to Paul of Paris for goods received, and, at the ſame time, that Anthony of Paris has bought of James of London goods of an equal value: if the two creditors, Paul of Paris and James of London, exchange their debtors, a transfer of money is needleſs. Let Peter of London pay to James of London the ſum he owes to Paul of Paris, and let James for the ſaid ſum transfer to him, by an order in writing, that which he has at Paris in the hands of Anthony. Peter, the proprietor of this order, will transfer it to Paul his creditor at Paris, and Paul, on preſenting it to Anthony, will receive caſh for it.

If no merchant of Paris had owed money in London, Peter would have been under the neceſſity of ſending over money to Paris to pay his debt: or, if James had ſold, at Paris, only to half the value that Peter was indebted there, the half of Peter's debt would have been acquitted, the other half by ſending over the ſpecie.

It is evident, therefore, that Exchange ſuppoſes reciprocal debts, that without them it could not exiſt, and that it conſiſts in the Exchange of the debtors.

The example propoſed proves alſo, that the object, end, and deſign of Exchange, is to ſpare the hazard and expence of transferring money. Let us ſuppoſe the debt between the two 100 l. and value the riſk and charges on merchandiſe in trade at 40 l. it is plain each muſt pay 110 l. inſtead of 100 l. without an Exchange of debtors.

The conſequence is alſo completely demonſtrated by this example, for the bill of Exchange drawn by James of London, or Anthony of Paris, was ſo effectually the ſign of money, that Paul of Paris, to whom it was ſent, has actually received 100 l. on preſenting it.

The part of Exchange we have defined, the transfer which one merchant makes to another of effects which he has in a foreign country, is applied to the repreſentation of metals ſtamped or coined: the ſecond part or value of Exchange is applied to the thing repreſented.

When gold, ſilver, and copper were introduced into trade to be the medium of commerce, and were converted into money of a certain denomination and weight, the coins took their denomination from their weight, that is, as among the French, the livre or pound was a pound weight of ſilver.

The neceſſity or diſhoneſty of men leſſened the weight of every piece of money, which, notwithſtanding, retained its former denomination.

Thus, there is in all countries a real and ideal money. Ideal monies are preſerved in accounts for the ſake of convenience; the alterations that have happened in money, have been different, in different countries: the proportion of the weight being not always equal, no more than the intrinſic value, the denomination is often different: ſuch is the origin of the compariſon we muſt make of theſe monies to exchange, compenſate, or weigh them one againſt another.

The greater or leſſer occaſion we have for this Exchange, the eaſe or difficulty with which it is tranſacted, the contingencies and charges, have a value in trade, and this value has an influence which we ought to conſider in the eſtimation of money.

Therefore, their compenſation or value in Exchange contains two proportions, which we muſt examine.

Theſe proportions conſtitute its eſſence; for, if the monies of all countries were of the ſame real value, of the ſame denomination and weight, in ſhort, if the particular contingencies were not eſtimated in commerce, there could be no difference in current coin, and, conſequently, no compenſation to make; a bill of Exchange would be ſimply the repreſentation of a certain weight of ſilver or gold.

A bill of Exchange on Paris for 100 livres would be equivalent to 100 l. in London, which on this ſuppoſition are real and exactly equal.

But, in fact, the difference between the real coins of England and France, and the contingencies of commerce, will have an influence on the quantity of money of the one country, to be paid for a quantity of money of the other.

Of theſe two proportions, that, which reſults from the mixture of the metals coined, is the moſt eſſential, and the neceſſary baſis of compenſation or the price of Exchange.

To find the juſt proportion of the mixture of metals in both coins, we muſt know the weight, the fineneſs, and ideal value of each, with the greateſt exactneſs; and the proportion of the weights made uſe of in each country for the weight of metals.

Silver coined in France is of the ſame fineneſs, as ſilver coined in England, that is, to 11 penny-weights fine 2 penny-weights alloy.

The pound ſterling is ideal money, or a collective name which contains within its value ſeveral pieces of real coin; as crowns, half-crowns, ſhillings, &c.

The crowns weigh each one ounce, three penny-weights, thirteen grains; the ounce Troy conſiſts of no more than 480 grains, therefore, the crown of 565 grains, and is worth 60 pence, or 5 ſhillings.

In France, there are two ſorts of crowns (écus) the écu or crown in Exchange and accounts, always valued at 60 ſols, or 3 livres Tournois, values equally ideal.

The ſecond ſort of écus or crowns, are real pieces of ſilver current; they are of the ſame ſtandard as Engliſh money of the ſame denomination; 16 $\frac{3}{5}$ make a marc which weighs 8 ounces, reckoning 576 grains to the ounce; they paſs current for 60 ſols, but are intrinſically worth no more than 56 ſols and $\frac{1}{2}$; the marc is 46 livres, 18 ſols.

This difference ariſes from the contingent expences of coinage, mixture, &c.

This being preſuppoſed, we muſt compare their weight and value, to know the proportion of the French to the Engliſh crown in value.

938 Sous are the value of a marc of France, = to 8 ounces French.

The ounce of France = to 576 grains.

565 Grains, the weight of a crown, = to 60 pence ſterling.

Intrinſic value = to 56 d. $\frac{1}{2}$, the intrinſic value of the écu current.

The proportion, 29 pence $\frac{1}{2}$.

The number found of 29 d. $\frac{1}{2}$ ſterling, is the juſt proportion of the compariſon of theſe two monies, or the par of the price of Exchange; that is, the French crown of the intrinſic value of 56 ſous 6 deniers at London, is worth 29 d. $\frac{1}{2}$ ſterling, but the écu in accounts of 3 livres, or 60 ſous Tournois, repreſenting the real crown, its value muſt be the ſame.

The weight and ſtandard of money evidently fix its comparative value with other money, and the proportion that indicates what quantity of the one is equivalent to the other, is the par of the price of Exchange.

We have hitherto only conſidered the real par of Exchange as it relates to ſilver coin, becauſe that is more commonly circulated; but we ſhall run into a very great error, if we form our ideas of the benefit a nation receives by Exchange, on this foot only.

It is very well known, that, beſides the uniform and general proportion in all countries, between the degrees of fineneſs of gold and ſilver, there is a particular value in every ſtate ſet upon theſe metals, which is regulated by the quantity that ſtate circulates.

The French louis d'or and our guinea are of the ſame fineneſs; the guinea weighs 156 grains, and is worth 21 ſhillings, or 252 pence ſterling: the louis d'or weighs 153 grains, and conſequently is worth 247 pence $\frac{1}{5}$ Engliſh; now in France 8 écus are change for a louis d'or, the écu we have demonſtrated to be worth no more than 29 d. $\frac{1}{2}$ eight times which ſum amounts to no more than 236 pence ſterling, yet, theſe eight crowns, repreſented by a louis d'or, are apparently worth 247 pence $\frac{1}{5}$ ſterling. The difference is 4 pence $\frac{4}{5}$ ſterling, and it is evident, that, if this be divided among the écus in Exchange of the louis d'or, each écu muſt be valued at 30 pence $\frac{1}{10}$ ſterling, inſtead of 29 pence $\frac{1}{2}$.

This difference ariſes from this cauſe: in France, they give 153 grains of gold for 2216 grains of ſilver, the weight of eight crowns, which ſettles a proportional value between theſe metals in the ratio of 1 to 14 $\frac{9}{19}$. In England we give 156 grains of gold for 21 ſhillings, each ſhilling weighs 113 grains, and they in all amount to 2373 grains, which is in the proportion of 1 to 15 $\frac{1}{5}$.

Wherefore, if a Frenchman pays caſh in England, it will be to his advantage to pay it in gold; but it is the intereſt of an Engliſh-man to pay caſh in ſilver in France; becauſe the guinea is worth no more than 22 livres, 14 ſous, 7 den. French, whereas twenty-one ſhillings, the value of a guinea, weigh 2373 grains, and are worth 24 livres, 2 ſous, 10 den.

Different contingencies alter the price of Exchange from the real par: and, as theſe accidents have an infinite variety, the alteration of the equality is continually floating up and down; this alteration is called the courſe of Exchange.

The cauſes of the alteration of the par of Exchange, are the alteration of public credit, and the abundance or ſcarcity of credits of one country upon another.

A variation in the current coin is an example of the variation which the loſs of public credit makes in the par of Exchange; although, at the very inſtant this change was made in the current

rent coin, a new real par of Exchange commenced, yet, the public credit declining, on account of the uncertainty of the property and the ſpecie not circulating, what repreſents the ſpecie muſt of courſe be under its value.

The ſecond cauſe of the alteration of the par of Exchange, is the abundance or ſcarcity of credits of one country upon another; and this abundance or ſcarcity proceed in general from two cauſes.

One is the neceſſity that obliges the body politic of a ſtate to tranſport large ſums into foreign countries, as in caſe of a war.

The other lies in the proportion of the current mutual debts of private perſons in each ſtate.

The private perſons of two nations may contract two kinds of reciprocal debts.

The inequality of reciprocal ſales will form a firſt kind of debts.

If one of the two nations has a great deal of money at lower intereſt than the other, the rich private perſons in the former nation will buy up all the public ſecurities of the other, becauſe they will receive more intereſt for their money: the product of this intereſt, which muſt be paid every year, forms a ſecond ſpecies of debts: this may be looked upon as the product of a commerce, becauſe the national funds are negociated; and, if you obſerve attentively, this is not a matter of ſpeculation only; in this caſe and ſeveral others, money is the merchandiſe, and thus theſe two debts belong properly to what is called the balance of trade, and will occaſion an abundance or ſcarcity of the credits of one country upon another. See BALANCE *of trade.*

When two nations would ſettle the balance of their commerce, that is, pay their reciprocal debts, they have recourſe to the Exchange of debtors; but, if the reciprocal debts are not equal, the Exchange of debtors will only pay a part of theſe debts, the ſurpluſage or balance of trade muſt be paid in ſpecie.

The deſign and intention of Exchange is to ſave the expence and hazard of tranſporting money; conſequently, every private perſon, before he determines on this method of trade, will ſeek credits on the country where he ſtands indebted.

Theſe credits will be dear in proportion to the difficulty of acquiring them, and conſequently, to have the preference, we are obliged to pay above their real value; if the credits are eaſy to come at, we ſhall pay under their value.

Let us ſuppoſe the merchants of Paris owe the manufacturers of Rouen 20,000 livres, and that the manufacturers of Rouen owe the bankers of Paris 10,000 livres; to ſatiſfy theſe demands, we muſt make a bill of Exchange for the 10,000 livres, the reciprocal debts between Paris and Rouen, and ſend the other 10,000 livres from Paris to Rouen.

Let us rate the charge and hazard of ſending this ſum at five livres per m. Every merchant in Paris will try to ſave this expence, and will ſeek to purchaſe a credit of a 1000 livres on Rouen; but as theſe credits are ſcarce, and difficult to procure, he will gladly give 1004 livres for a draught of 1000 livres on Rouen, and ſave one livre per m. thus the ſcarcity of bills of Exchange on Rouen will lower the price of this Exchange four livres per m. under par.

It is proper to obſerve, that the riſe and fall of Exchange is always underſtood of the country on which we draw. Exchange is low, when this country pays leſs real value for the bill, than it coſt the purchaſer: Exchange is high, when this country pays more real value for the draught, than it coſt the purchaſer.

The par of Exchange between London and Paris is at 29 ½ d. per écu of three livres; if the Exchange at London drops to 29 pence, London will pay beneath the intrinſic value of the écu; if the Exchange riſes to 30 pence per écu, London will pay above its real value.

To reſume the foregoing example, it has been ſhewn from the ſcarcity of credit on Rouen, a merchant at Paris is obliged to pay 1004 livres for a draught, to receive 1000 livres at Rouen.

Juſt the reverſe of this is the caſe of Rouen; credits on Paris are frequent and numerous; the manufacturers of Rouen who owe money at Paris, will give orders to the banker of Paris to draw upon them, becauſe they know that, for 1000 livres on Rouen, they ſhall pay 1004 livres at Paris: or, if you offer them draughts on Paris, they will purchaſe them at the ſame præmium as the draughts on Rouen are at Paris, which will raiſe the Exchange in favour of Rouen to four livres per m. which will therefore pay no more than 996 livres. When the reciprocal debts are paid, Paris muſt ſend to Rouen the remainder of the balance in ſpecie. But in the mean time it is clear, that, in the payment of the reciprocal debts, Rouen pays 1000 livres with 996, and Paris pays 1004 livres for 1000.

If Exchange ſubſiſts long on this foot between theſe two cities, it is evident, that Paris owes more to Rouen, than Rouen owes to Paris.

From whence we may conclude, that the courſe of Exchange indicates which ſide the balance of commerce inclines to.

We have already ſeen that the par of the price of Exchange is the compenſation of the monies of two countries; this compenſation is made uncertain by ſeveral accidents, and is therefore only momentaneous; its courſe indicates which ſide the balance of commerce inclines to; thus the price of Exchange is a momentaneous compenſation of the monies of two countries in proportion to their reciprocal debts.

As the nature of the accidents in trade which alter the par of the compenſation of monies, or price of Exchange, continually varies, the courſe or price of Exchange varies with theſe accidents.

The fluctuation of the courſe of Exchange has two effects. Firſt, it makes a daily uncertainty what quantity of money one ſtate muſt pay to another for ſuch a quantity of money of another ſtate. Secondly, it occaſions a trade of money by repreſenting the ſpecie by bills of Exchange.

When the quantity of money which one ſtate gives in compenſation for ſuch a quantity of money in another ſtate, is undetermined from one week to another: it follows that of theſe two ſtates one propoſes a certain, the other an uncertain value; becauſe every proportion ſuppoſes an unity as the common meaſure of both the terms of this proportion, and which ſerves to value it by.

Let us ſuppoſe that London to-day gives thirty pence ſterling for an ecu of Paris, it is certain Paris will always accept thirty pence for an écu, but it is uncertain whether London will continue to give ſo much. In terms of Exchange, this is called giving the certain or uncertain.

If the quantities were certain on both ſides, there would be no variation in the par of Exchange, and conſequently no courſe of Exchange.

This difference is introduced into every country; according to the different method of keeping their accounts; they fix a quantity, the valuation of which ſerves for a ſecond term, to find the value of another quantity of the ſame kind as the firſt. As, for example, if one écu or French crown be worth thirty pence ſterling, what are 100 worth at the ſame rate? Thus, between two places, one ought always to propoſe a certain quantity of its money, for an uncertain quantity which the other ſhall give it.

But, while one place gives the certain to one other place, it ſometimes gives the uncertain to a third. Paris gives the certain to London, that is, an écu to have from 29 pence halfpenny to 33 pence ſterling: but Paris receives from Cadiz a piaſtre for an uncertain quantity of ſous from 75 to 80 per piaſtre, as the accidents of commerce ſettle the value.

The ſecond effect of the fluctuation of the courſe of Exchange, is a trade of money carried on by repreſenting the ſpecie by bills of Exchange.

The merchant or banker is continually attentive to every alteration in the courſe of the price of Exchange, between the different places that have a mutual correſpondence; he compares theſe changes with each other, and conſiders what is the reſult; he ſeeks into the cauſe of them, to foreſee their conſequences, and by theſe means is enabled to make the moſt of his credits. But this is not the ſole object which ought to employ the views of the merchant; before he ſells his credits in any place, he ought to conſider the profit or loſs there will be in withdrawing his effects from this place; if the courſe of the price of Exchange is not in favour of the place of his reſidence, he will ſeek ſome other methods more lucrative, and his money will be returned by different channels. The knowledge of this trade conſiſts therefore in laying hold on all the advantageous inequalities of the par of Exchange, which offer between two cities, and theſe two cities and others: for, if five places of trade differ between each other in the ſame proportion with regard to the par of Exchange, no gain can be made by this commerce with them, the intereſt of money and expence of commiſſion would turn to nett loſs. This reciprocal equality between the courſe of the price of Exchange of ſeveral places is called the political par.

If we agree about this parity

$$\begin{aligned} a &= b \\ b &= c \\ c &= a \end{aligned}$$

It is certain that, *a*, *b*, &c. being equal quantities, there can ariſe no benefit by exchanging one with the other, which correſponds with the real par of the price of Exchange; let us ſuppoſe now

$$\begin{aligned} a &= b \\ b &= c \\ c &= a + d \end{aligned}$$

Here the parity is deſtroyed, we muſt Exchange *b* with *c*, which will give $a + d$: now, we have ſuppoſed $a = b$, therefore, the profit of this Exchange will be *d*. This difference correſponds with the inequalities of the courſe of Exchange between two or more places: the parity will be re-eſtabliſhed, if theſe quantities are increaſed equally

$$\begin{aligned} a + d &= b + d \\ b + d &= c + d \\ c + d &= a + d; \end{aligned}$$

This parity correſponds to the political par of the price of Exchange or equality of its courſe among ſeveral places.

The parity will be altered again, if

$$\begin{aligned} a + d &= b + d \\ b + d &= c + d \\ c + d &= a + d + f; \end{aligned}$$

In this caſe the Exchange muſt be made as before, and the profit of $b + d$ will be f; if, cæteris paribus, $a + d - f = c + d$, and we Exchange theſe two quantities, it is evident the proprietor of $c + d$ will receive leſs the quantity f: therefore, to avoid this loſs, he will Exchange $c + d$ with $b + d$, which is equal to the quantity $a + d$.

The operation of Exchange conſiſts in changing quantities one for another; he that is forced to Exchange a quantity for another quantity leſs than his own, ſeeks a third that may be equal to his, and reputed equal to that for which he is forced to make the Exchange, to prevent his own loſs; he that deals in this commerce, endeavours to Exchange leſſer for greater quantities, and his gain is conſequently the exceſs of the quantity which different Exchanges have procured him, in his own country, on the quantity he has furniſhed abroad.

This commerce is not lucrative, unleſs it be more beneficial than putting the money out to intereſt at home; from whence follows this conſequence, that thoſe people among whom the intereſt of money is loweſt, muſt have the balance of this trade againſt another nation which pays higher intereſt for money. If the people which pay the loweſt intereſt have plenty of money, an intercourſe of this trade muſt be very prejudicial to the other people, and the latter cannot bring foreign wealth into their dominions by this method.

This trade does not principally tend to increaſe the quantity of money in a nation, but is more connected with the political ſprings of government, and requires more refined judgment than any other. It reſults from the continual variations in the price of Exchange, on account of the diſparity of the mutual debts between different countries; as Exchange itſelf owes its riſe to the multiplicity of mutual debts.

From what has been ſaid on the nature of Exchange, we may draw the following general principles.

1. We ſhall know whether the general balance of trade has been in favour of a nation for ſome time, by the mean courſe of its Exchanges with other nations for the ſame ſpace of time.

2. Every Exceſs of the reciprocal debts of two nations or the balance of trade ought to be paid in money, or by credits on a third nation, which is always a loſs, becauſe the money that ought to be returned is carried elſewhere.

3. That nation, which is debtor to the balance loſes by an Exchange of debtors a part of the profit it might have by ſales, beſides the money it muſt part with to ſatisfy the balance of the mutual debts: and that nation which gives the credit, gains, beſide the money, a part of the mutual debt by the Exchange of debtors.

4. If one nation is ſo much indebted to another, that the debt has effect ſufficient to lower the courſe of Exchange, it will be more beneficial to that nation to export caſh in ſpecie, than augment their loſs by trading in bills of Exchange.

EXCRE'SCENTIA *faba Bengalenſis*, Bengal bean.—It is round, flat, wrinkled, and hollowed in the manner of an umbilicus, large, brown on the outſide, and blackiſh within, of a ſtyptic and aſtringent taſte, and no ſmell.

It is a powerful aſtringent, and highly ſerviceable in repreſſing all ſorts of hæmorrhages, particularly a ſpitting of blood, moderately incraſſating the blood, and ſhutting the mouths of the veins and arteries, conſolidating ruptures, and tempering and allaying acrimonious and corroſive humours.

D. Marloe, who gives the foregoing account of its virtues, was the firſt, as far as I know, ſays Dale, who communicated this exotic medicine, with its uſes, to the learned world, under the name of faba Bengalenſis. Hence ſome took it for a fruit which comes from Bengal, others for a ſpecies of myrobalans, and others again for the flower of the citrine myrobalan; becauſe it is very often found among thoſe fruits. But to me, ſays Dale, it ſeems to be a kind of excreſcence excited by the puncture of a certain inſect, or, more properly, the wounded fruit itſelf of the citrine myrobalan, which, from the venom of the ſtroke, aſſumes this monſtrous form. I have very often myſelf, he ſays, obſerved plums deprived of their natural ſhape by a wound of this nature inflicted by an inſect, and rendered hollow, without any ſtone. *Dale.*

EXCU'TIA *ventriculi*, a name, by modern ſurgeons, given to that inſtrument repreſented in *Plate* XX. *fig.* 1. It is generally made of ſoft briſtles formed into a bundle, and fixed to a flexible braſs or iron wire B B B, which may have flaxen or ſilken thread cloſely wrapped about it. Authors of very conſiderable note aſſert, that this inſtrument is highly commodious, not only for removing ſmall bones from the fauces, but alſo for cleanſing the ſtomach. When it is to be uſed for this latter purpoſe, they lay down the following directions, as neceſſary to be obſerved: a ſmall draught of warm water, or, according to others, of brandy, is to be taken before the inſtrument is uſed; ſince, by this means, the mucus and ſordes are the more eaſily reſolved and attenuated in the ſtomach. Then the Excutia A is to be immerſed in ſome proper liquor, and, by means of the wire B B, gently paſſed through the œſophagus, as far as the ſtomach. Then it is to be moved up and down through the fauces, like the ſucker of a ſiphon or pump, but muſt be ſoon totally extracted. Theſe authors order the Excutia, and repeated draughts of the above-mentioned liquor, to be uſed, till no more ſordes can be brought away from the ſtomach. This practice is, according to them, ſo highly beneficial, that by its means the lives of men may be protracted to an uncommon age, eſpecially if it is repeated every week, every fortnight, or every month. However great the encomiums beſtowed on this practice may poſſibly be, yet, it is certain, we have very few inſtances of cures happily brought about by its means; ſince the ſenſe of pain, and the danger of ſuffocation, attending the uſe of this inſtrument, muſt certainly create a juſt averſion to it. But theſe points are at greater length diſcuſſed by Wedelius and Teichmeierus, in their Diſputationes de Ventriculi Excutia. Theſe authors have alſo ſhewn, that this is not altogether an inſtrument of modern date, but long ago deſcribed by ſome authors. *Heiſter. Chirurg.*

EXO'MPHALOS (*Dict.*)— This rupture is owing to a protruſion of the inteſtine, or omentum, or both of them, at the navel, and rarely happens to be the ſubject of an operation; for, though the caſe is common, yet moſt of them are gradually formed from very ſmall beginnings, and, if they do not return into the abdomen upon lying down, in all probability, they adhere without any great inconvenience to the patient, until ſome time or other an inflammation falls upon the inteſtines, which ſoon bring on a mortification and death; unleſs, by great chance, the mortified part ſeparates from the ſound one, leaving its extremity to perform the office of an anus: in this emergency however, I think it adviſeable to attempt the reduction, if called in at the beginning, though the univerſal adheſion of the ſac and its contents are a great obſtacle to the ſucceſs: the inſtance in which it is moſt likely to anſwer, is, when the rupture is owing to any ſtrain, or ſudden jerk, and is attended with thoſe diſorders which follow upon the ſtrangulation of a gut.

In this caſe, having tried all other means in vain, the operation is abſolutely neceſſary; which may be thus performed: make the inciſion ſomewhat above the tumor, on the left ſide of the navel, through the membrana adipoſa; and then emptying the ſac of its water, or mortified omentum, dilate the ring with the ſame crooked knife, conducted on your finger; after this, return the inteſtines and omentum into the abdomen, and dreſs the wound without making any ligature, but of the ſkin only. *Sharp's Surgery.*

EXPE'CTORANTS (*Dict.*)— Among the ſeveral ſpecies of evacuants, none are, perhaps, of more importance than thoſe which eliminate the viſcid lymph ſecreted from the arterial blood, and remaining in the glands, or rather the glandulous coats and emunctories. But in no part of the body is there a larger ſecretion of mucous lymph than in the internal ducts of the aſpera arteria, and the bronchia of the lungs, which are internally lined with a glandular coat: hence, very often a ſerous, pituitous, viſcid, and, ſometimes, a purulent matter, is, in coughing, expectorated, and eſpecially in diſorders immediately affecting the lungs, whether of the acute or chronical kind. The medicines which promote this evacuation from the cavity of the thorax are called Expectorants; of which, the moſt conſiderable in the vegetable kingdom are, the roots of elecampane, arum, Florentine orris, and liquorice; the herbs Paul's betony, chervil, ſcabious, mouſe-ear, germander, hyſſop, and the tarragon; the flowers of violets, mallows, red poppies, and ſaffron; the ſeeds of aniſe and fennel; the bark of ſaſſafras; and, among reſinous gums, benjamin and gum ammoniac; among fruits, raiſins, figs, jujubes, and pine kernels; honey, liquorice-juice, and oil of ſweet almonds; among animal ſubſtances, ſperma ceti and fats; among mineral ſubſtances, ſulphur, together with its flowers and milk; among compound ſubſtances, the aniſated balſam of ſulphur, the aniſated ſpirit of ſal ammoniac, the lohoch ſanum, the ſyrup prepared of the lungs of a fox, the pectoral elixir, the pectoral balſam of Meibomius, and the aſthmatic ſpirit of Michaeli.

As all ſubſtances which promote excretion do not operate in the ſame manner, ſince ſome render the matter moveable, and diſpoſe it for evacuation; others open the emunctories, that it may be ſeparated from the juices; and others ſtimulate the veſſels and ducts to an excretory motion; ſo Expectorants operate pretty much in the ſame manner; for, if the humour ſecreted is thin and acrid, and the ducts and pores of the glands from which it is to be thrown, too much conſtricted, thoſe ſubſtances are moſt properly exhibited, which ſoften the paſſages, obtund the acrimony, and coagulate the too thin and fluid parts of the humours. Theſe intentions are beſt anſwered by the juice of liquorice-root, ſaffron, ſperma ceti, the flowers of violets, mallows, and red poppies, cream, oil of ſweet almonds, fats of animals, ſyrup prepared from the lungs of a fox, the ſyrup of violets, the ſyrup of white poppies, and the pilulæ de ſtyrace, eſpecially exhibited with ſome diluting liquor, ſuch as a decoction of oats, or of the ſhavings of hartſhorn, in the form of a jelly. But, when a large quantity of thick and viſcid matter is lodged in the bronchia of the lungs, it proves prejudicial to reſpiration, and when, for this reaſon, ſome ſtimulus to expectoration becomes neceſſary, the tough and viſcid matter is excellently reſolved by infuſions of Paul's betony, hyſſop, ſcabious, and germander; as, alſo, by the terra foliata tartari, a ſolution of crabs eyes, and antimoniated nitre. The nervous coats of the bronchia are ſtimulated to an excretory motion by a certain acrid, ſubtile, and oleous principle found in gum ammoniac, and its eſſence, the aniſated ſpirit of ſal ammoniac, myrrh, benjamin, powder of the roots of elecampane, and Florentine orris, flowers, milk, and balſam of ſulphur. When a ſtronger ſtimulus is required, as in a pituitous aſthma, and a ſuffocative catarrh, oxymel of ſquills, or the ſpiritus aſthmaticus of Michaeli, which is prepared of gum ammoniac and the green cryſtals of copper, may be exhibited.

In the exhibition of Expectorants, great caution is to be uſed on account of their different methods of operation; and the phyſician who preſcribes them promiſcuouſly, without any regard to time, or the ſtate and condition of the peccant matter, certainly does more harm than good: hence, when in epidemical coughs, raging in the ſpring and autumn, highly ſtimulating Expectorants are exhibited, before the thin acrid matter is corrected; or, on the contrary, when after the matter is concocted and prepared, emollient and relaxing medicines are exhibited; more harm than good is produced by ſuch pieces of practice.

In coughs of the moiſt and chronical kind, as alſo in a pituitous aſthma, in which large quantities of phlegm fall into the bronchia of the lungs, ſweet ſubſtances, linctuſes, ſyrups, and oleous medicines, weaken the ſtomach, whoſe ſtrength is already too much impaired, diminiſh the appetite, digeſtion, and chylification, and not only promote the generation of more recrementitious matter, and the increaſe of the diſeaſe, but alſo diſpoſe the patient to a cachexy, œdematous tumors, or even a dropſy. In theſe caſes, it is therefore more expedient to uſe balſamic pectorals, which are grateful to the ſtomach, ſuch as the pectoral elixir, the eſſences of myrrh, gum ammoniac, and the tincture of tartar.

Expectorants ought alſo to be cautiouſly uſed in a phthiſis and ſpitting of blood; as alſo in dry coughs, difficulties of breathing, and oppreſſive pains of the breaſt, which rather ariſe from a congeſtion of blood, than matter to be expectorated; ſince, in theſe caſes, Expectorants, either by ſoftening or ſtimulating, augment the congeſtion of blood and humours, inſtead of removing it.

In acute diſorders of the breaſt, ſuch as a legitimate pleuriſy and a peripneumony, Expectorants are alſo to be cautiouſly uſed, eſpecially in the beginning, leſt by their means the inflammatory ſtagnation of the blood ſhould be increaſed. But when theſe diſorders are on the decline, and when the greater part of the inflammation is diſcuſſed, they are very properly and commodiouſly uſed, in order to draw the concocted and viſcid matter out of the pulmonary canals. *Frederic. Hoffman. Medicina Rationalis Syſtematica.*

EXPORTA'TION (*Dict.*)— The obvious meaſures, requiſite to promote the Exportation of produce and manufactures, may be comprehended under the following particulars:

1. That our lands be cultivated in ſuch quantities, as to render all the neceſſaries and conveniencies of life as cheap as they are in thoſe nations who are ſtruggling to rival and ſupplant us in our commerce and navigation.

2. To this end, that all taxes and incumbrances whatſoever, as ſoon as may be done with ſafety, be taken off from the neceſſaries and conveniencies of life, that our people may work as cheap as thoſe of other nations, and our commodities be carried to foreign markets as cheap as they do, and, if poſſible, better in quality for the price.

3. That reaſonable public encouragement be given to thoſe who ſhall make any capital improvements in huſbandry, farming, and agriculture, &c. ſo as to afford not only our native productions deſirably cheap, but to promote the cultivation of ſuch valuable exotics as our lands will admit of, in order to make merchandize of them to ſome other nations.

4. That all reaſonable public encouragement be given to thoſe who ſhall make any material diſcoveries in the mechanical and manufactural arts, either by improvements in the old commodities, or by the invention of new, whereby general induſtry may be promoted, and our traffic and navigation with foreign countries advanced.

5. That working, mechanical, and manufacturing ſchools be eſtabliſhed for children over the kingdom, in order to prevent ſloth, debauchery, and villainy, by habituating infants from their cradle to honeſt induſtry, and hereby to render labour in general cheap throughout the kingdom.

6. That all meaſures be taken to render the kingdom popolous in uſeful artiſts and manufacturers, and ſeamen, more eſpecially in our own natives.

7. That our fiſheries of every kind be promoted to the utmoſt extent which they will admit of, as a nurſery to our ſeamen, as well as for the benefit of our traffic.

8. That we import rather foreign materials for manufactures, than things manufactured.

9. That we prevent the Exportation of ſuch quantities of wool as may injure our own woollen manufactures; and that every meaſure may be uſed to work up the whole of our wool, by the improvement of new kinds of woollen manufactures; as thoſe with wool and ſilk, wool and cotton, wool and linen, wool and hair, &c. and to apply the material of wool to whatever elſe it will admit of, eſpecially in the lieu of any general manufacture, wrought with foreign materials: ſuch, for example, as woollen hats for men, which, doubtleſs, might be properly ſtiffened for the purpoſe; woollen hats for the ladies, woollen wigs for labourers, &c. which not only might become generally faſhionable at home, and in our own plantations among the lower claſs of people, but might, perhaps, be exported in large quantities to other countries. In ſhort, to promote whatever manufactures could be thought of, whereby all the wool produced in Great Britain could be worked up; which ſeems the moſt natural and the moſt effectual way to prevent its being ſent abroad, to the detriment of our woollen manufactory at home.

10. That encouragement be given to thoſe who ſhould be inſtrumental to improve our fineſt wool in certain counties, that it may effectually anſwer the end of Spaniſh wool, ſo that we may have no occaſion to import the ſame from that kingdom; eſpecially ſince they have ſtole away our woollen manufacturers, ſhip-builders, and divers other artizans, in order to raiſe their own trade upon the ruin of our's, if they can.

11. That the produce of ſilk be duly encouraged in thoſe our plantations which may be proper for it, and that our own ſilken manufactures be preferred in our general wear to thoſe of foreigners.

12. That the trade of our colonies and plantations be improved to the utmoſt, ſo that they do not interfere with the commerce of their mother country; but that they be ſo regulated as to enable us to rival our competitors in ſuch branches as they are able to outdo us in.

13. That a ſtanding committee of trade be appointed by parliament, compoſed of perſons well verſed therein, whoſe buſineſs ſhould be conſtantly to conſider the ſtate thereof, and to find out ways and means to improve it; to enquire how the trades we carry on with foreign countries, grow more or leſs profitable; how, and by what means, we are outdone by others in the trades we drive, or hindered from enlarging them; what is neceſſary to be prohibited, both with regard to our exports as well as imports, and for how long time; to hear complaints from our factories abroad, and to correſpond with our miniſters there, in affairs relating to our trade, and to repreſent the reſult of their enquiries to parliament, with their opinion, what courſes may, from time to time, be proper to be taken for its encouragement; and to repreſent what bounties and drawbacks, &c. may be neceſſary for the advancement of particular branches. That this committee enquire into all the improvements that ſhall be made for the benefit of trade, and lay them before parliament; and that ſuch artiſts may be rewarded, at the public expence, according to their merits.

14. That proper treaties of commerce be made with nations, that may prove mutually and laſtingly beneficial.

15. That our merchants who export our product and manufactures, be ſecured in their foreign traffic, and the payment of their cuſtoms made as eaſy to them as poſſible. That good convoys and good cruizers, in time of war, be provided for the ſafety of their ſhipping and merchandizes, to the end that aſſurance may be kept low, and our merchandize come as cheap as poſſible to foreign markets, as well in times of war as peace.

16. That courts merchant be erected in the kingdom, conſiſting of able and experienced traders, for the ſpeedy deciding of all differences between merchants, relating to maritime and other commercial affairs.

EXTE'NSION *of fractured limbs*, in ſurgery. When the fractured bones maintain their natural ſituation, the ſurgeon has nothing to do but to apply a proper bandage to keep them in it; but, when the fractured parts recede from one another, ſome degree of Extenſion is neceſſary, which muſt always be ſuited to the diſtortion of the limb. The greater diſtance there is between the extremities of the divided parts of the bone, ſo much the ſhorter will the limb become from the natural contraction of the muſcles, and the Extenſion muſt be proportionably the greater; but, in theſe caſes, every thing is to be done tenderly, and with great care. 1. The patient is to be kept very firm and ſteady; the poſture of the body muſt be, in this operation, different, according to the different circumſtances of the caſe; ſometimes ſitting, and ſometimes lying, are the moſt proper. 2. An aſſiſtant muſt ſupport the limb with his hands, both above and below the fractured part. 3. The perſon who holds the lower part of the limb, muſt extend it ſtrongly and equally, till the fractured bone can be replaced; but when the ſurgeon is called at ſome diſtance of time from the accident, and a tumor and inflammations are come on, it is beſt, in ſuch caſe, to defer the Extenſion of the parts till theſe ſymptoms are removed, by letting blood, looſening the bowels, giving the patient large quantities of aqueous fluids, and preſcribing the proper internal remedies for abating inflammations, and fermenting the parts with warm diſcutient decoctions. Theſe applications will uſually ſucceed ſo well as to take down the inflammation, in twenty-four hours, in ſuch a manner, that the Extenſion of the limb may be ſafely attempted; but, when they do not take place ſo ſuddenly, they are to be repeated till they have the deſired effect; and, when the common fomentations fail, the following has often very great and happy ſucceſs: take two or three handfuls of ſcordium, and boil them for about a quarter of an hour in a pint of water, with ſix ounces of rectified ſpirit of wine; afterwards mix with it an ounce of common ſalt, and half an ounce of ſalt-petre, and uſe this to the inflamed fractured limb. To make the proper Extenſion of a limb, the ſurgeon muſt, while it is kept at its proper length by two aſſiſtants, direct it with his hands, ſometimes a little one way, and ſometimes another, putting it into different poſitions, as the nature of the caſe ſhall require, till the parts have recovered their natural ſituation. This will be known by the remiſſion or abſence of pain, and by obſerving, that the fractured limb is of the ſame length as the ſound one; and, if theſe ſigns of ſucceſs in the operation are wanting, there is great reaſon to ſuppoſe that the operation is as yet ineffectual, and the Extenſion is to be repeated, or continued, till the bones are evenly and properly replaced. *Heiſter's Surgery.*

EXTRA'VASATED *blood.* In the contuſions, fiſſures, depreſſions, fractures, and other accidents of the cranium, one or more of the blood veſſels diſtributed on the dura mater are frequently divided. The blood that is diſcharged from theſe veſſels greatly oppreſſes the brain and diſturbs its offices, frequently brings on pains and other miſchiefs, and often death itſelf, unleſs the patient be timely relieved. If the quantity of Extravaſated blood be ever ſo ſmall, it will certainly corrupt, and affect the meninges, and the brain itſelf, with the ſame diſorder; and from hence will proceed violent inflammations, deliriums, and ulcers, and finally death; and this will frequently be the caſe, after a violent blow upon the cranium, though the bone ſhould eſcape without injury. In theſe injuries of the head, the blood is ſpilt either between the cranium and the dura mater, or between the dura and pia mater, or between the pia mater and the brain; or, laſtly, into the ſinuſes of the brain. Either of theſe caſes is attended with very great danger, but, the deeper the extravaſation happens, ſo much greater muſt the danger be. Blood Extravaſated in the cavity of the cranium will be diſcovered from the violence of the ſymptoms that ſucceed a blow on the head; as if the patient lies ſtill without ſenſe or motion, if blood flows from the mouth, ears, or noſe; if the eyes are much inflamed and ſwelled; if vomitings ſucceed; when, upon the remiſſion of theſe ſymptoms, the patient complains of a remarkable heavineſs of head, ſleepineſs, vertigo, blindneſs, ſpaſms, and diſorders of this kind. When the quantity of Extravaſated blood on theſe accidents is very conſiderable, and oppreſſes the cerebellum, the patient dies upon the ſpot; but, when it is not in a very large quantity, or does not affect the cerebellum, life ſtill remains, but the ſymptoms juſt mentioned come on. In this caſe, if no fiſſure or contra-fiſſure is to be found, nor any external injury on the integuments of the head after a violent blow, it proves very difficult to find in what part of the head the extravaſation is ſeated. It will be proper in this caſe firſt to ſhave the head all over, and then thoroughly to examine it; for, if any part is ſofter than ordinary, or is enlarged, or red from ſtagnating blood, it is plain that this is the part that has received the injury. But, if neither this way, nor by enquiry among the perſons preſent at the accident, you can get light into the affair, it will be proper to cover the whole head with an emollient plaiſter, laying over it medicated bags of herbs, &c. well heated. This application will in a few hours time produce a tumor and ſoftneſs upon the injured part. Sometimes the patient alſo, though he lies ſpeechleſs, and ſeemingly ſenſeleſs, will be continually putting his hand to the injured part; and, if either ſide of the patient has loſt ſenſe or motion, and is become paralytic, it is an apparent ſign, whatever ſome might think to the contrary, that the injury has been received on the contrary or ſound ſide. If after accidents of this kind you can diſcover any wound in the ſkin, that muſt be enlarged with the knife till the injury on the cranium, of whatever kind it be, is come at.

When the ſeat of the injury is diſcovered, the firſt intention is to diſcharge the Extravaſated blood, and then to clean the wound, and remove all ſpinters, or extraneous bodies. Some have recourſe on theſe occaſions to the inſtant uſe of the trapan; but patients have been often very ſucceſsfully recovered without it. It is therefore beſt firſt to open a vein, and take away as much blood as the ſtrength of the patient will permit; this will take off the impetus of the veſſels, and prevent the extravaſation of more blood. Preſcribe after this a briſk purge to leſſen the quantity of the fluids; foment the head with medicated bags, and apply a melilot plaiſter to it; endeavour to rouſe the patient by volatile applications to the noſtrils, ſuch as ſal volatile, ſpirit of ſal armoniac, or ſpirit of hartſhorn; and give frequently attenuating fluids, ſuch as the decoctions of betony, ſage, roſemary, lavender flowers, ſaſſafras, and the like. This method does not immediately produce the deſired effect, but is to be continued for ſome time, and the preſcriptions frequently repeated, particularly when the bad ſymptoms ſeem by degrees to abate; and, if the patient find relief from the firſt bleeding, it will be proper to repeat it a ſecond or third time, eſpecially if he be of an athletic conſtitution. When, notwithſtanding this method, the ſymptoms are found however rather to increaſe than abate, it will be neceſſary to make a perforation in the cranium with the trapan, to give a paſſage for the diſcharge of the confined grumous blood; and, when there is no finding out the part affected, the ſkull muſt be perforated in ſeveral parts till the right is found. *Heiſter's Surg.*

EYE (*Dict.*)— If the humours of the Eye decay by old age, ſo as by ſhrinking to make the cornea and coat of the cryſtalline humour grow flatter than before, the light will not be refracted enough, and for want of a ſufficient refraction will not converge to the bottom of the eye, but to ſome place beyond it; and, by conſequence will paint in the eye a confuſed picture; and, according to the indiſtinctneſs of the picture, the object will appear confuſed. This is the reaſon of the decay of ſight in old men, and ſhews why their ſight is mended by ſpectacles. For the convex glaſſes ſupply the defect of plumpneſs in the Eye, and by increaſing the refractions make the rays converge ſooner, ſo as to convene diſtinctly at the bottom of the Eye, if the glaſs has a due degree of convexity.

And the contrary happens in ſhort-ſighted men, whoſe Eyes are too plump. For, the refraction being now too great, the rays converge and convene in thoſe Eyes before they come at the bottom; and, therefore, the viſion cauſed thereby will not be diſtinct, unleſs the object be brought ſo near the Eye as that the place where the converging rays convene may be removed to the bottom; or that the plumpneſs of the Eye be taken off and the refraction diminiſhed by a concave glaſs, of a due degree of concavity; or, laſtly, that by age the Eye grows flatter till it comes to a due figure. For ſhort-ſighted men ſee remote objects beſt in old age, and therefore they are accounted to have the moſt laſting eyes.

In determining the magnitude of pictures upon the retina, only one ray in each pencil need be conſidered; becauſe, when the picture is diſtinct, all the rays in any one pencil are collected to one and the ſame point of the retina. Or, which is much the ſame, we may ſuppoſe the pupil of the Eye contracted to a point: and, for greater ſimplicity and eaſe of the imagination, that this point O is a little hole at the center of a dark hollow hemiſphere, *Plate* XX. *fig.* 2. admitting only ſingle rays ſtraight through it without any refraction at all. For then the length of theſe pictures $p\,q\,r$ will increaſe and decreaſe as the angle $p\,O\,r$ does, or as the angle POR does; which I am going to ſhew to be the property of the natural Eye: and, if the ſemidiameter $O\,q$, of this hollow hemiſphere, be about five eighths of an inch, or if the axis of an human Eye, the pictures of the ſame objects will always have the ſame bigneſs in both ſorts of Eyes, very nearly.

The diameters or lengths of the pictures of objects upon the retina are meaſured by, or proportionable to, the angles which the rays that come from the extremities of the object do make in falling on the Eye, provided thoſe angles be but ſmall. For let two or more objects, *fig.* 3. and ϖx, either parallel or oblique to each other, ſubtend the ſame angle $P\,O\,Q$, or $\varpi\,O, x$ at O; and, becauſe the particles of light flowing from P and ϖ deſcribe the ſame line $P\,\varpi\,O$, they will be refracted to the ſame point p upon the retina; and in like manner thoſe that flow from Q and x will be refracted to the ſame point q; and ſo the picture $p\,q$ of the objects $P\,Q$, $\varpi\,x$, which ſubtend the ſame angle at O, are the ſame in magnitude; which was the firſt thing to be proved.

Now the pictures of objects painted upon the retina of a dead Eye are found by experience to be perfectly well ſhaped and proportioned in their parts; that is, the proportion of the parts $p\,q$, $q\,r$, of the whole picture $p\,q\,r$, is the ſame as that of the parts $P\,Q$, $Q\,R$, of the whole object $P\,Q\,R$; and this latter proportion is very nearly the ſame as that of the angles $P\,O\,Q$, $Q\,O\,R$, ſubtended by the parts $P\,Q$, $Q\,R$; and ſo the propoſition is proved, when the objects $P\,Q$, $Q\,R$, are both at the ſame diſtance from the Eye. And, ſince it was ſhewn juſt before that the objects $P\,Q$ and $\varpi\,x$ have the ſame picture $p\,q$, it follows that the proportion of the pictures of the objects $\varpi\,x$ and $Q\,R$ is the ſame as that of the angles $\varpi\,O\,x$, $Q\,O\,R$, ſubtended by them at the Eye.

When an object approaches towards the Eye, the diameter of its picture upon the retina increaſes in the ſame proportion as the diſtance between the Eye and the object decreaſes; and, on the contrary, it decreaſes in the ſame proportion as that diſtance increaſes. For the diameter of its picture increaſes in the ſame proportion as the angle increaſes, which the object ſubtends at the Eye; and this angle, when ſmall, increaſes in the ſame proportion as the diſtance between the Eye and object decreaſes.

The degree of brightneſs of the picture of an object painted upon the retina continues the ſame, at all diſtances between the Eye and the object; provided none of the rays be ſtopped by the way, and that the pupil does not alter its aperture. For inſtance, when the Eye approaches as near again to the object, the picture upon the retina becomes double in length and double in breadth, and conſequently quadruple in ſurface; for the ſurface would be double, if its length alone or breadth alone was double. The quantity of rays received through the ſame aperture of the pupil, at half the diſtance from the object, is alſo quadruple; and, being equally ſpread over four times the quantity of ſurface of the retina, they are juſt as denſe as before, when the object was at twice the diſtance.

It follows then that the faint appearance of remote objects is owing to the opacity of the atmoſphere, which hinders part of their light from coming to the Eye. Accordingly we find that the ſun, moon, and ſtars appear very faint, when near the horizon, and brighter continually, as they riſe higher; becauſe the tract of vapours, which lies in the way of the rays, is longeſt and thickeſt near the horizon; and becomes thinner and ſhorter, as the objects riſe higher, and conſequently does leſs obſtruct the paſſage of the rays.

The ſenſibility of the Eye, or its power to diſcern objects without inconvenience, by different quantities of light, is vaſtly extenſive. For inſtance, the diſproportion in the quantities of light, caſt upon the horizon by the ſun and moon, at any equal altitudes, I find no leſs than 90 thouſand to 1, when the moon is full; or no leſs than 180 thouſand to 1, when the moon is in the quarters. And the proportion between thoſe parts of the lights of the ſun and moon, whatever they be, which are reflected to our eyes from the ſame object by day and by night, can hardly be different from the proportion of the whole lights. Allowing then that the aperture of the pupil may poſſibly be eight or nine times leſs by day than by night (that is, about three times leſs in diameter) yet the proportion in the quantities of day-light and moon-light received by the Eye from the ſame object, to illuminate a picture of the ſame bigneſs, will be no leſs than twenty thouſand to one, when the nights have a middle degree of moonlight; I ſay no leſs, becauſe the numbers here given are deduced from a rule, which is built upon this principle, that the moon reflects all the light received from the ſun; which cannot be true, by reaſon of the appearance of very large obſcure places in her body; and, in all probability, a great part of the incident light is buried and loſt even in the brighteſt places.

The rule I mentioned is this, day-light is to moon-light as the ſurface of an hemiſphere, whoſe center is at the eye, to the part of that ſurface which appears to be poſſeſſed by the enlightened part of the moon: ſo that the whole heavens covered with moons would only make day-light. This will be evident enough from the following conſiderations, though I invented it another way. Day-light is made by innumerable reflections of the ſun's rays from all ſorts of bodies, till at laſt they come to our eyes; for, if this were not ſo, we we could ſee nothing in the world, even in the day time, but the ſun and ſtars and ſelf-ſhining ſubſtances. Accordingly we find that day-light is much the ſame, whether the ſun ſhines out or not, in the place we are in; becauſe his light is reflected to us from a vaſt quantity of earth, air, and clouds extended all round us, perhaps to a hundred miles or more. So that the abſence of the ſun's rays from a particular place ſcarce alters day-light. Another thing is, that the moon by day appears like a cloud in the air of a middle degree of brightneſs; ſome appearing duller and ſome brighter than the moon itſelf. The rays of the ſun being therefore intercepted in the night from all the viſible clouds, and being reflected to us by the moon only, it follows, that day-light is to moon-light, as the apparent ſurfaces of all the viſible clouds to the apparent ſurface of the viſible part of the moon, conſidered as the only cloud which remains enlightened. And theſe two lights, whatever be the diſtances of the moon and clouds, are juſt the ſame as if thoſe bodies were all placed at any equal diſtances from us, and compoſed the ſurface of an hemiſphere, whoſe parts are the true meaſures of the parts of the light which comes to us.

A vaſt diſproportion between the lights of the ſun and moon appears alſo by experiments made with burning-glaſſes; either by refraction of the rays through very broad lenſes, or by reflexion from very broad concave-glaſſes or metals: which, by collecting the rays of the ſun into a ſmall round image at the focus, do excite a more violent heat and burn quicker than the hotteſt wind-furnaces: as appears by their melting and calcining the hardeſt metals, by vitrifying bricks and ſtones in much leſs portions of time than a minute. Yet the rays of the moon, being collected by the ſame glaſſes, do not excite the leaſt ſenſible heat; nor do they ſenſibly affect the niceſt thermometer, when caſt upon the ball of it, though the brightneſs of the light be very ſenſibly increaſed. By meaſuring the breadth of the round image at the focus, and by comparing it with the breadth of the glaſs itſelf, it appears that ſome of theſe burning-glaſſes collect the incident rays into a ſpace about two thouſand times leſs than they poſſeſſed at their incidence. But by the preceding calculation the light of the full moon muſt be condenſed about 90 thouſand times, to make it as denſe and as warm as the direct rays of the ſun. It is no wonder then that the heat of the moon's rays is not ſenſible in the focus of the glaſs, being then even forty or fifty times thinner than the direct rays of the ſun. For it is found by experiments made with theſe glaſſes, that the degrees of heat are proportionable to the denſities of the rays: which being compared with a ſcale of the degrees of heat and warmth of ſeveral natural bodies, determined by Sir Iſaac Newton, in the Philoſophical Tranſactions, it appears there is a vaſt diſproportion between the degrees of light which the Eye can bear and be ſenſible of, and the degrees of its heat which the touch can bear and be ſenſible of.

Dr. Hook aſſures us, that the ſharpeſt eye cannot well diſtinguiſh any diſtance in the heavens, ſuppoſe a ſpot of the moon's body, or the diſtance of two ſtars, which ſubtends a leſs angle at the Eye than half a minute; and that hardly one of a hundred can diſtinguiſh it, when it ſubtends a minute. If the angle be not bigger than this, the two ſtars appear to the naked Eye, as if they were but one. I have been preſent at making the experiment, when a friend of mine, who had the beſt eyes of all the company, could ſcarce perceive a white circle upon a black ground, or a black circle upon a white ground, or againſt the ſky-light, when it ſubtended a leſs angle at the Eye than two thirds of a minute; or, which is the ſame thing, its diſtance from the Eye exceeded 5156 times its own diameter: which agrees well enough with Dr. Hook's obſervation. Hence the diameter of the picture of that circle upon the retina was but the 8000th part of an inch at moſt; and this may be called a ſenſible point of the retina. That this point is very ſmall any one may perceive from hence, that the breadth of the fineſt hair is viſible at the length of one's arm. *Smith's Optics.*

Contuſion of the Eye. When the Eye is, by any accident, contuſed, it will be intirely deprived of ſight, unleſs the contuſion be ſlight, or the proper remedies inſtantly applied. If the Eye have received a very ſlight contuſion, it will be proper to waſh it frequently, for the firſt day, with cold ſpring water, laying on it linen rags, wet with the ſame: on the next day it muſt be rubbed externally with camphorated ſpirits of wine, and covered up with ſtuphs wrung out of decoctions, made in wine of eye-bright, ſpeedwell, hyſſop, ſage, chamomile-flowers, and fennel ſeeds; but, if theſe things are not to be had, bolſters dipped in warm wine muſt be applied, and renewed very often; and, if the patient be of a plethoric habit, bleeding is alſo neceſſary. If the contuſion of the Eye is ſo violent, that you can plainly ſee the extravaſated blood through the cornea, and all objects appear red to the patient, a vein muſt be opened either in the foot or neck, the Eye muſt be kept continually fomented with warm ſtuphs, wrung out of the ſame decoctions as are before mentioned, and the feet muſt be bathed in warm water two or three times a day, and a few drops of pigeons blood muſt be, two or three times a day, put into the Eye; and, if all theſe attempts prove fruitleſs, you may very probably ſucceed, by making an opening in the cornea with the lancet. *Heiſter's Surgery.*

Wounds of the Eye. If the Eye is wounded, but not ſo as to let out the vitreous or cryſtalline humour, the wound muſt be anointed two or three times a day, with a feather, or fine rag, well dipped in the white of an egg, or elſe in a mucilage made of quince ſeeds, or of fleawort ſeeds, in roſe water; and, after each dreſſing, a compreſs is to be laid on, well ſaturated with a collyrium, made of the whites of eggs. 2. Two ounces and a half of roſe water, half a drachm of oil of roſes, and three grains of camphor, well mixed together, and thoroughly ſhook up every time it is to be uſed. If the accident is attended with any great degree of inflammation, as is very frequently the caſe, it will be proper to cover the ſmall compreſs, firſt laid over the Eye, with a larger, dipped in warm ſpirits of wine, with camphor. The bowels muſt, in this caſe, be kept open, and the patient blooded, if of a plethoric habit. And, if it happens, that the cryſtalline humour, or any part of it, ſticks in the orifice of the wound, it muſt, in this caſe, be pulled out, that it may not bring on a deformity, or worſe miſchief, to the Eye. *Heiſter's Surgery.*

Artificial Eye, is an optical machine, where objects are repreſented after the ſame manner as in the natural Eye; of conſiderable uſe in illuſtrating the nature and manner of viſion.

Its conſtruction is thus: provide two hollow hemiſpheres of hard, dry wood, well cemented together, to repreſent the ball of the Eye: let the anterior or fore hemiſphere be perforated with a round hole in C (*Plate* XX. *fig.* 4.) to ſupply the place of a pupil; and therein fit a thin, plane glaſs, or, which amounts to the ſame, a concavo-convex glaſs, to ſerve for the cornea. In the inſide, have a ſhort draw-tube G, with a lens convex on both ſides, to do the office of the cryſtalline therein. In the hind or poſterior hemiſphere, fit another drawn tube E F, with a plain glaſs therein, having its inner ſurface ſmooth, though not poliſhed, repreſenting the retina and optic nerve.

If now the aperture C be turned towards any object, and the draw-tube F E be gradually pulled out; you will have the object beautifully and ſtrongly repreſented, in all its colours, on the retina, only in an inverted order.

Eyes *of horſes*, in the manege, &c. Theſe ſhould be bright, lively, full of fire, pretty large, and full; but not too big, goggling, or ſtaring out of the head. They ſhould alſo be reſolute, bold, and briſk. A horſe, to appear well, ſhould look on his object fixedly, with a kind of diſdain, and not turn his Eyes another way.

The diſeaſes of the Eyes, in horſes, proceed either from a defluxion, or from ſome external hurt. In the former caſe, the Eyes are watery, hot, red, and ſwollen, the diſtemper advancing by degrees; in the latter, the malady comes ſpeedily to a height, and the ſkin on the outſide of the Eye is peeled off.

If the diſtemper takes its riſe from a rheum, or defluxion, it is to be conſidered, whether it proceeds from the Eye itſelf, or from another aggrieved part: in the latter caſe, the redreſſing of the part will ſet the Eye free; in the former, it is proper to cool the horſe's blood with an ounce of ſal prunellæ, mingled every day with his bran; and, when it leſſens his appetite, to change it for liver of antimony, till he recovers his ſtomach.

For ſore Eyes, when a ſkin is growing over them, the following receipt is recommended: to the white of an egg add a little ſine powdered ſalt; then ſet this on the fire till it be reduced to a powder. This, mixed with a little honey, is to be put into the horſe's Eye with a feather. If it is found inſufficient to eat off the ſkin, the powder alone muſt be blown into the Eye with a quill.

In caſe of a blow on the Eye, take honey, and, having added a ſmall quantity of powder of ginger, put it into the horſe's Eye; or elſe take hog's lard, with oil of roſes and elder, of each an equal quantity; then, having melted them together, anoint the Eye therewith.

Some horſes have naturally tender weeping Eyes, which void a ſharp eating humour; theſe are eaſily cured by waſhing or bathing them every morning and evening with brandy.

Eye *of a tree*, a ſmall pointed knot, to which the leaves ſtick, and from which the ſhoots or ſprigs proceed.

EYE-BROWS *wounded.* In wounds of this part, great care muſt be taken to guard againſt inflammations, leſt the Eye ſhould partake of the injury; all hot and ſharp things muſt be avoided, in eating and drinking, and the patient ſhould be blooded, if plethoric; the wound muſt be dreſſed with vulnerary balſams, and the dreſſings covered with compreſſes, dipped in camphorated ſpirit of wine. If the wound be large, and the Eye-brow intirely divided, it will be neceſſary to uſe the ſuture and dreſs of it, with a vulnerary balſam, covering both eyes, and keeping them as much as poſſible from motion. *Heiſter's Surg.*

EYE-LIDS *wounded.* Wounds, either of the upper or lower Eye-lid, will not readily heal, not ſo much from the thinneſs of the parts, as from the great quantity of fluids, with which the Eye is continually moiſtened. It is neceſſary, therefore, firſt to foment the part with decoctions of chamomile, hyſſop, or eyebright, till the flux of the blood is ſtopped, and the wound well cleanſed; then, if the wound is tranſverſe, it muſt be ſtitched up in the middle with a fine needle, and ſprinkled over afterwards with the powder of comfrey root, gum arabic, or other ſuch medicines, or anointed with balm of Gilead, Peru, or Capivi, laying over theſe applications a plaiſter of diachylon, and tying it up in ſuch a manner, that the Eye may have very little power to move about. If the wound is made lengthways, it will require ſeveral ſtitches, and muſt be dreſſed over them as before. *Heiſter's Surg.*

F.

FABA *Ægyptia*, in natural hiſtory, the Egyptian bean, by ſome called the Pontic bean, as it is not only copiouſly produced in Egypt, but, alſo, in ſome marſhy grounds of Aſia and Cilicia. It has a very large leaf, a ſtalk a cubit long, as thick as one's finger, and a flower whoſe colour reſembles that of a roſe, and which is as large again as a poppy-flower. But, when the flower falls, it bears ſmall pods, almoſt reſembling little bladders, and in which the bean is ſomewhat prominent above its covering, in the form of a bubble. They call it ciborium or cibotium, from the manner of planting it; which is, firſt, to lodge it in a moiſt clod, by way of a caſe or box, which is afterwards immerſed in water. Its root is thicker than that of the common reed. This root is eaten, both raw and boiled, and is called colocaſia. The bean itſelf is, alſo, eaten green; but, when dry, becomes black, and in bulk exceeds the Grecian bean. It is of an aſtringent quality, and good in diſorders of the ſtomach. In conſequence of its aſtringent nature, an inſperſion of its flower, inſtead of polenta, is highly beneficial to dyſenteric patients, and ſuch as labour under the cœliac paſſion. This flower is, alſo, uſed by way of poultice: but the huſks made into a decoction, with mulſum, prove more effectual, if three cyathi of the mulſum are exhibited for a doſe. This bean, if boiled in oil of roſes, relieves pains of the ears, if dropped into them; becauſe, in the middle of the bean, there is a green ſubſtance, highly bitter to the taſte. *Diſcorides.*

The root of this bean, triturated, and made up, with ſugar, in form of a preſerve, is exhibited for the hæmorrhoids. The juice, extracted from the flowers, ſtops immoderate diſcharges of the menſes. *Dale* from *Henricus Adrianus Van Rheede.*

Faba *Sti Ignatii*, St. Ignatius's bean, in natural hiſtory, a fruit of which Sir Hans Sloane gives us the following account:

It is about the bulk of a nutmeg, and triangular: the ſhavings of it, drank in cold water, are highly beneficial for evacuating poiſons by vomit, as alſo for the cure of bites inflicted by venomous animals, if, at the ſame time, a few of the ſame ſhavings are applied to the bite: theſe ſhavings, alſo, afford great relief, when applied to a part ſpaſmodically conſtricted, and ſtop hæmorrhages, when applied to the wounds. In the year 1692, a woman, who had, for a long time, been afflicted with floodings, was reſtored to perfect health, by drinking theſe ſhavings in ſome proper liquor: the ſame year, an infant, labouring under an highly intenſe fever, by drinking theſe ſhavings, had its diſorder forthwith removed in my preſence. They, alſo, afford relief to women in labour, and facilitate their delivery. I myſelf have found from experience, that this bean is of ſingular ſervice in all kinds of repletion, and crudities of the ſtomach, as, alſo, in a dyſentery and teneſmus.

Divide each bean into three parts; and, when there is a neceſſity, put one of theſe into the mouth, for a quarter or half a quarter of an hour, ſwallowing the ſaliva diſcharged; then drink about two or three ounces of cold water, and the effects of the medicine will be ſenſible.

Another manner of uſing this bean is to put it into the concave part of a hard ſhell with a little water, and rub it up and down. This water is to be put into a veſſel with ſome of the ſhavings; and the like is to be done, till you have two ounces of the water thus prepared, which is to be taken for a doſe.

When this bean, divided into pieces, is rubbed in the concave part of a ſhell, with oil, eſpecially that of olives, this oil produces the ſame effects with the former preparation, when drank; and is an excellent medicine, when applied to wounds, or members ſpaſmodically conſtricted.

The moſt ordinary method of uſing this nut is to put it entire into a little warm water, till the water is rendered bitter; and this infuſion is afterwards to be exhibited. Others uſe a little of the powder in ſubſtance; others ſwallow a piece of the bean; and others wear a whole bean, hung about their necks, by way of amulet.

When poiſon is ſuſpected, and in caſes where there is an immoderate and tumultuous conflict of the ſpirits, it is to be uſed without any regard to time. In other diſeaſes, it is to be uſed in a morning faſting. But, when the intention is to vomit, it is moſt conveniently exhibited an hour or two after eating: the doſe is half a ſcruple, in conjunction with other gentle emetics.

The powder, an infuſion, or the oil, of this bean are exhibited in tertian and quartan fevers. It is alſo uſed for provoking urine, the menſes, and ſuppreſſed labours; for facilitating the birth, expelling the ſecundines, the fœtus when dead, and worms; in all which caſes I have found it effectual. It is alſo exhibited in cholics, crudities of the ſtomach, an injured concoction, diarrhœas, teneſmus, and obſtructions of the liver and ſpleen.

It is produced in the Philippine iſlands, and thoſe adjacent to them; but we are ignorant what kind of plant it grows on; only I learned from Raphael de Roa, a learned Spaniard, who lived long in theſe iſlands, that it was a convolvulous plant, twiſted itſelf round the talleſt trees, and bare a fruit as large as a nutmeg. *Philoſ. Tranſ.*

FACE *of a plant*, a word uſed by Tournefort and many other botaniſts, to convey an idea of that general appearance of plants, which ſhews a ſameneſs in thoſe of the ſame genus, and a diverſity from the other genus's, though not eaſily charactered in words, yet very obvious to an eye accuſtomed to theſe reſearches. Thus all the ſpecies of wormwood have the ſame general face, by which they may be taken to be ſpecies of the ſame genus, and ſo of many more; nay, in ſome caſes, whole genera, and even claſſes, have the ſame kind of family face, as it may be called, by which they may be known: as the umbelliferous plants, except the perfoliata, and a few other inſtances.

It has been attempted by many to make this general face an indicatory note of the virtues of the plant which wears it, and there would certainly be this great advantage in it, if it could be brought to any degree of certainty, that the moſt obvious of all diſtinctions would be applied to the moſt valuable office: but, though an abſolute certainty cannot be arrived at, in an attempt of this kind, yet, allowing for the poſſibility of a few exceptions, general conjectures may be made on the following rules, which will rarely fail. The umbelliferous plants before-mentioned make a very large claſs, and it is their general and obvious character to have their ſeveral flower branches ariſe from one center, and expand into an umbrella, every one having a tuft of flowers at the end; theſe flowers conſiſt of five leaves, and the ſeeds are naked and double, and the leaves of the plant are generally deeply divided, as in parſly, carrots, and the like.

The verticillate plants are another claſs, which are eaſily known by their general face; their flowers ſtanding in ringlets round the ſtalks, and being labiated or of ſome ſuch form. The leaves alſo in moſt of theſe plants ſtand in pairs, and they have generally an aromatic ſmell. As the virtues of the umbelliferæ lie in the roots and ſeeds, ſo do theſe in the huſks of the flowers. It has been a common opinion, that the flowers of theſe plants contained their virtues, but this is erroneous. The flowers of ſage are almoſt inſipid, but the huſks taſte very ſtrongly. Theſe plants are, in general, poſſeſſed of the ſame virtues, and are all of a middle degree between the carminatives before-mentioned and the ſpices.

The ſiliquoſe plants have alſo the ſame general face. Their flowers are compoſed of four leaves, and their ſeeds contained in long pods, or in ſhort and thick ſiliculæ. In theſe plants the ſeeds are found to contain the principal virtue in ſome, and in others the leaves: ſome have alſo virtue in their roots, but the flowers of all are neglected.

FA'LCO, *the falcon*, in ornithology, a bird of prey of the hawk kind, much eſteemed for its ſtrength and activity. There are many ſpecies of this bird, but, when the word Falco is uſed ſingly without any diſtinctive addition, it is meant of that ſpecies called, by authors, the Falco peregrinus, from its travelling into different countries, at different ſeaſons of the year.

It has very long and large wings, reaching, when folded, to the tip of the tail. Its ſhoulders are very large, its tail very long and ending like the ſparrow hawk's in a point, its end being white variegated with orange-coloured ſtreaks. Its feet are of a greeniſh or bluiſh yellow, its neck is long, and its head of a pale dove colour. There is a ſpecies of this bird, which are of a much blacker colour on the back, and has been erroneouſly eſteemed by ſome a different ſpecies; probably it is only owing to the difference of age or ſex. This bird is caught in France, Germany, and elſewhere; but it is not well known where it builds. It feeds on ducks, geeſe, and other large birds. *Ray's Ornithology.*

F'ALLACIES *in viſion*, deceptions of the ſight, from the objects appearing, from their ſituation, different to the ſight than what they really are.

Since oblique diſtances appear longer in proportion as the eye is raiſed higher, to view them more fully; it follows that, being placed at a diſtance from a gentle aſcent, like the ſtage at a play-houſe, or a riſing mount at the end of a walk, we ſhall judge thoſe aſcents much longer than if they were level, eſpecially if they be artfully contracted in the remoter parts. For, by not obſerving, or attending to, the reality of theſe aſcents, we form the ſame idea of them, as is uſually ſuggeſted to the mind by a longer level walk with parallel ſides. Now, ſince the riſing of the ground, together with a gradual diminution of its breadth, when not obſerved, do make it ſeem longer, and conſequently leſs diminiſhed in breadth, than if the ſame extent was level, with parallel ſides; it ſhould follow that a gentle aſcent alone, whoſe ſides are parallel, ſhould ſtill widen the appearance of their remoter parts, ſo as to make the parallel ſides appear parallel or even diverging: which is contrary to the common appearance of parallel ſides.

The oblique ſituation of an object ſeen alone is ſuggeſted to the mind by a greater apparent magnitude or a diſtincter perception of the nearer than of the remoter parts. And conſequently, if the object be ſo remote or ſo uniform that we are not affected with a ſenſible difference in thoſe perceptions, we are ſubject to miſtake its poſition. For an object may appear under the ſame angle A O D (*Plate* XX. *fig.* 15.) in two oblique poſitions A D and *a d.*

Hence we ſometimes miſtake the poſition of a weather-cock or a flag; and, by taking the neareſt end of the ſail of a wind-mill for the remoteſt, we ſometimes miſtake the courſe of its circular motion. For if a ſpectator at O (*fig.* 16.) ſituated nearly in the plane of the ſails produced, imagine the fartheſt end A of a ſail A E to be the neareſt, and the real motion of the ſails be in the order of the letters A B C D E; when A is moved to B, and the line B O is drawn, cutting the circle A B C D E in D; ſince he firſt imagined the end A to be at E, he will not now conceive it at B but at D, and ſo will imagine the courſe of the motion to be from E to D; which is contrary to the real motion from A to B. The uncertainty we ſometimes find in the courſe of the motion of a branch or hoop of lighted candles, turned round at a diſtance, is owing to the ſame cauſe: and alſo that we miſtake a convex for a concave ſurface ſometimes with the naked eye, but more frequently in viewing ſeals and impreſſions with a convex glaſs or a double microſcope; and hills and vallies in the moon with teleſcopes, eſpecially if they invert the object: being led into the miſtake by an imperfect judgment of the diſtances of the parts of the objects, and confirmed in it by a contrary poſition of the ſhadows caſt by a ſide light.

We are frequently deceived in our eſtimates of diſtance by any extraordinary magnitude of objects ſeen at the end, of it: as, in travelling towards a large city or a caſtle, or a cathedral-church, or a mountain larger than ordinary, we think they are much nearer than we find them to be on trial. For, ſince by experience the ideas of certain quantities of known diſtances are uſually annexed to the apparent magnitudes of known objects of a common ſize, and ſince the apparent magnitudes of theſe larger objects at a greater diſtance are the ſame as of the ſmaller at a ſmaller diſtance, it is no wonder they ſuggeſt the uſual idea of ſmaller diſtance annexed to more common objects. This is farther evident, becauſe we are ignorant of the nature of the country, and of the inequalities in the ground interpoſed.

Animals and all ſmall objects ſeen in vallies, contiguous to large mountains, appear extraordinary ſmall, becauſe we think the mountain is nearer to us than if it was ſmaller; and we ſhould not be ſurpriſed at the ſmallneſs of the neighbouring animals, if we thought them farther off: In like manner, when they are placed at the top of the mountain, or upon a large building, and are viewed from below, we think they are extraordinary ſmall for the ſame reaſon, and alſo becauſe we judge the mountain or the building to be lower in proportion than if it was ſmaller, both becauſe of its extraordinrary magnitude and greater obliquity of its higher parts to the viſual rays. Dechales tells us that, while he ſtood at the bottom of a mountain, he once obſerved a parcel of crows, which at firſt he thought were higher than the mountain, becauſe, I ſuppoſe, they appeared ſo very ſmall in compariſon to it; but he found they ſpent half an hour in aſcending, before they got to the top of it. The part of the monument extant above the tops of the ădjoining houſes, I am told, is five times longer than the height of the houſes, and yet from below that part appears but two or three times longer at moſt, becauſe of its unuſual magnitude and obliquity to the ſight.

Aquilonius mentions a Fallacy in diſtance which he had frequently obſerved and admired. In a warm ſummer's morning, when fogs are exhaled from moiſt ground, we frequently ſee them very near us in ſome known place; but, as ſoon as they are ſeparated from the ground and are going to aſcend, they appear ſo remote, that, ſays he, I could never have believed they hung over that place, had I not ſeen them there the moment before. The reaſon is, they then appear in the manner and direction of other remote clouds in the horizon, whoſe difference in diſtance cannot be diſcerned, for want of ſome viſible ſurface extended between them; like the ſurface of the ground, when the riſing cloud lay upon it.

It is ſaid to be a common obſervation made by travellers in the night or the duſk of the evening, that near objects, as trees and houſes, are often taken to be very large and remote. The reaſon may be, that, being unable to diſcern the quantity o ground interpoſed, they refer them to the brighter ſky in the horizon, and ſo think they are remoter and conſequently larger: as I remember a red coat of arms, upon the top of an iron gate at the end of a walk, was taken for a brick houſe in the fields beyond it. *Smith's Optics.*

FAMI'LIA, in natural hiſtory, a term uſed by authors to expreſs a certain order of animals, or other natural productions, agreeing in their principal characters, and containing numerous individuals, not only different from one another, but, that in whole ſets, ſeveral numbers being to be collected out of the ſame family, all of which have the family character, and all ſome ſubordinate diſtinction peculiar to that whole number; or, though found in every individual of it, not found in thoſe of any others.

It has been too common to confound the words, claſs, family, order, &c. in natural hiſtory. But the determinate meaning of the word Familia ſeems to be that larger order of creatures, under which claſſes and genera are ſubordinate diſtinctions. Among the quadrupeds, the ſeveral genera of the unguiculated creatures agree one with another in many general characters common to all; and in which they differ from the ungulated animals, which have alſo their ſeveral peculiar characters common to all, and yet different from all thoſe of the others. Theſe naturally conſtitute certain larger diviſions into families, and no one would ever break through theſe, or bring the cat and the horſe into the ſame family.

In the ſame manner, in ichthyology, there are ſeveral genera of fiſhes, which agree perfectly in certain common characters, and diſagree from all others in them. The bream and the herring, though very different in genus, may yet be brought into the ſame family, both having many characters in common, as well as many different ones; but no one would ever be for bringing the herring and the whale into the ſame family. The arrangement of natural bodies into theſe families, or general and larger claſſes, is of the utmoſt uſe to natural hiſtory, when it is properly done, and the diviſions are genuine and natural; when otherwiſe, it is hurtful.

Theſe diviſions of animals into families are of two kinds; the one artificial or hypothetical, the other natural. The artificially contrived families, or claſſes of bodies, are founded on certain accidents of the things under conſideration, not made from the parts of the bodies themſelves. Of the artificial kind are thoſe diſtinctions ſo much in uſe among the old naturaliſts, founded on the place of growth and time of flowering of plants, the time and manner of bringing forth in animals, the food of creatures, and their different magnitudes. And to theſe falſe foundations for general diviſions may be added thoſe founded on the number of certain external parts of the creatures.

The abſurdity of the firſt of theſe methods is eaſily ſeen, ſince it requires a prior knowledge of the objects, before they come under our conſideration. If an unknown plant mineral, or animal, be offered to a naturaliſt, how is he to inform himſelf of its time of flowering, its place of production, or its manner of bringing forth its young. And, as this is impoſſible, it is alſo impoſſible that he ſhould ever refer to its family, or trace it out among the individuals of it. As to the latter method of making the number of certain external parts the character of a family, it is eaſy to ſee the abſurdity of it in regard to the fiſhes, for the fins of theſe animals are not always the ſame in number, in the different ſpecies truly and properly belonging to one genus. Thus the pearch, gadus, ſyngnathus, and many others, have more or fewer fins, in the ſame genus. Theſe are the errors of the artificial or hypothetical claſſes and families of natural bodies.

The natural families are liable to no ſuch objections. In theſe all the genera, referred to the ſame family, agree perfectly and punctually in their principal parts; the ſeveral individuals, of which theſe families are compoſed, being reduced into genera, theſe are to be arranged into their proper claſſes, according to their natural agreements; and, of theſe claſſes, the ſmaller the number, the eaſier and plainer will be the whole method. Theſe natural families can be only founded on eſſential characters, and, in the quadruped kingdom, they are to be taken either from the figures of the hoofs or claws, or from the teeth. In birds, the figure and proportion of the beak is a very proper character; and, in fiſhes, the figure of the head, and the ſituation of the tail, are to be conſidered, and are ſtable and eſſential characters. The whole animal world may eaſily be thus reduced to families, and from theſe two claſſes, genera and ſpecies, the ſtudy of nature rendered much more regular and eaſy, than it can be by any artificial diviſions. *Linnæi Faun. Suec. Artedi Ichthyolog.*

FARM (*Dict.*)—It is commonly allowed that a Farm ſhould make three rents, as they expreſs it; one for the landlord, one for the charges, and one for the farmer to live upon; but it is very ſeldom that a Farm will conſtantly do this, or is to be maintained at that charge. In a Farm of one hundred pounds a year, if the land is worth twenty ſhillings an acre, a hundred pound may defray the charges of it; but, if in a Farm of the ſame rent the land be worth but ten ſhillings an acre, a hundred and thirty pounds a year muſt be allowed for the charges of this, or nearly ſo; and two hundred and fifty acres of ſuch land muſt be reckoned to a farm of a hundred pounds a year, or elſe the farmer will be ruined, if it be not very improveable land.

FAST *Ground*, or *Faſt country*, a term uſed by ſome of our miners to expreſs what other call the ſhelf. In digging, they frequently, after the paſſing the ſeveral ſtrata, which have been diſturbed, and give proofs of having been toſſed about in the water by their irregularity, meet with plain, firm, regular, and ſolid ſtrata, which evidently ſhew that they have undergone no change ſince their original formation and inſtitution. The workmen, who are very good philoſophers in this reſpect, aſſign the different ſtructure, they thus find in the upper and lower ſtrata of the earth, to its juſt cauſe, that is, the deluge; and determine, that all they find irregular has been waſhed up, and depoſited there again in the time of that cataſtrophe, but that the ſhelf or Faſt country is in its natural ſtate and poſition. They obſerve, in favour of this opinion, that their loads of ore run very irregularly in the irregular ſtrata, but ſo much more regularly in the ſhelf or Faſt ground. *Phil. Tranſ.* N°. 69.

FA'THER-*Laſher*, in ichthyology, an Engliſh name given to a fiſh, called by ſome authors, though improperly, ſcorpæna, and ſcorpius marinus. It is properly of the cottus kind, and is named by Artedi, the ſmooth cottus without ſcales, with ſeveral ſpines upon the head, and with the upper jaw a little longer than the under. It more reſembles the ſmall fiſh we call the bull-head or miller's thumb, than the ſcorpæna. *Arted. Gen. Piſc.*

FA'TTENING *of horſes*. The being able to do this ſpeedily is one of the greateſt arts our dealers have, and indeed one of the greateſt niceties of the whole management of that creature. Many methods have been preſcribed, but the following ſeems moſt to be depended on: take elecampane, cimmun ſeed, tamariſk, and aniſeed, of each two ounces; common groundſel, one handful. Boil all theſe very well, with two handfuls of garlic ſcraped and cleaned, in a gallon of good ale; ſtrain the liquor well off, and give the horſe a quart of it every morning made hot; keep him warm after it. After he has taken this for four or five mornings, he may be turned out to graſs, or kept in the houſe, as the ſeaſon will permit. But, whenever provender is given him, a quantity of a powder is to be prepared of equal parts of cummin ſeeds and elecampane, and give him half an ounce of it every time, ſprinkling it in by degrees, as he eats, that he may not nauſeate the whole.

If this method does not ſucceed in a ſhort time, then take two ſpoonfuls of diapente; brew it in a pint of ſweet wine, and give it the horſe for three mornings. This will take off any inward ſickneſs, and make the other things take effect. After this, feed him with good provender three times a day, that is, after his watering in the morning, after his watering in the evening, and at nine o'clock at night. If he does not eat the provender well and freely, it muſt be changed for ſome other kind.

If all this does not ſucceed, let the horſe be blooded; and then take half a buſhel of coarſe barley meal, put it into a pail full of water, and ſtir the whole together very well; then let it ſettle by ſtanding. Pour off the clear liquor into another veſſel, and let him drink it for his common drink, and eat the remainder which falls to the bottom of the pail. If he refuſe to eat this alone, there may be ſome bran mixed among it. This ſhould be given him three times a day, morning, noon, and night. If he does not rightly take to the meal with the bran, ſome oats muſt be mixed with it, and this will readily bring him to feed on it. But, which ever way is uſed, they muſt be by degrees diminiſhed in quantity, till at length he is brought to eat the meal alone; for that is the thing that muſt fatten him up. Care muſt be taken that the barley is ground freſh every day, as it is uſed, for it quickly grows ſour; and, when this has once been the caſe with one parcel, no art will ever bring the horſe to touch any of it afterwards. Scarce any horſe but will be well fattened by keeping him to this diet for about 20 days. Barley ground in this manner cools and purges the creature; but the greateſt efficacy, as to the Fattening him, lies in the water, which by this management takes up all the rich part of the barley into itſelf. When the horſe grows luſty on this diet, it muſt be taken from him by degrees, giving him at firſt oats once, and barley-meal twice a day; and then oats twice, and the barley-meal once, till he is perfectly weaned from it. In the mean time, he muſt have good hay, and he muſt not be rid; only it will be proper to walk him gently about an hour or two in the heat of the day. If it be found that the horſe wants a good ſmart purging during the time of his continuing in the barely diet, the beſt time to give it him, is after the firſt eight days, and the following is a very proper ſort of phyſic: take of the fineſt aloes one ounce, agaric in powder half an ounce, and powder of florentine orris one ounce. Let all theſe be mixed together, and put into a quart of milk warm from the cow. This will work very briſkly; and, after it is over, the uſual diet is to be continued. If horſes of value were to be kept to this diet once a year, it would make them leſs hot and dry, and not ſubject to many diſeaſes which they are troubled with at preſent, and would be particularly uſeful after campaigns and long journies. If the horſe loſes his appetite by this diet, it will be proper to tie a chewing ball to his bit, renewing it ſo often, till at length he begins to feed heartily on the barley; for theſe balls at once reſtore appetite, and are themſelves of a Fattening nature. *Mortimer's Huſbandry.*

FAVORI'TO, in the Italian muſic, is an epithet given to ſuch parts of any compoſition as are performed to the greateſt advantage. Thus, choro Favorito is a chorus in which are employed the beſt voices and inſtruments to ſing the recitativo's, play the ritornellos', &c. This is otherwiſe called the little chorus, or choro recitante. *Broſſ. Muſ. Dict.*

FAU'SSE *Chenille*, in natural hiſtory, a term uſed by Mr. Reaumur, and others of the French writers, to expreſs a large claſs of worms produced from the eggs of ſeveral ſpecies of four-winged flies.

The Fauſſe chenilles are a claſs of animals almoſt as numerous as the caterpillar. They are eaſily diſtinguiſhed into ſeveral genera, according to the different numbers of legs, as thoſe with eighteen legs, thoſe with twenty, twenty-two, and twenty-four. The Fauſſe chenille of the alliaria is of this laſt kind. They are of ſeveral colours, in the different kinds; ſome are white, ſome brown, others black, but the greateſt number of all are green. There are many of a ſlate colour, or bluiſh black variegated with ſtreaks and ſpots of brown, and other colours. And, beſide theſe, there are others variegated on ſeveral other grounds; in general, however, they are much inferior in beauty to the caterpillars. The colours of theſe inſects are however very indiſtinct marks to diſcern them by, ſince they are not permanent, but the creature varies them at different times of its life. Theſe inſects, like the true caterpillars, change their ſkin ſeveral times in their lives, and with it they change their colours alſo. The young ones of theſe animals are always much more handſome than thoſe more grown; for, at every change of the ſkin, there is a loſs of ſome of the variegations; and uſually at the laſt change they are all gone, and the creature puts on a colour different from any that it had before. This is an obſervation of the accurate Valliſnieri, who gives an inſtance of it in a worm caterpillar of the elder. This creature, while young, is of a fine green, with a long ſtreak of brown running all the way down the back; but, after the laſt change of its ſkin, it appears without the ſtreak, and all over of a pale yellowiſh hue.

Theſe creatures differ from the common caterpillars in their manner of remaining on the leaves of a plant. The caterpillar is always extended at its full length, whether it is eating or not; but the Fauſſe chenille, though it extends its body to the full length while eating, always rolls it up into a ſpiral when at reſt, making ſeveral circular turns with it, of which the head is at the end of the outermoſt, and the tail in the very center of the inner one. They give themſelves various odd contortions, when they are ſeizing on their food; and it is a very whimſical ſight to obſerve twenty or thirty of them, in thoſe kinds which live in ſociety, attacking the different portions of the ſame leaf all at once, and each giving its body ſome odd turn at the ſame time. This is a common ſight on the leaves of the oſier; a whitiſh green kind being very frequent in large companies on that tree, and often ſeen thus feeding in covies. It is remarkable, that, as the caterpillar feeds indifferently on every part of the leaf, this animal uſually attacks only the edges. Some ſpecies of theſe animals feed only early in the morning, and, as the leaves are then wetted with the dew, they cannot avoid taking in a large quantity of water with their food; in conſequence of which, when they are examined afterwards, their bodies are frequently found covered with drops of a thick and viſcous matter of an ill ſmell. It ſeems probable, that the abundant aqueous matter in this caſe finds its way out at thoſe numberleſs apertures in the ſkin, at which the creature takes in the air: theſe inſects, as well as the caterpillars, having very numerous tracheæ.

The generality of the animals of this claſs feed on the leaves of plants and trees, but there are ſome which affect other parts of them. There are a ſmall ſpecies very frequently found living within the young branches of the roſe-tree, which often deſtroy that part of the ſhrub. Others are found lodged in young pears, apples, and other fruit: They ſeem to have been placed there, when very young, and always deſtroy the fruit, occaſioning its falling off from the ſtalk before half grown. Some ſpecies of them are alſo found on the leaves of trees, which are rendered tumid, and make what are called leaf galls, theſe being often inhabited by animals of this claſs, in particular the leaf galls of the willow. The creature, when it finds the time of its change into the nymph ſtate approaching, gives itſelf the trouble of forming a caſe in which it may paſs into that ſtate, and remain in it during the deſtined time, without being ſubject to external injuries. It ſpins a web of ſilk for this purpoſe of the ſhape of a little egg. This on the outſide ſhews nothing remarkable, but when cut open, it is found to be compoſed of two different ſubſtances, at leaſt of two ſubſtances of very different workmanſhip, though the materials are the ſame in both. The outer caſe is reticulated, and formed of very ſtrong threads wove into a looſe open net work ; but the inner one is formed of extremely fine threads, and thoſe wove into a cloſer ſtuff than all that the loom can come up to. The outer ſtrong and coarſe web was plainly intended for no other purpoſe, but for the better defending and preſerving them from injuries. And theſe two diſtinct caſes do not any where adhere to one another, but barely touch ; ſo that, on pulling aſunder the outer one between the fingers, the inner one comes out whole. The ſtrength of this exterior ſhell is extremely neceſſary, as alſo the cloſe texture of the inner one, for the defending the incloſed animal in the nymph ſtate from ſeveral devouring inſects. The ants, in particular, are very fond of theſe nymphs, and will hunt out the caſes wherever they are to be found ; and, if they can eat their way through them, are ſure to make a meal of the incloſed creature.

The roſe worm, or Fauſſe chenille, is very ſingular in the manner of its performing this great work. This is a ſmall greeniſh ſpecies often found on the leaves of the roſe, and famous for the various odd attitudes into which it twiſts its body occaſionally. It uſually carries its tail erect, and often in the ſhape of the letter S. This ſpecies, though green on the ſides and belly, is yellowiſh on the back, variegated with ſeveral ſpecks of black or deep brown, from each of which there grows a long hair. This creature, when the time of feeding is over, goes into the ground, in order to ſpin its double web. The external one is of a reddiſh brown, and the internal one whitiſh. Theſe when taken out of the earth are uſually fouled with ſmall particles of dirt, ſo that, to have them in perfection, it is beſt to keep the animal in a box, where it will ſpin them perfectly clear. There are ſome ſpecies of this animal that hide themſelves in the holes of trees, and in the cavities between the bark and the wood ; and theſe never ſpin any outer web, but are found incloſed in the fine thin internal one alone. They all, after having paſſed a proper time in this ſtate, ſome only a few weeks, others a whole winter, become four-winged flies. The flies produced of theſe inſects are of that kind which have no trunk, but have a ſtrong tooth on each ſide of the head, which, meeting one with the other in the middle of the mouth, are able to cut any thing to pieces that the creature has occaſion to make its way through. The firſt uſe of theſe is the eating a hole through the double web, in which the creature finds itſelf incloſed at its birth. All the flies of this kind have a general reſemblance one to another, and may be known to belong to the ſame family, though they are very different in colour, and other obvious characters. They are never very handſome, and are all as it were ſtupid, having very little motion, and ſtanding readily at any time to be caught between the fingers. Their wings always are croſſed over the body, and form a ſort of raiſed covering over it ; they are not ſmooth and even, as thoſe of moſt other flies, but have prominencies and cavities, and ſeem as if they had been but ill expanded, at the time of the creature's hatching from the nymph ſtate. *Reaumur's Hiſt. Inſ.*

FEE'DING *of fiſh.* The owner of fiſh-ponds will find this an article very worthy of his conſideration, as the trouble or expence of it are very little, and the profit very great. In a ſtew, thirty or forty carps may be kept up from October to March, without any other food than what they will find there for themſelves. And, by fiſhing with trammels or flies, it will be proper in March or April to take, from the larger waters, ſome to repleniſh the ſtews ; but after this, from March to October, it is neceſſary to feed them as much as to feed chickens that are cooped up, and it will turn to as good account. The care of doing this is beſt committed to the gardener, who is always at hand and on the ſpot ; for the regular ſerving them is of the utmoſt conſequence.

Any ſort of grain is good to feed them with, eſpecially peaſe and malt coarſe ground, and grains after brewing, while they are freſh and ſweet, are very proper ; but it is to be obſerved, that that one buſhel of malt, not brewed, will go as far as two buſhels of grains. Chippings or raſpings of bread ſteeped in the droppings of malt liquors, eſpecially of ale, are very good for carp. The quantity of theſe ſhould be about two quarts a day to thirty carps ; and it is better to have it given twice a day, that is, morning and evening, than all at once. Peaſe or other ſeeds or grains, boiled and prepared for the food of carp, may be let down into the water on a ſquare board like a trencher, ſupported by four ſtrings, one at each corner, and with ſome leads faſtened to its bottom to ſink it a proper depth ; it is to be ſupported by a pole or otherwiſe, and it is a very entertaining ſight to obſerve the manner in which they will come all about it, and take off their food.

When large ponds which contain great numbers of fiſh are to be fed in this manner, it will be ſome expence to the owner ; but on taking out the fiſh, and obſerving how they thrive by it, this will be eaſily borne with.

Grains are the cheapeſt and moſt ſtaunch food that can be procured for fiſh, and, where breweries are near, they are eaſily had, but even in country places it will be eaſy to agree with the neighbouring families, who brew, to throw their grains into the pond at a certain price. Carp and tench will be fed like fowls in this manner. Pike alſo may be fed with eels to fatten them quickly, and with any other fiſh at other times. Pearch are not at all proper for this ſort of management.

FEE'LERS, *antennæ*, in natural hiſtory, are the horns, as they are uſually called, upon the heads of inſects.

FELLI'NG *of timber.* Many circumſtances are well known and conſtantly obſerved in the Felling of timber for building, which though, to a haſty obſerver, they might appear trifling, yet prove, on experience, to be of the utmoſt conſequence. One thing obſerved by Mr. De Buffon, which very greatly increaſes the ſolidity and ſtrength of timber, is that the trees, intended to be felled for ſervice, ſhould firſt be ſtripped round of their bark, and ſuffered to ſtand and die upon the ſpot before the cutting. The ſappy part, or blea of the oak, becomes by this management as hard and firm as the heart, and the real ſtrength and denſity of the wood has been proved, by many experiments, to be greatly increaſed by it ; nor is this a practice of any detriment to the proprietor, ſince the remaining ſtumps of theſe trees ſend up their young ſhoots as vigorouſly, as if they had been cut down in their natural condition. *Memoires de l' Acad. Scienc. Par.*

When any tree is to be cut down for timber, the firſt thing to be taken care of is a ſkilful diſbranching ſuch limbs as may endanger it in its fall. Many trees are utterly ſpoiled for want of a previous care of this kind. In arms of timber that are very great, it is always neceſſary to chop or ſink in them cloſe to the bole, and then, meeting it with downright ſtrokes, it will be ſevered from the tree without ſplitting. In Felling the tree, take care always to cut it as cloſe to the ground as poſſible, unleſs it is intended to be grubled up ; and the doing this is of advantage both to the timber, and to the wood ; for timber is never ſo much valued, if it be known to grow out of old ſtocks. When an oak is down, the bark is to be ſtripped off, and ſet ſo that it may dry well. Trees that are nine inches girt about a yard from the ground, are commonly reckoned timber trees ; but none under this ſize, becauſe ſuch will be about ſix inches girt in the girting-place, when the bark is off : the knowledge of this will ſave the trouble of climbing up to meaſure them. The common method of ſelling timber is as it ſtands, but the ſeller is liable to great cheat and impoſition in this reſpect. It is ſold either by the load or ton ; forty feet is reckoned a ton in ſome places, and fifty a load ; and in others fifty in the ton, and the load is but forty ; ſo that whoever ſells timber ſtanding, ſhould mention how many feet he means in the ton or load. The trees, when felled, are meaſured either by girth or ſquare meaſure ; it is uſually reckoned, that forty feet of round timber, or fifty feet of hewn or ſquare timber, weigh the ſame, that is, twenty-hundred. And this is uſually counted a cart load ; and, as they ſeldom ſtrip the bark off from elm, the buyer commonly allows an inch for the bark, which is a great deal more than it comes to ; and therefore, if the owner can ſtrip off the bark in the meaſuring-place, which ſhould be about the middle of the tree, it will be much the better.

Some allow four feet out of every load for aſh, and five feet for oak and elm ; and, as for the computation of the feet, if it is ſquare meaſure, the ſquare is taken by a pair of callipers, or by two rules clapped to the ſide of the tree, meaſuring the diſtance between them, and, if the ſides are unequal, they add them together, and take half the ſum, which they account the true ſide of the ſquare.

If girth meaſure be uſed, they do it by girting the middle of the body of the tree with a line, and taking a quarter part of this girt for the ſquare, meaſuring the length from the butt end ſo far forwards, till the tree comes to be but ſix inches in the girth, that is, twenty-four inches in circumference ; and, if the trees have any great boughs which are timber, that is, which hold ſix inches girth, they meaſure them by themſelves, and then add them to the whole. For the caſting up the contents of this, they make uſe of Gunter's line, upon which, if a pair of compaſſes be extended from twelve to the number of inches contained in the ſquare, they place one foot of the compaſſes at the length, and keep the ſame extent with them ; if the ſquare is under twelve inches, the compaſſes are to be returned twice from twelve, and it will ſhew the contents. This is the common practice of meaſuring, and therefore the ſeller muſt generally acquieſce in it ; it is a very falſe way, being almoſt one fifth part leſs than the whole. *Mortimer's Huſbandry.*

FEN *(Dict.)* — What the farmers call Fens or fenny-lands are of two kinds. Firſt, thoſe which are only drowned by upland floods and great rains, and are very large and lie upon the levels, ſo that the water cannot run off from them, but muſt be there till the hot weather and winds dry it off : and, ſecondly, thoſe that are conſtantly wet, only that in dry times they are ſhallower covered with water than in others. In draining of theſe ſorts of lands, which is the only means of making them uſeful to the world, two things are to be conſidered : firſt, the laying them perfectly dry, which can only be effected by the making cuts and drains for the carrying off the water from their loweſt parts, and thence from the whole ; or, ſecondly, the taking off from the great additional wetting they have from land floods, and long continued rains. The firſt method makes a perfect cure ; the other is only a temporary relief, and makes the lands more ſerviceable in dry times, and leaves leſs for the ſun to dry up.

Whatever is attempted in regard to the draining of Fens, the loweſt part of the ground is to be found out firſt, and the overflowing from great rains, and from land-floods, muſt be provided for, in the carrying off that way; for, ſhould this be neglected, all the labour and coſt employed on the other principle would be thrown away. If it is found that this can be done, there muſt be afterwards be cut a large drain through the middle of the land, and ſeveral ſmaller drains communicating with this.

The great drain muſt be dug deep enough to drain the whole level, and this, and all the others, muſt be made the narroweſt at the head, and wider all the way to the mouth, where it muſt be wideſt of all.

Theſe drains muſt be all well cleanſed from mud and weeds every ſpring and autumn, and the water from land-floods muſt be kept from coming in upon theſe lands, as much as poſſible, that there may be the leſs to be drained off; the lower edges of the Fen-land muſt be for this purpoſe guarded with banks to turn the water into other channels. In Eſſex, they have many lands that lie below the high-water mark, and are above the low-water mark, and have land-floods or fleets running through them, which make a ſort of ſmall creek. Theſe lands they have a very eaſy way of draining, though they are naturally very moiſt, when they firſt incloſe them from the ſea; they do it with a bank, which they extend from one ſide of the land they deſign to take in to the other, excepting a ſpace that they leave, where the creek or land-floods run into the ſea. They then prepare a wooden frame, well planked and of a conſiderable thickneſs, fitted to the head of the creek, and capable of ſhutting it wholly up; in this frame they make ſeveral holes, in which are placed wooden troughs, made each of four boards, and ſuited in ſize and number to the quantity of water that is to be diſcharged through them from the land-floods. Each of theſe trunks is open towards the creek, but on the ſea-ſide it has a door or flap, which opens when the land-flood preſſes againſt it, and gives it free paſſage out; but, when the ſea-water is riſen to the height of it and preſſes it, it is ſhut by the force, and no ſea water is let in. When this head is prepared, they let it in, and, ſtopping up the whole creek, they continue the banks on each ſide till they meet it: thus all the land-floods are let out at low water, and not a drop of ſea water can be admitted, ſo that the lands are kept dry and uſeful, which were before rendered uſeleſs, by being drowned with ſalt water at every high-water mark. The freſh water of the creek is thus kept unmixed with the ſea water, and therefore affords good drink for the cattle, which is commonly very difficult to be had in this ſort of lands, the tides ſpoiling what freſh waters there are, every time they come up. *Mortimer's Huſbandry.*

The wet grounds called Fens in Lincolnſhire and elſewhere in England, bring many advantages to the inhabitants of thoſe countries. Fowl and fiſh are very plentiful in them. The pike and eels are large and eaſily caught, but they are uſually coarſe. The duck, mallard, and tail are in ſuch plenty, as is ſcarce to be conceived; they are taken in decoys, by prodigious flocks at a time. They ſend theſe fowl to London from Lincolnſhire, twice a week on horſe-back, from Michaelmas to Lady-day, and one decoy will furniſh twenty dozen, or more, twice a week, for the whole ſeaſon, in this manner. The decoy-men contract with the people who bring them to London at a certain rate, and they are obliged to take the whole number that is catched off their hands. Two teal are uſually reckoned equal to one duck, and ſix ducks and twelve teal are accounted a dozen of wild-fowl; and the uſual market price is about nine ſhillings, for ſuch a dozen. About Midſummer, when the moulting ſeaſon is, a great number are deſtroyed alſo by the people of the neighbourhoods. The poor birds at this time are neither able to ſwim nor to fly well; and the people going in with boats among the reeds, where they lie, beat them down with long poles.

A little before Michaelmas, vaſt flights of theſe birds arrive at the decoys from other places; they ſoon grow fat in them, and continue there a prey to the maſters or owners, as long as the decoys are unfrozen; but, when they are iced over, they fly away again, and go to the neighbouring ſeas for food. *Philoſ. Tranſ.* N°. 223.

The Fens alſo abound in a ſort of herbage that is very nouriſhing to cattle: ſheep and horſes always grow fat upon it. Theſe Fens are common, and the owners of cattle mark them, that they may be known. It is remarkable, that, though all is open, the cattle, uſed to one particular ſpot of ground, ſeldom leave it, but the owner may find them always in or near the ſame place. The Fens have many large and deep drains. In theſe the pike and eels grow to a vaſt ſize; and they are full of geeſe which feed on the graſs, but theſe eat rank and muddy, and may even be ſmelt, as ſoon as a perſon comes into a room where they are roaſting. But the people have another very great advantage in theſe, beſide the eating them, that is, their feathers and quills; and the produce of theſe is ſo great, that the Cuſtom-houſe books in the town of Boſton ſhew, that there are frequently ſent away, in one year, three-hundred bags of feathers, each bag containing a hundred and a half weight. Each pound of feathers brings in the owner two-pence, and it may be thought ſtrange by people unacquainted with theſe things, but it is a certain truth, that the owners pull them five or ſix times a year for their feathers, and three times for their quills. Each pulling comes to about a pound, and many people have a thouſand geeſe at a time, or more. They are kept at no charge, except in deep ſnowy weather, when they are obliged to feed them with corn.

FE'NCES, in gardening. — In hotter climates than England, where they, have not occaſion for walls to ripen their fruit, their gardens lie open, where they can have a water Fence, and proſpects; or elſe they bound their gardens with groves, in which are fountains, walks, &c. which are much more pleaſing to the ſight than a dead wall: but in colder countries, and in England, we are obliged to have walls to ſhelter and ripen our fruit, although they take away much from the pleaſant proſpect of the garden.

Since therefore we are under a neceſſity to have walls to ſecure our gardens from the injury of winds, as well as for the conveniency of partitions or incloſures, and alſo to ripen our fruit, brick walls are accounted the beſt and warmeſt for fruit: and theſe walls, being built panel-wiſe, with pillars at equal diſtances, will ſave a great deal of charge, in that the walls may be built thinner, than if they were built plain without theſe panels; for then it would be neceſſary to build them thicker everywhere: and, beſides, theſe panels make the walls look the handſomer.

Stone walls are to be preferred to thoſe of brick, eſpecially thoſe of ſquare hewn ſtones. Thoſe that are made of rough ſtones, though they are very dry and warm, yet, by reaſon of their unevenneſs, are inconvenient, to nail up trees to, except pieces of timber be laid in them, here and there, for that purpoſe.

But in large gardens it is better to have the proſpect open to the pleaſure garden; which ſhould be ſurrounded with a foſſe, that from the garden the adjacent country may be viewed; but this muſt depend on the ſituation of the place: for, if the proſpect from the garden is not good, it had better be ſhut out from the ſight by a wall, or any other Fence, than to be open. As alſo, when a garden lies near a populous town, and the adjoining grounds are open to the inhabitants; if the garden is open, there will be no walking there in good weather, without being expoſed to the views of all paſſengers; which is very diſagreeable.

Where the foſſes are made round a garden which is ſituated in a park, they are extremely proper; becauſe hereby the proſpect of the park will be obtained in the garden; which renders thoſe gardens much more agreeable than thoſe which are confined.

In the making theſe foſſes there have been many inventions; but, upon the whole, I have not ſeen any which are in all reſpects preferable to thoſe which have an upright wall next the garden; which (where the ſoil will admit of a deep trench) ſhould be five or ſix feet high; and, from the foot of this wall, the ground on the outſide ſhould riſe with a gradual eaſy ſlope to the diſtance of eighteen or twenty feet; and where it can be allowed, if it ſlopes much farther, it will be eaſier, and leſs perceptible; as a ditch to the eye, when viewed at a diſtance. But, if the ground is naturally wet, ſo as not to admit a deep foſſe, then, in order to make a Fence againſt cattle, if the wall be four feet high, and ſlight poſts of three feet high are placed juſt behind the wall, with a ſmall chain carried on from port to port, no cattle or deer will ever attempt to jump againſt it: therefore it will be a ſecure Fence againſt them; and, if theſe are painted green, they will not be diſcerned at a diſtance, and at the ſame time the chain will ſecure perſons walking in the garden from tumbling over.

In ſuch places where there are no good proſpects to be obtained from a garden, it is common to make the incloſure of park paleing; which, if well performed, will laſt many years, and has a much better appearance than a wall: and this pale may be hid from the ſight within, by plantations of ſhrubs and evergreens; or there may be a quick hedge planted within the pale, which may be trained up, ſo as to be an excellent Fence by the time the pales begin to decay.

There are ſome perſons who make ſtuckade Fences round their gardens to keep out cattle, &c. which, when well made, will anſwer the purpoſe of Fences; but this being very expenſive in the making, and not of very long duration, has occaſioned their not being more commonly in uſe.

As to Fences round parks, they are generally of paling; which, if well made of winter-fallen oak, will laſt many years; but a principal thing to be obſerved, in making theſe pales, is not to make them too heavy; for, when they are ſo, their own weight will cauſe them to decay; therefore, the pales ſhould be cleft thin, and the rails ſhould be cut triangular, to prevent the wet lodging upon them; and the poſts ſhould be good, and not placed too far aſunder. If theſe things are obſerved, one of theſe pales will laſt, with a little care, upwards of forty years very well. The common way of making theſe Fences is, to have every other pale nine or ten inches above the intermediate ones; ſo that the Fence may be ſix feet and a half high, which is enough for fallow deer; but, where there are red deer, the Fence ſhould be one foot higher, otherwiſe they will leap over.

Some incloſe their parks with brick walls; and, in countries where ſtone is cheap, the walls are built with this material; ſome with, and others without mortar.

A kitchen garden, if rightly contrived, will contain walling enough to afford a ſupply of ſuch fruits as require the aſſiſtance of walls, for any family; and this garden, being ſituated on one ſide, and quite out of ſight of the houſe, may be ſurrounded with walls; which will ſcreen the kitchen garden from the ſight of perſons in the pleaſure garden; and, being locked up, the fruit will be much better preſerved than it can be in the public garden: and the having too great a quantity of walling is often the occaſion that ſo many ſcandalous trees are frequently to be ſeen in large gardens, where there is not due care obſerved in their management.

The height of garden walls ſhould be twelve feet; which is a moderate proportion; and, if the ſoil be good, it may in time be well furniſhed with bearing wood in every part, eſpecially that part planted with pears, notwithſtanding the branches being trained horizontally from the bottom of the walls.

I would recommend the white thorn, the holly, the black thorn, and crab, for outward Fences to a good ground: but I do not approve of the intermixing them.

The white thorn is the beſt quick to plant; becauſe it is the moſt common, and may be clipped ſo as to render it the cloſeſt and the hardieſt Fence of any other tree; and, being very durable, is preferred to all others for outward Fences; or, for the diviſion of fields, where they are expoſed to cattle, &c.

The black thorn, and crabs, make very good Fences, and are to be raiſed as the white thorn: but, if the kernels of apples or crabs be ſown, it is beſt to ſow the pommace with them, and they will come up the ſooner, i. e. the firſt year.

If crab ſtocks be planted, while young, in the ſame manner as quick, they make excellent hedges; and ſo will ſome ſorts of plums.

The holly will make an excellent Fence, and is preferable to all the reſt; but it is difficult to be made to grow at firſt, and is a ſlow grower; but when once it does grow, it makes amends by its height, ſtrength, and thickneſs. *Miller's Gard. Dict.*

FENCES, in agriculture. — The incloſures of grounds are in ſome places made by ditches full of water, and others by walls either of ſtones alone, or of ſtones and earth. Where theſe materials are in plenty, they make very good Fences, but in other places, the common method is by quick hedges. To raiſe them, a ditch is dug and a bank thrown up, and on this young trees are regularly planted. The white thorn is the beſt of all trees to plant for a Fence, being a tolerable quick grower, and laſting a long time, and making a very handſome Fence. It will ſucceed on any ſoil where a ditch and new bank are made, except it be wholly of gravel or ſand; and even in this caſe it will thrive, if there happen a rainy ſeaſon after the planting of it.

Some raiſe it by ſeeds, and others by young plants; the latter is the moſt expeditious way, for the ſeeds lie two years in the ground before they ſhoot, but they grow very faſt after two or three years. Some prepare the haws, or fruit of the white thorn, by tying them up in a hair bag, and ſoaking them all winter; after this, if they are ſown in February or March, they will come up the firſt year, and grow better than any other way.

Where ſets are ſcarce, it is a good way, when the underwoods are felled, or rather the year before, to ſow haws and ſloes in them, and they will furniſh a ſupply of young plants for hedges, without doing the woods any harm, becauſe they may be drawn before they come to be too large. The white thorn is alſo of conſiderable value in ſome ſort of works; its root becomes very beautifully veined, when old, and elegant boxes and combs are made of it. It is uſed by ſome alſo, in the buſineſs of inlaying, and would be more ſo, if its beauty were more known. The crab and the ſloe tree, or black thorn, come next in value to the white thorn, for quicks for Fences. *Mortimer's Huſbandry.*

FERMENTATION (*Dict.*)—Fermentation under the hands of the diſtiller differs from the common, which is uſed in the making of profitable malt liquors and wines, as being much more violent, tumultuary, active, and combinatory than that. A large quantity of ferment or yeaſt is here added, the free air is admitted, and every thing contrived to quicken the operation; whence it is ſometimes precipitately finiſhed in the ſpace of two or three days.

This great diſpatch has its great inconveniences with regard to the ſpirit, which hence becomes not only fouler, or much more groſs and really terreſtrial, than if the liquor had been ſlowly fermented; but alſo ſuffers a diminution in its quantity, from the violent and tumultuary admiſſion, conflict, and conſtant agitation of the free air in the body, and upon the ſurface of the liquor; eſpecially if not immediately committed to the ſtill, as ſoon as the Fermentation is fairly ſlackened or fully ended.

It is a difficult taſk to render the buſineſs of Fermentation at once perfect and advantageous. To ferment in perfection of neceſſity requires length of time, proper attendance, and cloſe veſſels; beſides ſeveral particular encheireſes and contrivances, which one cannot reaſonably expect ſhould be received and practiſed in the large way of buſineſs, on account of the charge: unleſs it could be made appear, as there is ſome reaſon to ſuſpect it may, that the increaſe in the quantity of ſpirit (not now to mention the improvement of its quality) might be brought to pay the additional expence: but it requires farther experience to reduce the thing to a certainty. In the mean time, it may not be amiſs to try how much of the more perfect art of vinous Fermentation is profitably practicable by the diſtiller, in the preſent circumſtance of things.

The improvements to be made in this affair will principally regard, (1.) 'The preparation or previous diſpoſition of the fermentable liquor. (2.) The additions tending to the general, or ſome particular end. (3.) The admiſſion or excluſion of the air. (4.) The regulation of the external heat or cold. And (5.) A ſuitable degree of reſt at laſt'. When proper regard is had to theſe particulars, the liquor will have its due courſe of Fermentation, and thence become fit to yield a pure and copious inflammable ſpirit by diſtillation.

It has been long known, that the tincture, ſolution, or liquor, deſigned for Fermentation and the ſtill, ſhould be made thin, or very conſiderably aqueous; as this property not only fits it to ferment readily, but alſo to yield more of a pure vinous ſpirit in proportion, and part with it eaſier in diſtillation, than if it were richer, more glutinous, or clammy: the groſs, foul, viſcid, and earthy particles of ſuch glutinous liquors being after Fermentation apt to riſe with the boiling heat employed to raiſe the ſpirit, which thus of courſe comes over foul and fœtid.

There is another advantage attending this thinneſs of the liquor, viz. that it will the ſooner fall fine, by ſtanding, before Fermentation: whence it may be commodiouſly drawn off from its fæces, or bottom; which muſt always, in caſe of corn, malt, or other mealy ſubſtances, be kept out, where the purity of the ſpirit is conſulted.

A certain degree of warmth ſeems requiſite, in the northern climates, to all artificial liquors intended for immediate Fermentation, eſpecially in the winter: but the natural juices of vegetables that have never been inſpiſſated, as that of grapes, and other fruits, when fully ripened, will uſually ferment as ſoon as they are expreſſed, without any external aſſiſtance. But as a certain degree of inſpiſſation prevents all tendency to Fermentation in vegetable juices, otherwiſe ſtrongly diſpoſed to ferment; ſo a long continuance or increaſe of the inſpiſſating heat, eſpecially if it acts immediately, through a metalline or ſolid body, upon the juice, will deſtroy its fermenting property; and this the more effectually, as the heat employed approaches to that of ſcorching, or the degree capable of giving an empyreuma. After the ſame manner, ſeveral experiments make it appear, that there is a certain degree of heat; the continuance, or leaſt increaſe whereof, proves detrimental, or deſtructive to Fermentation; as there is another that wonderfully encourages and promotes it. Theſe two degrees of heat ought to be carefully noted and ſettled by the thermometer, or other more certain method, for philoſophical and chemical uſes; but for common or œconomical occaſions, they may be limited to what we uſually underſtand by a tepid and a fervid heat: a fervid heat is the bane of all vinous Fermentation; as a tepid one, or rather an imperceptible warmth, is the great promoter thereof. In this neutral ſtate therefore, with proper contrivances to preſerve and continue it, the liquor is to be put into a ſuitable veſſel for Fermentation; at which time, if it work not of itſelf, it muſt be quickened by additions; and, in general, by ſuch things as are properly called ferments.

By ferments is here meant any matter, which, put to a rightly diſpoſed fermentable liquor, will cauſe it to ferment much ſooner and faſter, than it would of itſelf; and thus greatly ſhorten the operation. Thoſe are called ferments in an abuſive ſenſe, which, when added to the fermentable liquor, only correct ſome fault therein, and thereby fit it to ferment the better, yield the more ſpirit, or give ſome particular flavour.

The primary uſe of ferments, therefore, is to ſave time, and make diſpatch in buſineſs, whilſt they only occaſionally and accidentally give a flavour, or increaſe the quantity of ſpirit. And, accordingly, all fermentable liquors may, without the leaſt addition, and only by a proper management of heat, be brought to ferment, more perfectly, though more ſlowly, than with the aſſiſtance of ferments.

Theſe ferments, in general, are the flowers and fæces of all fermentable liquors, generated and thrown up, or depoſited, either in the Fermentation itſelf, or after the operation is finiſhed.

There are two of theſe procurable in large quantities, and at a moderate expence, viz. beer-yeaſt and wine-lees; a prudent and artificial management, or uſe whereof, might render the buſineſs of diſtillation much more facile, certain, and advantageous. It has been eſteemed a conſiderable difficulty and diſcouragement, in this buſineſs, to procure a ſufficient ſtock of theſe materials, and preſerve them, at all times, ready for uſe. Hence, ſome have been driven to invent artificial ferments, or to form mixtures, or compounds of particular fermentable ingredients, but with no great ſucceſs: theſe uſually falling ſhort in their effects, even in compariſon of bakers leaven. And indeed whoever has any talent at experiment, in this way, will ſoon find it much eaſier, cheaper, and better, in all reſpects, to preſerve the uſual and natural ferments, or raiſe nurſeries thereof, than to invent artificial compoſitions, or good ſerviceable ſubſtitutes for them.

That common yeaſt may be preſerved freſh and perfect, for ſeveral months, is matter of experience; and neceſſity has put people upon inventing ſeveral expedients for the purpoſe. The foundation of the thing reſts wholly in dextrouſly freeing the matter of its ſuperfluous moiſture, and bringing it out of a ſemi-fluid ſtate, wherein it is always expoſed to a farther Fermentation, or deſtructive alteration; and thus of courſe runs into what is vulgarly called corruption: at which time, it becomes intolerably fœtid and cadaverous. The method of drying it in the air is ſubject to great inconveniencies, and requires the due obſervance of ſeveral circumſtances, and particular encheireſes, to render it perfect and effectual. The beſt way, in all reſpects, is ſlowly and gradually to preſs it, in a thick, cloſe, and ſtrong canvas bag, after the manner of wine-lees, by the tail-preſs, till at length it comes into a kind of cake; which, though ſoft, will eaſily ſnap, or break dry and brittle betwixt the fingers. And in this ſtate, being well packed up, or cloſely ſecured in a tight caſk, it will long keep uncorrupted, fragrant, and fit for the fineſt uſes.

The ſame method is likewiſe practicable to the ſame advantage in the flowers or yeaſt of wine; which may thus be commodiouſly received from abroad. Or, in defect of theſe flowers, others of equal goodneſs may be raiſed from freſh wine-lees barely by mixing, and ſtirring them into a proper warm liquor: whence the lighter, or more moveable and active parts of the lee, will be thrown to the top, and may be taken off, and preſerved, as above-mentioned, in any quantity that ſhall be deſired.

And hence a facile method of raiſing an inexhauſtible fund, or perpetual ſupply, of the moſt uſeful ferments, may be readily formed, in the way of ſucceſſive generation; ſo as to cut off all future occaſion of complaint, for want of them, in the buſineſs of diſtillation.

It muſt be obſerved, that all ferments abound in eſſential oil, much more than the liquors that produce them; whence they very ſtrongly retain the particular ſcent and flavour of the ſubject. It is therefore requiſite, before the ferment is applied, to conſider what flavour ought to be introduced, or what ſpecies of ferment is beſt ſuited to the liquor. The alteration thus cauſed by ferments is ſo conſiderable, as to determine, or bring over any neutral fermentable liquor, to be of the ſame ſpecies with that which yielded the ferment: which is an obſervation of greater moment, than will preſently be conceived; as opening not only a new ſcene in the buſineſs of diſtillation, but alſo ſome other buſineſſes depending upon Fermentation. The benefit of it does not, however, extend to malt, treated in the common way; nor to any other ſubject but what affords a ſpirit tolerably pure and taſteleſs: as it otherwiſe makes not a ſimple, pure and uniform, but a compound, mixed, and unnatural flavour. How far the fine-ſtiller may apply it, well deſerves his conſideration; and whether our native cyder-ſpirit, crab-ſpirit, &c. which have little flavour of their own, may not, by this artifice, or a little farther improvement of it, be brought nearly, or intirely into the ſtate of ſome highly eſteemed foreign brandies, is recommended to experience.

When the proper ferment is thus pitched upon, ſuitable to the deſign; its quantity, quality, and manner of application, are next to be conſidered.

Its quantity muſt be proportioned to that of the liquor, its tenacity, the degree of flavour it is intended to give, and the diſpatch required in the operation; from which conſiderations, every one will form a rule to himſelf: but, till ſuch a rule is obtained, or in order to obtain it, proper trial will ſhew how much ſuffices for the purpoſe; beginning with a little, and obſerving to add more occaſionally; the weight of the whole being noted before-hand. Treacle is found to require a large proportion of ferment, and even ſometimes needs the aſſiſtance of other additions. Indeed, the manner wherein this inſpiſſated juice is obtained, tends greatly to unfit it for Fermentation. The ſtrength, long continuance, and almoſt immediate contact of the fire in ſugar-making and refining, and the frequent uſe of lime, or other alkaline or terreſtrial bodies, ſo condenſe, indurate, and ſcorch the body of this juice, and abſorb its acid, that one would ſcarce expect it ſhould ferment at all, even with the addition of jalap, or other powerful, ſaline, and acid, or acrid ſtimulators, which tend to break the viſcous and aduſt connexion, or ſtrong combination of its particles.

More circumſpection is neceſſary, with regard to the quality of the ferment, if a pure ſpirit be required; for, in caſe of the leaſt muſtineſs, or corruption, which all ferments have a ſtrong and natural tendency to, unleſs carefully cured and preſerved, it may deeply impreſs itſelf, and communicate a finewy or fœtid, nauſeous and cadaverous ſmell and taſte to the whole body of the liquor and ſpirit. Great care is therefore required, that the ferment be perfectly freſh and fragrant, nor in the leaſt inclinable to acidity, or eagerneſs; which might prevent its riſing, or forming a head, and give the liquor an acetous, inſtead of a vinous tendency.

When thus the proper quantity of a good-conditioned and ſuitable ferment is got ready, it muſt be put to the fermentable liquor in the bare tepid, or ſcarce luke-warm ſtate above-mentioned. The beſt manner of bringing them together, for raiſing the Fermentation quick and ſtrong, ſeems to be this: when the ferment is ſolid, it ſhould be broke into ſmall pieces, and gently thinned, with the hand, or otherwiſe, in a little of the luke-warm liquor. But a complete uniform ſolution ſhould not be here endeavoured; becauſe this would, in ſome meaſure, weaken the power of the ferment, or deſtroy its future efficacy. The whole intended quantity, therefore, being thus looſely mixed with a moderate parcel of the liquor, and kept near the fire, or elſewhere, in a tepid ſtate, free from the too rude commerce of the external air; more of the inſenſibly warm liquor ought, at proper intervals, to be added, till, at length, the whole quantity is well ſet at work together. And thus, by dividing the buſineſs into parts, it may be much more ſpeedily and effectually done, than by attempting it all at once: in which caſe, it is very apt to miſcarry, and require a reparation in the method already deſcribed.

When thus the whole is ſet at work, ſecured in a proper degree of warmth, and kept from a too free intercourſe with the external air; it becomes, as it were, the ſole buſineſs of nature to finiſh the proceſs, and render the liquor fit for the ſtill; and thus the general end of the Fermentation would be anſwered. But during the whole courſe of the operation, there are ſeveral other things that may be added, with ſome particular view; as either to improve the vinoſity, increaſe the quantity of the ſpirit, or give a particular flavour. And ſuch additions may require ſome particular alterations in the general method above ſet down. See ADDITIONS. *Shaw's Eſſay on Diſtillation.*

In order to aſcertain the fermentative quality of animal ſubſtances, Dr. Pringle, in the Appendix to his Obſervations on the Diſeaſes of the Army, has made ſeveral curious experiments: bread and water only ſtood ſeveral days, in a furnace, heated, as uſual, to 100 degrees; but, two drachms of freſh meat being added to double the former quantity of bread, and water in proportion, the mixture began to ferment in a few hours, and continued to do ſo about two days. For the moſt part, the Fermentation was ſo ſtrong that, if the corks had not frequently given way, the phials muſt have burſt. The bread and fleſh which at firſt lay at the bottom, ſoon roſe to the top, and conſtantly, as the air elapſed, let fall ſome particles that had been buoyed up by the fluid; thus a ſediment was formed, reſembling lees, whilſt the lighteſt part, or flowers, remained on the ſurface; but, the Fermentation continuing, theſe alſo ſubſided, and the acid taſte and ſmell of the liquors, after the action ceaſed, was a farther proof of the preceding Fermentation. This change was the more extraordinary, as, when the motion began, the mixture was tending to corruption, and, in effect, in a few hours afterwards, became offenſive; but next day the putrid ſmell abated, and went off before the Fermentation ceaſed.

The doctor made ſeveral other experiments, to the ſame purpoſe, and nearly ſimilar effects; from all which, he thinks it probable that moſt animal ſubſtances, tending to putrefaction, are endowed with a power of raiſing a Fermentation in the farinacea, and even of renewing that action in ſuch as have undergone it before.

The effect of Fermentation therefore is to change putrid ſubſtances to a ſtate of acidity, which they not only retain, but grow ſtill more and more acid. It is obſerved, indeed, that the acid ariſing from Fermentation has ſomething of an auſtere and ſaltiſh taſte, but without any offenſive ſmell. Now, conſidering how much air is generated by Fermentation, it may ſeem ſtrange that the ſame materials, uſed as food, ſhould make ſo little diſturbance in the body. And the difficulty would be the greater, did the ſaliva, as ſome ſuppoſe, promote both Fermentation and putrefaction.

From this theory of Fermentation the doctor accounts for the ſourneſs or acidity of the ſtomach, a diſorder to which many people are ſubject; ſince not only a ſtrong but an auſtere acid may be produced from the food of thoſe who live on fleſh, bread, and water only, as often as the ſtomach is relaxed, or any way diſabled from conveying the whole aliment into the inteſtines; for what is left, having time to undergo a complete Fermentation, is thereby changed into a harſh ſort of vinegar.

Spirits, wines, acids, bitters, aromatics, and the hotter antiſcorbutic plants retard alimentary Fermentation, by their power of correcting putrefaction. However, they may have their ſeveral uſes; ſome for checking immoderate Fermentation, when, by reaſon of a putrid effluvia, or a defect of it, the aliment may ferment too violently; and others, again, for bracing the ſtomach, and fitting it for expelling its contents in due time.

All theſe facts correſpond with digeſtion; for the moſt nouriſhing and digeſtable food, to people in health, conſiſts in a due mixture of animal and vegetable ſubſtances with water: ſcorbutic or putrid habits require acids, wine, or other antiſeptics. An acid, abounding in the ſtomach, is corrected by abſorbents, and, in a want of natural heat, and a debility of the ſtomach, wines, bitters, and warm and acid ſubſtances become neceſſary. *See Pringle's Obſerv. on the Diſeaſes of the Army, Append.*

FERMENTED *Liquors.*—All Fermented liquors abound with with an over-proportion of water; and, if a very conſiderable quantity of it were taken away, they would become not only richer, but more durable, provided that ſo much of the aqueous humidity was retained, as was juſt ſufficient to preſerve the vinous conſiſtence, to keep the ſaline part fluid, and to retain the ſlimy and unctuous parts expanded and mixed among

mong the reſt. But as an actual and truly ſaline matter abounds in wine and in vinegar, and that of an acid, auſtere, and tartareous kind; when the ſpirituous part is drawn away, the wine becomes ſurpriſingly more auſtere; and, when a large quantity of the watery part is ſeparated, this ſuperabundant ſaline, tartareous matter coagulates into a cryſtalline form, and either falls to the bottom, or ſticks to the ſides of the caſk. For the ſubtile, oily matter, which makes the ſpirituous part in wine, blunts and takes off from a tartareous acidity, in the ſame manner that the addition of ſpirit of wine blunts, ſheathes, and dulcifies the acid, corroſive parts of ſpirit of nitre, in making the ſpiritus nitri dulcis.

But this tartareous ſalt, abounding alſo with an over-proportion of ſo groſs and unctuous matter, cannot be diſſolved or diluted without a very large proportion of water, which being taken away, it preſently converts into dry and ſolid cryſtals, as is the known caſe of cream of tartar. Hence proceeds the effect before obſerved, that the auſterity and roughneſs of wine are the more preſerved, the more the wine is deprived of its ſpirituous parts. This experiment is familiar in our kitchens, where wine, being burnt or boiled into ſauce, is found to have a much greater degree of auſterity, than the ſauce and wine had before it had undergone the action of the fire, and loſt its ſpirituous part.

When the water is, even by diſtillation, plentifully drawn off from wine, not of a terreſtrial and chalky, but of a tartareous nature, a beautiful tartar will be found to cryſtallize, among the remaining maſs, in a conſiderable proportion. But though this ſuperfluous water, that generally dilutes the wine, and weakens its taſte, might be advantageouſly ſpared from it, and it would then become much more rich and noble, and at the ſame time more ſmooth and ſoft, through the loſs of ſome conſiderable portion of its tartar; yet this ſeparation cannot be effected by diſtillation, becauſe that carries away other parts as well as the water, and damages the whole, by taking off what ought to be the moſt carefully preſerved. The ſpirituous part is the life of all fermented liquors; it keeps the whole together, and in a manner embalms and renders them durable, and not ſubject to corruption; it alſo in a great meaſure gives them that aromatic, refreſhing, and reſtorative virtue, and the beſt effects they have on the human body. Nor is this all, but the intimate and ſubtile union of this ſpirituous part with the reſt is perfectly the ſole and entire cauſe of both the former effects; ſo that it by no means ſuffices to have the ſpirit barely preſent among the other parts, for then it might be drawn off and poured back again, without any damage to the wine; but the eſſential union is here diſſolved by taking it away, and can never be reſtored again by a ſimple re-affuſion. It is therefore deſtructive of the end propoſed thus to break and diſſolve the texture of the wine, and this entirely ſubverts and deſtroys its nature. This inevitably proves the caſe, whenever wine is evaporated or diſtilled, which conſtantly requires a degree of heat capable of raiſing water into vapour; and hence the ſpirituous part, being greatly lighter than the aqueous, flies off together with it, or before it, and the wine is left diſſolved in its texture, and without its ſoul. Upon this, the remaining ſaline unctuous maſs is ſo diſturbed, as no longer to remain connected, but it becomes thick and turbid, and afterwards runs impetuouſly into a kind of corruption attended with acidity and ropineſs. All theſe circumſtances ſhew, that, though the condenſing of wines by taking away their ſuperfluous humidity would be a very deſirable thing, yet it is by no means to be done by evaporation. *Shaw's Eſſay on concentrating Wines.*

FERN, *Filix*, in botany. There are great varieties of this plant, in different parts of the world; but we ſhall only mention two ſpecies, the male and the female.

The leaf of the male Fern is compoſed of other leaves, which adhere to a rib in ſuch a manner, as to have lobes on both ſides, cut into the depth of the main fibre: the fruit reſembles that of polypody.

It grows on the ſhady banks of hedges: the part uſed in medicine is the root, which is thick, blackiſh without, but pale within, fibrous, involved and interwoven with multitudes of appendages, and of a bitter and ſomewhat aſtringent taſte.

The virtues are the ſame as thoſe of the female Fern; but it has a peculiar efficacy againſt the rickets, or reckets. It expels worms and the ſtone; relieves thoſe who labour under an increaſe of the ſpleen. Dioſcorides ſays, that the root drank, or made into an ointment with fat, cures wounds inflicted by arrows. Theophraſtus, Pliny, and Dioſcorides agree, that it cauſes barrenneſs and abortion. Tragus aſſures us, from his own experience, that, when a horſe falls down, and you are puzzled to find the nature of his diſorder, if you put a rib of the root of this plant under his tongue, he will immediately excrete both ways, and riſe up. *Dale, Ray.*

The common female Fern, or brakes, has many large leaves divided into ſeveral branches, beſet with long, narrow, ſtiff pinnulæ, which are moſtly ſmooth about the edges, though ſometimes they are a little indented: The back of theſe, about Midſummer, will be covered round the margins with a great number of duſky brown particles, which are the ſeed: the root is long and thick, ſpreading much in the earth, ſending out ſhoots on every ſide, which makes it hard to be eradicated: It grows but too frequently on commons and heaths, being uſed, in want of fuel, by the country people, for heating their ovens, and other uſes.

The roots only are uſed in medicine, and thoſe but rarely, being commended as very good for worms, eſpecially the flat worm: a kind of pot-aſh is made of the ſtalks and leaves burnt. *Miller's Bot. Off.*

The common female Fern is very miſchievous and troubleſome to the farmers, being very difficult to deſtroy, where it has any depth of ground to root in. Its root will often penetrate to eight feet deep, and, ſpreading a great way, they will riſe again to the ſurface, and ſend up new plants at a conſiderable diſtance. In graſs land the beſt way of deſtroying it is mowing the graſs, three times a year in ſpring, in May, and in Auguſt. Dung and aſhes are very good manure for lands which abound with it, but the beſt of all things, for deſtroying it, is urine. Fern cut up, when the ſap is in it, and laid to rot upon the ground, is a very good manure for land, and will mellow it ſo as to prevent its binding. Trees, planted where Fern grows, are obſerved to thrive very much, even though it be upon a hot gravel; the reaſon of this is, that the Fern ſhades the roots and keeps them moiſt and cool. *Mortimer's Huſb.*

The ſeeds of the ſeveral ſpecies of Fern were wholly unknown to the antients. Swammerdam, in his Biblia Naturæ, claims to himſelf the honour of having firſt diſcovered them; but it appears from Hook's works, that Dr. William Cole ſent an account of the ſeeds of ſeveral of the plants of this kind to that author, in 1669, whereas Swammerdam declares his diſcovery of them to have been in 1673; ſo that it is plain that Dr. Cole's was prior to his by ſome years. Swammerdam is an author of that ſtrict probity, that there is no room to doubt but that he ſpoke what he thought to be true; and it is even poſſible that he might have diſcovered them ſooner than the time he mentions; but, however that be, it appears from the later obſervations of the ingenious Dr. Miles, that his accounts are extremely accurate and juſt. The ſeed-veſſels of the common Fern, the Engliſh and foreign maiden-hairs, the wall-rue, hart's-tongue, and the like plants, are all alike in their general form, their only differences being in the ſize, and their arrangement on the plants. The number or quantity of the ſeeds is very different in different plants, but Mr. Miles obſerves, that, the fewer ſeeds there are in any ſpecies, there is always the more in quantity of a ſort of ſpongy or fungous matter, which forms a kind of tubercle, not unaptly reſembling what is called Jew's-ears, which ſeems a ſubſtance intended for the ſheltering the ſeeds.

In the female Fern and Engliſh maiden-hair, the whole ſurface of the leaf, on the under ſide, ſeems covered with a congeries of ſeeds, ſo that they guard one another, and therefore have leſs occaſion for a covering of fungous matter of this kind; yet even on theſe plants, when the ſeeds are fallen off, there are found ſmall membranes, a little curled, looking as if they had been raiſed with the edge of a fine penknife, from the ſkin of the leaf, not unlike the pieces of ſkin that are raiſed off from the hand, in the trying a penknife or other ſharp inſtrument. In the common male Fern, there are found, at the proper ſeaſon, ſeveral brown ſpots placed in a regular manner; theſe are of a pale brown colour, and are principally compoſed of this fungous matter, the ſeed-veſſels being ſmall and inſerted round it. *Phil. Tranſ.* Numb. 461.

Theſe ſeed-veſſels conſiſt of a ſtalk by which they are inſerted into the leaf; this repreſents an elaſtic cord, and is ſurrounded by a great number of annular ribs, reſembling the cartilages of the aſpera arteria; and indeed nothing in nature ſo exactly reſembles this cord or ſtalk, as the wind-pipe of a ſmall bird. This cord incircles the globular membranous pod wherein the ſeed lies, adhering to it, and dividing it into two hemiſpheres.

The pod is compoſed of a fine whitiſh membrane ſomewhat like that which lines the inſide of a pea-ſhell; the ſeeds are irregular in ſhape, and of a reticulated ſurface. The moſt advantageous way of viewing this is to uſe the common microſcope for opake objects, putting on a ſmall magnifier, and laying the ſeeds with their capſules, &c. as taken from the back of the plant, on a piece of poliſhed ivory. The proper time of the year is in the beginning of September; and then, if the plant be newly gathered, the ſeed-veſſels often burſt, while they are under inſpection, and ſhew a very elegant appearance. The manner of this burſting of the pod, which is the method nature has taken for the ſcattering and diſperſing of the ſeed, is this: the cord becomes extended in ſome one part, and ſoon after breaks aſunder; this by expanding burſts the pod into two parts, and, continuing to expand itſelf, as it departs from a curve, and approaches to a right line, it rends itſelf away from the globular pod, till it be at length wholly diſengaged from it; and then, as there can be no farther reſiſtance given to its expanding, it ſuddenly flies off, with a ſort of jerk, and becomes quite ſtraight at once. By this laſt action the capſules are ſhook, and the ſeeds are diſcharged out of them on the plate of ivory, in the ſame manner as the grains of wheat or barley would be thrown out of a bowl plaeed on a table, by the ſhaking of the bowl. This is a beautiful phænomenon in the minute ſeed-veſſel of the Fern, and frequently ſeen when the ſeeds are freſh gathered, as then the cords and capſules are green and juicy, and the burſting goes on gradually; but, when they are dry and criſp, there is nothing of this ſeen, for the burſting is inſtantaneous, and the ſeeds are toſſed ſo far by it, that none of them fall within the area taken by the lens. When the pod and cord are but juſt ripened, they ſometimes are twenty minutes in burſting, and the whole method of the proceſs is then diſtinctly and beautifully ſeen. This whole mechaniſm would be ſeen in a much more perfect and beautiful manner, if it were poſſible to get off the ſeed-veſſels from the leaves without injuring them in doing it; for the common way, in getting them off, is by rubbing the leaves, and this muſt neceſſarily burſt a great number of them; in this method they are ſeen to fly off from the leaves, in form of a fine duſt or powder, and often get into the pores of the ſkin, and become as troubleſome, as cow-itch. *Phil. Tranſ.* Numb. 461.

FERN-*aſhes.* The aſhes of the common female Fern produce a very ſingular phænomenon, in the common way of treating them and their ſalt. If a large quantity of theſe aſhes are procured, and the ſalt to the quantity of ſeveral pounds extracted from them in the common way, it will ſucceed better than in ſmaller quantities. The greater part of this ſalt being dried, if the remainder, which is more moiſt, be expoſed to the air to receive ſome of the vapours of it, this will ſoon become fluid, or an oil, as it is very improperly called, by deliquium. The reſt of the lixivium, which will be heavy, and of a deep blood red, or claret colour, being ſet by in a glaſs veſſel unſtopped for five or ſix months, there will be found, at the bottom of the liquor, a very large quantity of ſalt precipitated to the thickneſs of about two inches of the bottom of the veſſel. The lower part of this will have all the foulneſs, and appear diſcoloured; but the upper part will be extremely pure and white. From the ſurface of this part, there will grow up a number of plants, in appearance ſtanding erect, and at ſmall diſtances from one another. Theſe are only the laſt cryſtallizations of the ſubſiding or ſeparating ſalt, but they have a regularity that is very ſurpriſing; they vary conſiderably in ſize and weight, but are all of the ſame ſhape, exactly reſembling ſo many plants of the common unbranched Fern, ſending out a great number of regular leaves on each ſide the ſtem. Theſe ramifications of the ſalt will remain many weeks in this perfection, if the veſſel be not ſtirred; but they are ſo tender, that the leaſt motion deſtroys them, and they, after this, never will form themſelves again. *Phil. Tranſ.* Numb. 105.

FERN-*oil*, in pottery, a name given, by our merchants who have been in China, to a ſort of varniſh, which the Chineſe uſe in their porcelain manufactories: it is alſo called lime-oil, and is a thing ſo eaſily made, that it would be worth attempting what might be done with it, in our imitations of the porcelain. They make it in this manner: they take a large quantity of Fern well dried, and, ſpreading a covering of it over a piece of ground ſufficient for the quantity of oil they intend to make, they lay upon this a coat of large lime-ſtone, newly calcined into lime; on theſe they ſprinkle with the hand a ſmall quantity of water juſt to ſlake them. They cover this bed of lime with another of Fern, and ſoon, till they have raiſed it to eight or ten feet high; they then ſet fire to the Fern; this burns away in a little time, and leaves a mixture of the lime and its own aſhes. This mixture is laid in the ſame manner between beds of more Fern, and burnt again. This operation is repeated five or ſix times. *Obſerv. ſur les Coutom. de l' Aſie.*

When the laſt calcination is finiſhed, the mixture of lime and aſhes is carefully gathered up and thrown into large veſſels of water, and, with every hundred weight of it, they put in one pound weight of kekio; they ſtir the whole together, and, when the coarſer part has ſubſided to the bottom, they take off the finer which ſwims at the top in form of a fine cream, and, putting it into another veſſel of water, they let it ſubſide to the bottom by long ſtanding; they then pour off the water, and ſave the reſiduum in form of a thick oil.

This they mix with the oil of ſtone, prepared by powdering and waſhing in the ſame manner a particular ſort of ſtones, and, with this, they cover all the veſſels that they intend to varniſh. The Fern-aſhes have a very great ſhare in the advantage that this oil has over our common varniſh; and the Chineſe tells us, that they once inſtead of Fern uſed the wood of a tree, called ſetki; and they ſuppoſe that the ſuperiority of the old porcelain over the preſent is owing to the uſe of this tree inſtead of the Fern; but it is now too ſcarce among them. The new manufacture which we have at Briſtol excels every thing that has been done of the like kind, in the beauty of the varniſhing; and it is ſaid, they have found their advantage on an imitation of this, and the Chineſe oil of ſtone. Theſe two oils, as they are called, are always mixed together, and they muſt be carefully preſerved of the ſame degree of thickneſs, or elſe all the varniſhing will not be even. *Obſerv. ſur les Coutom. de l' Aſie.*

FE'RRET, *vivierra.* This creature has but one note in her voice, which is a ſhrill but ſmall whining cry. The female uſually brings forth ſeven or eight young ones at a time: ſhe carries them in her body forty days; the young ones are blind for a long time after they are littered. When they are tamed, they are to be fed with milk, and with barley bread; they will faſt a long time; when they walk, they ſet up their back, which is otherwiſe ſo long, that it would be troubleſome to drag it on; when they are touched, they ſmell very diſagreeably; they naturally ſleep very much. The Ferret is a bold and audacious animal, and is an enemy to almoſt all others. It does not eat the fleſh of the creature it kills, but ſucks their blood.

When the warrener has occaſion to uſe the Ferret to catch rabbits, he firſt makes a noiſe in the warren to frighten them all into their holes; then he pitches his nets, and, having muzzled the Ferret that he may not bite the rabbits, he turns him into their holes to frighten them out, and then the dogs drive them into the nets that are ſet for them.

FERRETS, in glaſs-making, the irons with which the workman tries the melted metal to ſee if it be fit to work.

It is alſo uſed for thoſe irons which make the ring at the neck of bottles. *Neri's Art of Glaſs.*

FERRE'TTO, in the glaſs trade, a ſubſtance which ſerves to colour glaſs. This is made by a ſimple calcination of copper, but it ſerves for ſeveral colours. There are two ways of making this; the firſt is this: take thin plates of copper, and lay them on a layer of powdered brimſtone, in the bottom of a crucible; over theſe lay more brimſtone, and over that another layer of the plates, and ſo on alternately, till the pot is full. Cover the pot, lute it well, place it in a wind furnace, and make a ſtrong fire about it for two hours. When it is taken out and cooled, the copper will be found ſo calcined, that it may be crumbled to pieces between the fingers, like a friable earth; it will be of a reddiſh, and in ſome parts a blackiſh colour. This muſt be powdered and ſifted fine for uſe.

The other way is leſs eaſy, but it makes a more valuable Ferretto. It is this: make a number of ſtratifications of plates of copper and powdered vitriol alternately in a crucible, which place in the floor of the glaſs furnace near the eye, and let it ſtand there three days; then take it out, and make a new ſtratification with more freſh vitriol, and calcine it again as before; repeat this operation ſix times, and a moſt valuable Ferretto is produced. *Neri's Art of Glaſs.*

FERRI'FIC *Cauſe*, a term uſed by ſome writers to expreſs that principle, to which what they call production or generation of iron in burnt bodies, in which no iron could be diſcovered before burning, is owing. It is the general opinion of the preſent philoſophers, that this iron thus diſcovered in the aſhes of plants, and the like burnt ſubſtances, really exiſted there before, and only needed the diſunion of the concreted body, to the bringing of its parts together. If this be the caſe, there is evidently no production of iron in the caſe, and therefore the term Ferrific is a word without a meaning. Becher, however, in his Supplement to his Phyſica Subterranea, is of a very different opinion, determining, that the iron is really produced in theſe caſes, during the action of the fire, and that by the tranſmutation of ſome other matter into iron; and from this he agrees the poſſibility of gold-making among chemiſts by tranſmuting ſomething elſe into gold, as ſome other ſubſtance is in this caſe tranſmuted into iron.

FE'RULA, *fennel giant*, in botany, a genus of plants, whoſe characters are:

It has a large, ſucculent, and milky root; the ſtalks are fungous, full of pitch, and diſpoſed to take fire. The ſeeds are very large, oval, and thin; they throw off their involucrum, and, for the moſt part, turn black, when ripe.

It is ſometimes cultivated in the gardens of botaniſts, and flowers in July. The parts in uſe are the medullary ſubſtance of the ſtalk, the ſeeds, and the juice or gum, which is the ſagapenum of the ſhops. *Dale.*

The medulla, or pith, of the green Ferula, being drank, is good for ſpitting of blood, and the cœliac paſſion. It is preſcribed in wine, for the bite of the viper; and, intruded into the noſtrils, ſtops bleeding of the noſe. The ſeed, drank, relieves under the gripes, and, uſed in unction with oil, provokes ſweat. The ſtalks, taken as food, cauſe head-ach; they are uſually pickled. The Ferula often produces a ſtalk three cubits long; its leaves reſemble thoſe of fennel, but are much larger and thicker. The ſagapenum diſtils from the ſtalk, wounded near the root. *Dioſcorides, Lib.* ii. *cap.* 91.

FEVE, in natural hiſtory, a name firſt given to the chryſalis of the ſilk-worm, and from thence to all chryſaliſes of the butterfly kind; in which ſenſe it is now received and uſed with the moſt accurate writers, and made a ſynonymous term with the words chryſalis and aurelia.

Choleric FEVER, in medicine, the name of a Fever, called alſo by ſome a bilious Fever, and by others a cauſus; though the generality of writers diſtinguiſh the cholerica febris from the cauſus. All bilious Fevers are properly ſpecies of acute Fevers, and owe their origin to diſtemperatures of the bile, at times when the aliments are in a ſtate of fermentation in the ſtomach and inteſtines.

The cauſus is diſtinguiſhed from the cholerica febris, properly ſo called, by its being ever much more violent and dangerous, and by the excretions which attend it: for, in the choleric Fever, the vitiated gall and bilious excretions are always plentifully voided, ſometimes upward, ſometimes downward, and ſometimes both ways. In the cauſus, the matter is more uſually detained in the body, and rarely voided otherwiſe than by vomiting, and that uſually only in ſmall quantities, and in the beginning of the diſtemper.

Signs of it. The general ſigns of the cholerica febris and cauſus are a remarkable anxiety, and frequent complaints about the breaſt, as of a ſtraitneſs and painful heat. A violent heat on the inſide of the mouth, and inſatiable and intolerable thirſt, trembling and convulſive motions of the joints, and violent deliriums. Dryneſs of the mouth and tongue are often ſo terrible in this diſeaſe, that the ſkin cracks with it; and often the whites of the eyes, ſometimes the whole body becomes yellowiſh. The peculiar and appropriated ſymptoms of a cholerica febris, ſtrictly ſo called, are an univerſal languor and debility of the limbs.

A ſevere ſhivering firſt ſeizes the patient, and is ſoon ſucceeded by a very violent heat, and raging pain in the head; and, after the two firſt days, there uſually are very terrible ſtrainings and reachings to vomit. The matter brought up at theſe times is cauſtic, acrid, and bilious, and inflames and even ulcerates the fauces; and, if voided upon a ſtone floor, effervesces violently. If this vomiting abates, there immediately comes on a diarrhœa attended with a teneſmus, occaſioned by the irritation of this ſharp matter in the rectum. Faintings alſo are very frequent in this diſeaſe, eſpecially where the vomitings do not bring up a ſufficient quantity of the offending matter. The peculiar and appropriated ſigns of the cauſus, ſtrictly ſo called, are theſe: a violent and inſatiable thirſt, greater than that in any other Fever. The bowels are always bound, and it is but very ſeldom that there is any tendency to vomit. The urine is reddiſh and turbid, and, after ſtanding ſome time, depoſits a red ſediment. Often there is a ſenſible pain and ſoreneſs in the præcordia, ſo that the patient cannot bear the leaſt touch upon the breaſt; and uſually, in the courſe of the diſeaſe, there are faintings and violent convulſions.

Perſons moſt ſubject to this diſeaſe are ſuch as eat largely, and drink heavy and imperfectly fermented liquors after it. The cholerica febris, properly ſo called, is moſt frequent with thoſe of a cholerico-ſanguineous habit, and ſuch as feed on high-ſeaſoned meats, and drink abundance of wine or other ſtrong liquors; and is often brought on ſuch perſons, by their falling into violent paſſions after a full meal. The cauſus peculiarly attacks the people of melancholic habits, who are much inclined to paſſion, but ſuppreſs it, and who are naturally coſtive.

Method of cure. The cure of theſe diſeaſes conſiſts in the mitigating the violent ſharpneſs of the humour, and promoting its evacuation; and, finally, in abating the burning heat brought on by it. The utmoſt endeavours are firſt to be made to correct and alter the morbific matter. To this purpoſe, the ſeveral preparations of nitre, with the teſtaceous powders and mucilaginous ptiſans, with ſmall mixtures of lemon-juice, and frequent draughts of cooling and diluting liquors, are to be given moderately warm. If the coſtiveneſs be too violent, clyſters of broth muſt be injected, with the addition of a little oil and ſalt; and, if neceſſary, ſmall doſes of rhubarb. To quell the febrile heat and emotion of the blood, the miſtura ſimplex may be given with great ſucceſs; and there is often a ſenſible good effect from the application of rags, wetted in camphorated ſpirit of wine, to the pit of the ſtomach. After the morbific matter is evacuated, the reachings to vomit may be allayed by gentle opiates. All hot medicines change the bilious Fevers into inflammatory ones, and the common ſudorifics drive the morbific matter into the blood, and uſually bring on almoſt immediate diſcolourings of the ſkin, like thoſe of the jaundice. Bleeding, though performed ever ſo early in the diſeaſe, ſeldom does any good, except only in remarkable plethoric habits. *Junker's Conſp. Med.*

FIBRA'RIÆ, in natural hiſtory, the name of a claſs of foſſil bodies, the greateſt part of which have been very improperly called, by the writers of foſſils, fibroſe talcs, they being of a very different ſubſtance and ſtructure of parts from the talcs, and having none of their diſtinguiſhing characters.

The word is derived from the Latin *fibra*, a fibre, or filament, theſe bodies being all compoſed of arrangements of parallel filaments of fibres.

The Fibrariæ, in general, are foſſils compoſed of parallel filaments uſually remaining ſo diſtinct as to preſerve in the whole maſſes of a thread-like texture, but ſometimes uniting ſo as to form plates or flakes, reſembling thoſe of the talcs in external figure. They are bright, and in ſome degree tranſparent; not giving fire with ſteel, nor fermenting with, or ſoluble in acid menſtrua. *Hill's Hiſt. of Foſſ.*

FI'BROSE *roots*, thoſe which conſiſt wholly of ſmall fibres, ſuch as the roots of the meadow-graſs, pinks, and ſeveral other flowers. When a Fibroſe root penetrates ſtraight into the ground, it is called perpendicular; when it creeps under the ſurface, horizontal; when ſomewhat thick, it is called fleſhy; when very thin, capillary; when it runs all the way undivided, ſimple; when divided, or when it ſends off ſmaller roots, branched; when its ſurface is covered with extremely ſhort and fine fibres, hairy.

FICOI'DES, in botany, a genus of plants, whoſe characters are:

The whole plant is ſucculent, and has the appearance of houſleek: the leaves are conjugated, or grow oppoſite by pairs: the calyx ſurrounds the extreme margin of the ovary; is of a carneous or fleſhy ſubſtance, and pentaphyllous or pentaphylloidal: the flower is polypetalous, very minutely divided, and ſpringing from the top of the capſule: the ovary produces five reflected tubes, and becomes firſt a ſucculent, afterwards a fungous fruit, divided into five or more cells, like little pods full of numerous minute ſeeds.

Boerhaave, in his Index alter Plantarum, enumerates fifty-three ſpecies of this plant; which, in the Hiſtoria Plantarum attributed to him, are ſaid to be of an emollient quality, and to have the other virtues of the ſedum or houſleek. The fruit is eatable, and a good part of the food of the Hottentots.

FIELD-*book*, in ſurveying, a book uſed for ſetting down angles, diſtances, and other things, remarkable in taking ſurveys.

The pages of the Field-book may be conveniently divided into five columns. In the middle column, the angles at the ſeveral ſtations taken by the theodolite are to be entered, with the diſtances from the ſtations. The diſtances taken by the off-ſet ſtaff, on either ſide of the ſtation line, are to be entered into the columns on either ſide of the middle column, according to their poſition with reſpect to that line. The names or characters of the objects, with proper remarks, may be entered in the columns on either ſide of theſe laſt mentioned. *Treat. Pract. Geom.*

FIE'LDFARE, in zoology, the Engliſh name of a bird of the thruſh kind, called by authors turdus pilaris. It is larger than the common thruſh, and is of a bluiſh grey colour on the neck; the head is ſpotted with black, and the ſhoulders and back are a yellowiſh brown, variegated with black; the throat is variegated with black and yellow; the lower part of the belly is white and but a little ſpotted; and on each ſide of the neck, and near each eye, it has a large black ſpot; thoſe on the neck are on its lower part near the inſertions of the wings; its wing-feathers are variegated with black, white, and a yellowiſh brown, and the tail is of a bluiſh black, with ſome variegations of black and white.

It is a bird of paſſage, and viſits us in England towards the end of autumn in vaſt flocks, and leaves us in ſpring; it is not certainly known where they breed. They feed on berries, particularly thoſe of the holly, and are a well-taſted bird. *Ray's Ornith.*

FIE'LD-FORT.— *Plate* XXXI, *fig.* 6. in the Dictionary, repreſents an irregular Field-fort; ſuch as are thrown up by an army, when they beſiege a place.

FIG (*Dict.*)— *Method of cultivating* FIG-TREES.— Theſe trees are always planted as ſtandards, in all warm countries; but in England they are generally planted againſt walls, there being but few ſtandard Fig-trees, at preſent, in the Engliſh gardens: however, ſince the fruit is found to ripen well upon the ſtandards, and the crop of Figs is often greater upon them, than upon thoſe trees againſt walls, it may in time become the general practice to plant them either in ſtandards or eſpaliers: the latter, I think, will ſucceed beſt in England, if they were managed as in Germany; where they untie the Fig-trees from the eſpalier, and lay them down, covering them from the froſt with ſtraw or litter; which prevents their ſhoots being injured by the froſt; and this covering is taken away gradually in the ſpring, and not wholly removed until all the danger of froſt is over: by which management, they generally have a very great crop of Figs; whereas, in England, where the trees grow againſt warm walls, if the ſpring proves warm, the young Figs are puſhed out early; and the cold, which frequently returns in April and May, cauſes the greateſt part of the fruit to drop off, ſo that our crop of Figs is generally more uncertain, than moſt other ſort of fruit; and it frequently happens, that trees which are planted againſt north and eaſt aſpected walls, produce a greater quantity of fruit in England, than thoſe which are planted againſt ſouth and ſouth-eaſt aſpects; which muſt happen from the latter putting out their fruit ſo much earlier in the ſpring than the former: and, if there happen cold froſty nights, after the Figs are come out, which is frequently the caſe in this country, the forwardeſt of the Figs are generally ſo injured as to drop off from the trees ſoon after. In Italy, and the other warm countries, this firſt crop of Figs is little regarded, being few in number; for it is the ſecond crop of Figs which are produced from the ſhoots of the ſame year, which is their principal crop; but theſe rarely ripen in England; nor are there above three or four ſorts which ever ripen their ſecond crop, let the ſummer prove ever ſo good; therefore it is the firſt crop which we muſt attend to in England: ſo that, when theſe trees are growing againſt the beſt aſpected walls, it will be a good method to looſen them from the wall in the autumn; and, after having diveſted the branches of all the latter fruit, to lay the branches down from the wall, faſtening them together in ſmall bundles, ſo that they may be tied to ſtakes, to keep them from lying upon the ground; the damp whereof, when covered in froſty weather, might cauſe them to grow mouldy: and hereby they will be ſecured from being broken by the wind. When they are thus managed in the autumn, if the winter ſhould prove very ſevere, the branches may be eaſily covered with peas-haulm, ſtraw, or any other light covering, which will guard the tender fruit-bearing branches from the injury of froſt: and, when the weather is mild, the covering muſt be removed, otherwiſe the Figs will come out too early; for the intention of this management is to keep them as backward as poſſible: then in the ſpring, when the Figs are beginning to puſh out, the trees may be faſtened up to the wall again. By this management, I have ſeen very good crops of Figs produced in two or three places.

I have alſo ſeen great crops of Figs in ſome particular gardens, after very ſharp winters, when they have, in general, failed in other places, by covering up the trees with reeds made into panels, and fixed up againſt the walls.

In the pruning of Fig-trees, the branches muſt never be ſhortened; becauſe the fruit are all produced at the upper part of the ſhoots; ſo, if theſe are cut off, there can be no fruit expected; beſides, the branches are very apt to die after the knife: ſo that, when the branches are too cloſe together, the beſt way is to cut off all the naked branches quite to the bottom, leaving thoſe which are beſt furniſhed with lateral branches at a proper diſtance from each other; which ſhould not be nearer than a foot; and, when they are well furniſhed with lateral branches, if they are laid four or five inches farther aſunder, it will be better.

The beſt ſeaſon for pruning of Fig-trees is in autumn, becauſe, at that time, the branches are not ſo full of ſap; ſo they will not bleed ſo much, as when they are pruned in the ſpring; and, at this ſeaſon, the branches ſhould be diveſted of all the autumnal Figs; and, the ſooner this is done, when the leaves begin to fall off, the better will the young ſhoots reſiſt the cold of the winter. There are ſome ſeaſons ſo cold and moiſt that the young ſhoots of the Fig-trees will not harden, but are ſoft and full of juice: when this happens, there is little hope of a crop of Figs the ſucceeding year; for the firſt froſt in the autumn will kill the upper part of theſe ſhoots, for a conſiderable length downwards: whenever this happens, it is the beſt way to cut off all the decayed part of the ſhoots, which will prevent the infection from deſtroying all the lower part of the branches; and, by this method, I have ſeen a moderate crop of Figs put out from the lower part of the ſhoots, where, if the ſhoots had not been injured, there would have been no fruit produced; becauſe it is chiefly from the four or five uppermoſt joints of the ſhoots that the fruit comes out: and it is for this reaſon, that as many of the ſhort lateral branches ſhould be preſerved as poſſible, thoſe being the moſt productive of fruit; for, where the long ſtraight ſhoots are faſtened up, there will be no fruit, but at their extremities; ſo that all the lower part of the trees will be naked, if there is not a particular regard had to ſupply young ſhoots in every part of the trees.

Thoſe trees which are laid down from the walls or eſpaliers, ſhould not be faſtened up again until the end of March, for the reaſons before given; and thoſe againſt walls may remain for ſome time longer: and, when the large ſhoots of theſe are nailed up, if the ſmall lateral branches are thruſt behind theſe, to keep them cloſe to the wall, it will ſecure the young Figs from being injured by the morning froſts: and, when this danger is over, they may be brought forward to their natural poſition again: during the ſummer-ſeaſon theſe trees will require no pruning, but the branches are often blown down by wind; therefore, whenever this happens, they ſhould immediately be faſtened up again, otherwiſe they will be in danger of breaking; for, the leaves of theſe trees being very large and ſtiff, the wind has great power on them; ſo that, where the branches are not well ſecured, they are frequently torn down.

Thoſe trees which are planted againſt eſpaliers, may be protected from the injury of froſt in the ſpring, by placing reeds on each ſide the eſpalier, which may be taken down every day, and put up again at night; but this need not be practiſed in warm weather, but only at ſuch times as there are cold winds and froſty mornings: and, although there is ſome trouble and expence attending this management, yet the plentiful crop of Figs, which may be this way obtained, will ſufficiently recompenſe for both: the beſt way of making this covering is, to faſten the reeds with rope-yarn, in ſuch a manner, as that it may be rolled up like a mat; ſo that the whole may with great facility be put up, or taken down: and, if theſe reeds are carefully rolled up, after the ſeaſon for uſing them is over, and put up in a dry ſhed, they will laſt ſeveral years.

There are ſeveral perſons, who of late have planted Fig-trees in ſtandards, which have ſucceeded very well: this practice was revived, by obſerving ſome old ſtandard Fig-trees in ſome gardens, which had been growing many years, and generally produced a much greater plenty of fruit than any of thoſe trees which were growing againſt warm walls: indeed, the ſtandard Fig-trees are in much greater danger of having their branches killed by ſevere froſt; but in mild winters they generally do better than thoſe againſt walls; ſo that, where theſe trees can be covered in very hard winters, there will always be plenty of fruit; and theſe may be covered by faſtening as many of the branches together, as can be conveniently brought into a bundle; and winding ſome hay-bands, ſtraw, peas-haulm, or any ſuch light covering as can be readily procured; which in the ſpring may be gradually taken off, ſo as not to expoſe the ſhoots all at once to the open air; and, if there is ſome ſuch light covering laid round the ſtems, and upon the ſurface of the ground about their roots, it will more effectually ſecure them from the danger of froſt; but, when this is practiſed, great care ſhould be taken, that no mice or rats harbour in this covering; for theſe will eat off the bark from their ſhoots, and kill them: and I have often obſerved, thoſe trees which were againſt walls, have ſuffered greatly from theſe vermin, by having many of their largeſt branches diſbarked near the ground, which has abſolutely killed them: and it is in the winter that theſe vermin do this miſchief to them; therefore they ſhould be carefully watched at that ſeaſon.

The common blue and white Figs, which are the ſorts that have been the moſt generally cultivated in England, are not ſo proper to plant for ſtandards, as ſome other ſorts which have been lately introduced; for they are much tenderer, and are often killed almoſt to the root, when ſome of the other ſorts, which have been growing in the ſame ſituation, have received very little injury from the froſt: indeed, the white ſort is generally a great bearer, and the fruit is very ſweet; but, to thoſe palates which are accuſtomed to Figs, that ſort is not much in eſteem, from its want of flavour. *Miller's Gard. Dict.*

FIG *inſect*, in natural hiſtory, a name given by the Engliſh to the creature called by the French, after Mr. Reaumur, the faux puceron, or falſe puceron, from its very much reſembling the puceron in external appearance, but extremely different from it, when nearly examined. Theſe inſects are, when at their full growth, of the bigneſs of the head of a pin of the largeſt ſize, but there are uſually found among them ſeveral that are ſmaller, down to ſuch as are ſcarce perceivable to the naked eye. They are found in great plenty on the back or under ſides of the leaves of the Fig-tree, but they never are ſeen in cluſters like the pucerons; twenty or thirty being the greateſt number uſually found on one leaf, and theſe ſcattered in different parts of it. Theſe animals, though of the ſame general figure with the pucerons, yet are of ſo very different a nature, that they are all of them become at length winged inſects, none remaining naked, as great part of the pucerons do; and they are not in a condition to multiply or bring forth young in this ſtate, but muſt paſs firſt through their transformation into the fly, like that to whoſe eggs they owed their origin.

FI'GURES *on China ware.* There are ſeveral very different ways of making the Figures we ſee on the China ware, and, according to the method uſed, they have a very different appearance; but none of them are difficult. The common Figures which we ſee, are traced with a pencil dipped in the colours prepared of ſtones and earths, waſhed to fineneſs by water, and afterwards dried, and then blended with gum-water for uſe in the common way. The common blue is our ſmalt, and the finer blue a ſtone they call leao; the reddiſh is calcined copperas; and the green a preparation of the ſcoriæ of copper. Theſe will all mix with gum-water, and ſpread from the pencil; and the only care to be taken in regard to them is, to make the powder very fine. The miniature paintings, as they are called, on the blue China, are thus done: the veſſel is plunged all over into the common blue, made into a ſoft paſte or varniſh with water; this gives the whole veſſel a coat of blue, and the workman takes a fine needle fitted into a proper handle, and with the point of this, he pricks out his Figures, every touch leaving behind a ſmall white ſpot, which is owing to the taking off the blue where the point touched it; after this is finiſhed, and the whole is dry, the veſſel is varniſhed over, and the Figures appear painted in miniature under the ſurface.

The elevated or emboſſed Figures of beaſts and flowers which we ſee on China, are done in a much eaſier manner, than would naturally be imagined. The artiſt carves theſe firſt with a burin on the ſurface of the veſſel, while yet ſoft; after this he cuts away the ſubſtance about the Figures, and they appear elevated in any degree that he pleaſes. Theſe are painted by the common hands employed in this work, and, when dry, are varniſhed over; and the effect is very elegant, while the means are not at all to be diſcovered.

The moſt beautiful of all China, in the judgment of many, is that which is all white, but has Figures within the ſurface; theſe appear very neat and diſtinct, though the ſurface is perfectly ſmooth. They are made of a whiter matter than the reſt, called hoache (which ſee) and, when theſe are laid on in this white, and covered with the common varniſh, they are ſeen through it, and are of a different white both from the varniſh and the ſubſtance of the China. *Obſervations ſur les Coutumes de l'Aſie.*

FI'GURED *ſtones*, in natural hiſtory, a name given by ſome writers to thoſe foſſil bodies which are found in the ſhape of ſhells and other parts of animals. Diſputes among the learned have never run higher on any ſubject, than on the origin of theſe ſtones; ſome have declared them to be all of marine origin at firſt, and that they were brought to the places where we find them in this foſſil ſtate, at the time of the univerſal deluge, and have been ſince altered in the nature of ſtones, by long lying in the earth, in the way of waters impregnated with ſtony particles, which they have depoſited in them, after entering their ſubſtance in their paſſage through the earth.

Others are of opinion, that theſe bodies, though reſembling ever ſo exactly the ſea fiſhes, yet never were in the ſea at all: but that the firſt ſemina of the ſea ſhells, corals, and other ſubſtances, being carried by the ſea water through the ſubterranean paſſages into all parts of the earth, even into the higheſt mountains, have been there left in vaſt numbers, and, growing there among ſtony matter, have arrived at their true bulk and figure, but in a ſtony ſubſtance.

FILA'GO, *common cudweed*, in botany, a genus of plants whoſe characters are:

The calyx is ſquamoſe, and neither ſhining nor ſpecious: the floſcules are divided or cut in form of a ſtar: the broken parts end in ductile filaments.

The common cudweed grows to be near a foot high, uſually with one woolly ſtalk, having ſeveral long, narrow, crumpled, ſharp-pointed, whitiſh leaves, ſet pretty cloſe to the ſtalk: on the top of the branches grow round globules or heads, compoſed of a great number of ſmall naked flowers ſet together in cluſters; and from the middle of theſe, on both ſides, ſpring ſmaller branches, over-topping them three or four inches, bearing at the ends the like, but ſmaller heads of flowers; whence it is called herb impious, from the younger heads over-topping thoſe from whence they had their original. The heads paſs away into down, holding very ſmall ſeed: the root is ſmall, woody, and periſhing yearly: it grows in dry barren places, and often in fallow fields.

Cudweed is drying and binding, and accounted good for all ſorts of hæmorrhages and fluxes. It is given to cattle that have loſt the ruminating faculty, and is therefore called cudweed. It is rarely uſed. *Miller's Bot. Off.*

FILIPE'NDULA, *dropwort*, in botany, a genus of plants whoſe characters are:

The root is fibrous and perennial, with glandulous bulbs faſtened to it: the leaves are finely jagged, like thoſe of millefoil: the calyx is monophyllous, denticulated, and divided into ſix or ſeven ſegments, which are retroflected, or bent backwards: the flowers are hexapetalous or heptapetalous, looſely diſpoſed in panicles on long ſtalks, which are almoſt naked: the ſtamina are numerous, and ſituated on the reflected margin of the calyx: the fruit is generally round, and contains many ſeeds compacted together, each of them furniſhed with its tube.

The Filipendula is ſtyptic, ſweet-ſmelling, glutinous, of a taſte a little ſaltiſh, and gives a pretty deep-red tincture to blue paper: the root gives it a pretty ſtrong one: it is ſtyptic, and a little bitter. This plant contains a ſalt, approaching to that of alum; but it is mixed with a great deal of ſulphur; for by chymical analyſis we obtain from it a great deal of acid earth and oil. All authors agree that it is very diuretic and aperitive. Tabernæmontanus, after Sylvaticus, Simon Januenſis, Bayrus, and Lobel, recommend it for the epilepſy; and Mercator and Prevotius for the dyſentery. *Martyn's Tournefort.*

FI'LTRUM, in natural hiſtory, the name of a ſtone much uſed in the eaſtern parts of the world, and ſometimes with us, for the filtrating water intended for drinking. The Japoneſe are extremely fond of this ſtone, and impute their uninterrupted health, and particularly their being always free from the ſtone and gravel, to their drinking the water thus cleared of all its heterogeneous and miſchievous particles. The people of this and many other places, thereabout, have a ſettled opinion, that moſt diſeaſes ariſe from impurities of water, and are well aſſured, that theſe impurities are all lodged in this ſtone filtre, and left behind by the water in its paſſage.

The manner of uſing the ſtone is this: they form a ſort of mortars with very thick bottoms, out of the largeſt pieces of it, and the water is poured into theſe, and, the ſtone being of a very lax and ſpongy texture, it ſoon makes its way through, and is received into a veſſel placed underneath for that purpoſe. Some ſay, that the ſtone itſelf is a kind of marine fungus; that it is ſoft, while in the water, and grows to the ſides of rocks in ſome part of the gulf of of Mexico, at the depth of a hundred ells, from whence it is with the utmoſt difficulty got up; and that it hardens into ſtone, as ſoon as it comes into the air.

This ſeems a fabulous account, however, only propagated to countenance the high price it bears. Whatever be its origin in Mexico, we are well aſſured, that there are other places where it is to be had on much eaſier terms, than by fetching it from the deep bottoms of the ſea. We are at preſent acquainted with two kinds of it: the one black, reſembling the common black ſlate, with which we cover houſes; and the other grey, and of a tophus ſtructure. We have alſo ſtones which may be applied to this purpoſe, in many parts of Europe; and, in all probability, every ſpecies of thoſe which are porous, and of the tophus kind, will do. The oſteocolla, uſed in the ſhops as a medicine, will perfectly well anſwer that purpoſe; and, if one of the tubes of this be ſtopped at the bottom, and then filled with water, it will be ſeen immediately making its way through it on all ſides. The incruſtations on vegetable and other ſubſtances, in ſprings, are all formed of a matter very analogous to the oſteocolla, that is, of a coarſe terrene ſpar. And, if a piece of any of theſe be hollowed at the top, and water put into it, it will be ſeen to fall out at the bottom in form of a little ſhower of rain; this might give ſome countenance to the Mexican ſtory of their Filtrum being formed under water. As the ſpar is contained in all water, ſo that of the ſea, as well as of rivers and ſprings, may form itſelf into a ſort of fungous maſſes, againſt the ſides and edges of the rocks; but it is not probable that it ſhould be found at ſuch depths. On obſerving the great denſity and firmneſs of the ſparry concretions in ſprings, which yet ſuffer water to pervade their texture ſo very readily, Dr. Vater, to whom we owe this account, was induced to try the common coarſe ſtone uſed in building houſes to this purpoſe; and a mortar, being made of this, was found to let the water through, as well as the Mexican ſtone. The water firſt paſſed through this mortar had an earthy taſte from ſome of the looſe matter of the ſtone, which it diſlodged in its paſſing through; but this is alſo the caſe in the Mexican, and all other kinds of filtring ſtones, and it goes off in all, after a few times uſing. It being found therefore an eaſy thing for uſe to have our water filtred in the ſame manner that the Japoneſe have, it remains to try, whether it will have thoſe ſalutary effects, which the people of that part of the world give it; and this ſeems not to be imagined from reaſon and analogy. We very well know that water is frequently impregnated with ſaline particles, and that it alſo frequently diſſolves by this means earthy and other matters, which it otherwiſe could not do. But we alſo know, that ſalts diſſolved in water are not to be ſeparated by filtration; and it is equally certain; that earthy, ſparry, and other matter, that is ſuſpended in water, when clear, will in like manner paſs through the filtre with it. We daily ſee, that the ſolid bodies of metals, when perfectly diſſolved in proper menſtruums, paſs through the filtre of paper with thoſe menſtruums; and, if afterwards ſomething be added to the ſolution to weaken the force of the menſtruum, ſo that it can no longer ſuſpend ſo much of thoſe heavy bodies, then the liquors become turbid, and the diſunited particles of the metal will, on a ſecond filtration, be left in the paper. It ſeems evident from this, that it is not the fineneſs of the filtre, but the ſtate in which heterogeneous ſubſtances are ſuſpended in fluids, which is the occaſion of their paſſing through with them, or ſeparating from and remaining behind them. It is in vain to ſay, that filtres of ſtone can ſtop the earthy and ſparry particles of water, though filtres of paper cannot; ſince we every day ſee in caverns in the earth, that the water which oozes through the hardeſt rocks, forms ſtony icicles or ſtalactitæ, before it falls to the bottom. Upon the whole, we are happy enough to have no occaſion for filtring ſtones, ſince our ſprings and rivers afford us waters already pure enough to our hands; and, in places where this is not the caſe, it is always poſſible to ſave rain water, which will keep a long time, with proper management, and is much purer than all the art in the world can make ſuch as has once been foul. *Valentini Muſæum Muſæorum.*

FI'MBRIATED (*Dict.*)—This figure in heraldry is repreſented, *Plate* XXV. *fig.* 16, in the Dictionary.

FINE-*ſtiller*, in the diſtillery. That branch of the art which is employed on the diſtilling the ſpirit from treacle or other preparations or recrements of ſugar, is called fine-ſtilling, by way of diſtinction from malt-ſtilling; and the perſon who exerciſes this part of the trade is called a Fine-ſtiller.

The operation in procuring the ſpirit from ſugar is the ſame with that uſed in making the malt ſpirit; a waſh of the ſaccharine matter being made with water from treacle, &c. and fermented with yeaſt. It is uſual to add, in this caſe, however, a conſiderable quantity of malt, and ſometimes powdered julap, to the fermenting backs. The malt accelerates the fermentation, and makes the ſpirit come out the cheaper; and the jalap prevents the riſe of any muſty head on the ſurface of the fermenting liquor, ſo as to leave a greater opportunity for the free acceſs of the air, and thus to ſhorten the work, by turning the foamy, into a hiſſing fermentation. *Shaw's Lect.*

FI'NERY, in the iron works, is one of the two forges, at which they hammer the ſow iron. In order to make the wrought iron, they firſt hammer a piece of a proper ſize gently at this forge, and, by degrees, bring it, after it has been hammered into a ſquare bar or bloom, into what they call an aneory; which is the ſame maſs hammered ſmaller in the middle, and there reduced to the ſhape the whole is to be brought to, at the choſery or other forges. *Ray's Engliſh Words.*

Carious FI'NGERS. The Fingers, when carious or affected by a ſpina ventoſa, are to be amputated three ways: 1. By a ſtrong pair of ſciſſars or ſharp-edged pincers. 2. By a chiſſel ſtruck by a leaden mallet, by which they are ſeparated at one blow; or, laſtly, by dividing the next ſound joint with a ſcalpel, and drawing back a part of the ſkin to wrap over the ſtump, that it may heal the ſooner; and this is the beſt method of all, as by this you are in no fear about any ſplinters of the bone being left.

Fractured FINGERS. When one or more of the bones in the Fingers are broke, the ſurgeon's buſineſs is carefully to replace what has been removed, and to roll up the Finger a little way with a narrow bandage, and then to bind it firmly to the next ſound Finger. But it is much more proper, when the Finger is maſhed, ſo as to give no hope of a good cure, to take it off at once.

Luxated FINGERS. The bones of the Fingers and thumbs are liable to luxations of each of their articulations, and that in ſeveral directions; but theſe are accidents not only eaſily diſcovered, but very eaſily remedied alſo; for, the ligaments being not very robuſt, the fat and muſcles thin, and the ſinuſes of the articulations ſhallow, the extenſion is very eaſy, and the reduction of them into their former places not leſs ſo. The beſt method is, to extend ſufficiently the Finger with one hand, and to replace the luxated bone at the ſame time with the other, and to retain it ſo by a proper bandage. *Heiſter's Surgery.*

FI'NING *of wines*. The uſual method of Fining down wines, ſo as to render them expeditiouſly bright, clear, and fit for uſe, is this: take an ounce of iſinglaſs, beat it into thin ſhreds with a hammer, and diſſolve it by boiling, in a pint of water; this, when cold, becomes a ſtiff jelly. Whiſk up ſome of this jelly into a froth with a little of the wine intended to be fined, then ſtir it well among the reſt in the caſk, and bung down tight; by this means the wine will become bright in eight or ten days. *Shaw's Lectures.*

This method, however, is found to be beſt ſuited to the white wine; for the red ones, the wine-coopers commonly uſe the whites of eggs beat up to a froth, and mixed in the ſame manner with their wines. The method by which theſe viſcous bodies act in the operation is this: they entangle themſelves among the flying lee or light fæculencies, that float in the wine, and thus, forming a maſs ſpecifically heavier than the wine, they ſink through the body thereof like a net; carrying down all the foulneſs it meets in the way to the bottom; but, when the wine is extremely rich, ſo that its ſpecific gravity is greater than that of the maſs formed by the ingredients uſed in Fining, and the dregs or lee, this maſs then riſes upward, and floats at the ſurface of the wine, which will in this caſe alſo draw off fine.

FINO'CHIA, in gardening, the name of a plant which has of late years been introduced into the Engliſh gardens, and cultivated as a ſallad herb. It is a ſpecies of fennel, and is called by authors fœniculum dulce Azoricum. The ſweet fennel of the Azores iſlands. It is a high delicacy with ſome in England, though in general it is not liked; it ſeems, however, to be gaining more and more ground among us, and probably will in a little more time be a commonly eſteemed herb. The culture of it is this:

Good ſeeds muſt be firſt procured from Italy, for thoſe of Engliſh ripening are very apt to degenerate. In February ſome of theſe ſhould be ſowed for the firſt crop, on a light dry ſoil, and in a warm ſituation. The manner of ſowing theſe ſeeds is firſt to rake the bed very ſmooth, then draw a ſmall rill along it; and in this ſcatter them pretty thin; for the plants are not to ſtand nearer than ſix inches to one another; cover this with half an inch of earth, and, at the diſtance of ſixteen inches, make another rill, and ſo on throughout the bed. In about a month the plants will come up, and they muſt be then cleared of weeds, and cut up to four inches diſtance; a month after this, they muſt be thinned to ſix or ſeven inches diſtance; the ſtalks will now begin to ſwell to a large bulk juſt above the ground; this part muſt be earthed up in the manner of celeri, about a fortnight before it is uſed, which will make it eat very tender and criſp.

A ſecond crop ſhould be ſown three weeks after the firſt; and in that manner till July; every three weeks or a month a new crop ſhould be ſown, to keep a conſtant ſupply for the table.

The crops ſown in the hotter weather ſhould be watered and ſhaded from the great heats. *Miller's Gard. Dict.*

FIR-*tree*, *abies*, in botany, a genus of trees whoſe characters are:

It is ever-green, the leaves are ſingle, and for the moſt part produced on every ſide the branches; the male flowers or catkins are placed at remote diſtances from the fruit on the ſame tree; the ſeeds are produced in cones, which are ſquamoſe.

The difference between theſe and the pines is, the latter having two or more leaves produced out of the ſheath or cover.

Theſe trees are all raiſed from ſeeds taken out of their polyſpermous cones. The way to get out the ſeeds is, either by expoſing the cones to a gentle fire, or by ſoaking them all night in water, which will cauſe their ſquamoſe cells to open, and readily emit their ſeeds. The former method is the beſt, provided they are not expoſed to too great heat. But this ought not to be done until you are ready to ſow them; which is beſt performed in the beginning of March.

Theſe plants ſhould be all raiſed in a nurſery, where they may be protected from the birds; otherwiſe they will be in danger of being deſtroyed, when they firſt come up: for, as they bring up the huſk of the ſeed on the top of the plant, the birds in picking off the huſk will break off the plant, whereby a whole bed may be loſt in a few hours, if they are not carefully guarded from them.

The beſt time of ſowing theſe ſeeds is about the latter end of March, or the beginning of April, on a bed of light earth, covering the ſeeds about half an inch deep with the ſame ſort of earth. If this bed is netted over to keep off the birds, it will be a ſecure method to prevent them from deſtroying the young plants at their firſt coming out of the ground; at which time the plants ſhould be ſcreened from the ſun in the middle of the day, by covering the beds with mats; becauſe too much ſun frequently deſtroys theſe plants, when they are young. In this bed the plants ſhould remain until the following ſpring, when there ſhould be a number of beds prepared in the nurſery to receive theſe ſeedling plants; and the beginning of April they ſhould be tranſplanted into the beds, at the diſtance of ſix inches row from row, and at three inches aſunder in the rows. In removing theſe plants, they ſhould be very carefully raiſed up with a trowel, ſo as not to break off the fibres of their roots; and they ſhould be kept as little time out of the ground as poſſible; and, during the time they are out, their roots ſhould be covered, to prevent the wind from drying their fibres: and, in planting, the earth ſhould be preſſed cloſe to the roots of the plants, to prevent the air from penetrating the ground to the roots of the plants. If the ſeaſon ſhould prove dry, it will be proper to water the plants every week once or twice, according to the warmth of the weather; and the beds ſhould be covered with mats, to ſcreen the plants from the ſun, and drying winds, until they have taken good root; after which time they will require no farther care, but to keep them clear from weeds. In theſe beds the plants may remain two years; at the end of which they ſhould be tranſplanted into an open ſpot of ground; for their roots will in that time meet quite over the beds. This ground ſhould be well trenched and cleared from the roots of all bad weeds, and made level to receive the plants, which ſhould be tranſplanted about the beginning of April, juſt before they begin to ſhoot; and, if it ſhould prove moiſt weather, it will be of great advantage to the growing of the plants. In removing them out of the beds, there ſhould be great care taken, not to tear off or injure their roots; nor ſhould too many of the plants be taken up at one time; but rather plant them as faſt as they are taken up, that they may be as little time out of the ground as poſſible; for the drying winds which uſually happen at this ſeaſon, will greatly injure the roots of theſe plants, if they are much expoſed thereto.

The diſtance which theſe plants ſhould be placed in this nurſery, ſhould be four feet row from row, and two feet aſunder in the rows. This diſtance may by ſome perſons be thought too great; but if they conſider how their roots ſpread in the ground, as alſo, that, when they are planted nearer together, it will be very difficult to take up the plants again without cutting and tearing off their roots, eſpecially if they are not all taken up clean at the ſame time; theſe conſiderations will have greater weight than that of the loſs of a little ground, with thoſe perſons who have a regard to the future welfare of the plants. In planting of the plants, it will be the better way to draw a line acroſs the ground, and to dig out a trench of a foot wide thereby, into which the plants may be placed at the diſtance of two feet aſunder; then fill the earth into the trench, covering the roots of the plants with the fineſt part of it, ſcattering it carefully between the roots; and, when the whole trench is filled in, preſs the earth gently down with your feet; but by no means tread it too hard, eſpecially if the ground is ſtrong, or apt to bind too cloſe.

When the plants are planted, if the ſeaſon ſhould prove dry, they ſhould be watered, to ſettle the earth to their roots; and if this is repeated three or four times, if the ſeaſon ſhould continue dry, it will greatly promote their taking new root, and ſecure them from the injuries of the drying winds. In this nurſery the plants may remain two or three years, according to the growth they ſhall have made; and, during this time, the ground between the plants ſhould be conſtantly kept clean from weeds, and dug between the rows every ſpring; in doing of which, care muſt be taken not to cut or injure the roots of the plants: this is all the culture they will require during their continuance in the nurſery. And, when they are tranſplanted into the places where they are to remain, the neceſſary care to be taken is, in taking them up, not to injure or cut off their roots, and let them be as little time out of the ground as poſſible; and, when they are out, to guard their roots from the drying winds. The ſureſt time for removing of theſe trees is about the beginning of April; though they may, and often are removed with ſucceſs at Michaelmas, yet the ſpring is the more ſure ſeaſon, eſpecially in moiſt land.

Moſt of the kinds of Firs may be removed at the height of ſix or ſeven feet; but thoſe of two feet high are much better, and will in a few years get the better of thoſe taller trees: therefore I would not adviſe the tranſplanting of theſe trees, when they are much above two feet high, eſpecially if they have ſtood long in the nurſery unremoved; for then their roots will have extended themſelves to a great diſtance, which will be cut in taking of them out of the ground; and, where great amputation is uſed either to the roots or branches of theſe trees, the quantity of turpentine, which commonly iſſues from theſe wounds, will greatly weaken the trees. There is alſo another advantage in planting of theſe trees ſmall, which is that of not requiring ſtaking to ſecure them from not being blown down by ſtrong winds, which in tall trees is a great trouble and expence: and whoever will give themſelves the pains to obſerve, how much trees of two feet high exceed in growth thoſe which are removed of much higher growth, will, I am ſure, be convinced of the truth of what I have above ſaid.

Theſe trees are chiefly cultivated for ever-green plantations in gardens and parks, where, by their perpetual verdure, they have a ſingular beauty in winter; and in ſummer they are not without ſome beauty, by the contraſt there is between them and the other woods, by the different ſhades of green. But, as neither of the ſorts of Firs are equal to the Scotch pine in the goodneſs of the timber, theſe are not ſo profitable for large plantations, which are deſigned for improvement more than beauty. *Miller's Gard. Dict.*

FIRE (*Dict.*)— The learned and ingenious Dr. Knight has endeavoured to account for the phænomena of heat and Fire, by the vibratory motion of a repellent fluid. See HEAT.

The ſparks of Fire which are produced by ſtriking flint againſt ſteel, are of the number of thoſe things which cuſtom, by rendering the phænomenon familiar, has diverted our attention from the cauſe.

The ſtriking Fire in this manner has probably been as old as the knowledge of ſteel; and, ſince the microſcope has been familiar among us, it has been diſcovered, that theſe ſparks are ſo many ſpherical balls of iron detached by the blow from the maſs, and rendered by the heat a ſort of ſcoriæ. Kemp de Kenvyck, a very ingenious chemiſt, propoſed it as a problem worthy the attempts of the curious to ſolve, and propoſed the whole in thoſe words: When a flint and ſteel are ſtruck together, if the ſparks are received on a white paper, they are found to be round maſſes, which, examined by the microſcope, are found to be melted and ſcorified or vitrified iron, which will no longer anſwer to the magnet. It is therefore demanded, 1. Which of the two inſtruments contributes moſt to this change in the iron? 2. What ſubſtance it is that is employed to this purpoſe? 3. In what manner the operation is performed; and, 4. Why, if iron be uſed inſtead of ſteel, the ſparks are very few or none, when with ſteel they are ſo many? Theſe queſtions have appeared almoſt unanſwerable, becauſe people ſcarce knew how to conceive, that iron which requires ſo long continued and ſo violent a Fire to put it in fuſion, could, by means only of a ſlight blow, be not only melted, but deſtroyed as it were. The moſt eminent perſon of the time declined engaging in the attempt, and Mr. Muſchenbroek, from whom a ſolution was expected by many, at length referred the whole to Mr. de Reaumur, who had ſome time before publiſhed a treatiſe on iron and ſteel, and was therefore judged to have moſt conſidered the metal in both thoſe ſtates.

This gentleman accepted the taſk, and attempted the ſolution of the problem by reſolving theſe queſtions: 1. By what means the iron is in this act converted into ſcoriæ? 2. By what method it can be ſo deſtroyed? 3. How it comes not only to be reduced to ſcoriæ, but to be in a ſtate of fuſion, and truly rendered liquid; and, 4. Why iron gives leſs as well as fewer ſparks on colliſion with flint than ſteel does? The nature of iron is well enough known for us to be aſſured it contains a large portion of inflammable matter, and that it is never ductile, but while it has a quantity of that inflammable matter in it; and that, when that is wholly taken from it, it becomes friable, and is reduced to a ſort of ſcoriæ, analogous to common vitrified matters.

What much conduces to the explication of the grand problem, is, that this inflammable matter contained in iron is very eaſily ſeparated, when iron is heated in an open Fire; which is evidently ſeen, in that it is impoſſible to heat a bar of iron in a ſmith's forge ſo much as to make it ready for working or joining with another bar, without reducing its whole ſurface to ſcoriæ, or a friable matter which is all thrown off from the bar by the blows of the hammer.

The ſmaller and thinner a piece of iron is, the more eaſily is it reduced to ſcoriæ; and it is eaſy to conceive from hence, that, in pieces extremely ſmall, there requires no more than the once thoroughly heating them to reduce the whole to ſcoriæ; and it is eaſily proved by experiment, that the flame of a candle, being applied to a fine ſmall piece of filings of ſteel, will ſoon make it red-hot, and that, if it be then ſuffered to cool and laid on a white paper, it will be found much to reſemble the ſparks thrown off by the flint and ſteel, and will be reduced to ſcoriæ, and be friable under the nail, like a piece of charcoal.

It appears then, that there requires but an inſtant of time to give a red heat to a ſmall particle of iron; and alſo, that, when that heat has been given, the particle muſt have loſt that inflammable matter which cauſed its ductility, and conſequently muſt be reduced to ſcoriæ; and hence it appears not wonderful, that the very ſmall piece or particle of ſteel which is ſtruck off by the flint, ſhould be diveſted of its inflammable matter, and, with it, of its ductility, by keeping red-hot in the open air, only ſo long as it was in falling from the ſteel to the paper that is placed to receive it. The extreme ſmallneſs of the particle gives power to ſo ſhort a heat to deſtroy its inflammable matter, in which its ductility conſiſts; and therefore to reduce it to a matter no longer ductile, that is, into ſcoriæ; and we find, that, if a parcel of fine ſteel filings be dropped thro' the flame of a lamp driven into a horizontal direction by the blaſt of a blow-pipe, they will, in the inſtant of their paſſing through that flame, ſparkle, and become ignited, and, if they are received on a white paper placed underneath, the ſmalleſt particles will be found round and friable, reduced to ſcoriæ, no way differing from the little globules of ſcorified ſteel, which are ſtruck off from the flint and ſteel in giving Fire by their colliſion. When we have occaſion to melt larger parcels of ſteel or iron, we are obliged to have recourſe to ſuch ſubſtances to mix with them as will replace with increaſe that inflammable matter which the Fire drives off: the ſubſtances of this kind are common ſulphur, orpiment, arſenic, and the like; and by means of theſe it is ſoon made to run like lead. *Mem. Acad. Scien. Par.* 1736.

One great proof of the ſparks being melted and rendered globular by means of the ſulphur of the flint is, that ſparks may be ſtruck from ſteel, in the ſame manner, by glaſs as by flint, but in leſs quantity; theſe, having been received on a paper, were examined by Mr. Reaumur, and were found to be ſcoriæ, of an irregular figure, having never been melted, and therefore never reduced to the globular ſhape of the others. In regard to the great change wrought in iron by this operation, or its being, according to the words of Kemp, deſtroyed, no longer retaining its great character of being attracted by the load-ſtone, Mr. Reaumur, willing to try the experiment before he reaſoned upon it, found this aſſertion not to be fact, or at leaſt not a general one.

All the ſeveral kinds of ſparks which he mentions, thoſe produced by the common colliſion of flint and ſteel, thoſe by dropping ſteel-filings through the flames of a lamp, and even thoſe from the filing of the antimoniated iron, all as readily anſwer to the load-ſtone as common filings of iron; ſo that, if this caſe ſometimes happen, and iron be liable thus to be deſtroyed, it is however no general fact, but a very rare and extraordinary one. *Mem. Acad Par.* 1736.

Everlaſting FIRE, a very extraordinary phænomenon, near Baku, in Perſia, before which the Geberrs offer their ſupplications. See GEBERRS.

This object of devotion to the Geberrs lies about ten Engliſh miles N. E. by E. from the city of Baku, on dry rocky land. There are ſeveral ancient temples built with ſtone, ſuppoſed to be all dedicated to Fire; moſt of them are arched vaults not above ten to fifteen feet high. Among others, there is a little temple, in which the Indians now worſhip: near the altar, about three feet high, is a large hollow cane, from the end of which iſſues a blue flame, in colour and gentleneſs not unlike a lamp that burns with ſpirits, but ſeemingly more pure. Theſe Indians affirm that this flame has continued ever ſince the flood, and they believe it will laſt to the end of the world; that, if it was reſiſted or ſuppreſſed in that place, it would riſe in ſome other. Here are generally 40 or 50 of theſe poor devotees, who come on pilgrimage from their own country, and ſubſiſt upon wild celeri, and a kind of Jeruſalem artichokes, which are very good food, with other herbs and roots, found a little to the northward. Their buſineſs is to make expiation, not for their own ſins only, but for thoſe of others; and they continue the longer time, in proportion to the number of perſons for whom they have engaged to pray. They mark their foreheads with ſaffron, and have a great veneration for a red cow. They wear very little cloathing, and thoſe who are of the moſt diſtinguiſhed piety put one of their arms upon their heads, or ſome other part of the body, in a fixed poſition, and keep it unalterably in that attitude.

A little way from the temple is a low clift of a rock, in which there is a horizontal gap, two feet from the ground, near ſix long, and about three broad, out of which iſſues a conſtant flame of the colour and nature already deſcribed; when the wind blows, it riſes ſometimes eight feet high, but much lower in ſtill weather: they do not perceive the flame makes any impreſſion on the rock. This alſo the Indians worſhip, and ſay it cannot be reſiſted, but it will riſe in ſome other place. About twenty yards on the back of this cliff is a well cut in a rock, twelve or fourteen fathom deep, with exceeding good water.

The earth round this place, for above two miles, has this ſurpriſing property, that, by taking up two or three inches of the ſurface, and applying a live coal, the part which is ſo uncovered, immediately takes fire, almoſt before the coal touches the earth: the flame makes the ſoil hot, but does not conſume it, nor affect what is near it with any degree of heat. Any quantity of this earth, carried to another place, does not produce this effect. Not long ſince, eight horſes were conſumed by this fire, being under a roof where the ſurface of the ground was turned up, and by ſome accident took flame.

If a cane or tube, even of paper, be ſet about two inches in the ground confined and cloſed with earth below, and the top of it touched with a live coal, and blow up, immediately a flame iſſues, without hurting the cane or paper, provided the edges be covered with clay; and this method they uſe for light in their houſes, they having only the earth for their floor: three or four of theſe lighted canes will boil water in a pot, and thus they dreſs their victuals. The flame may be extinguiſhed in the ſame manner as that of ſpirits of wine. The ground is dry and ſtony, and, the more ſtony any particular part is, the ſtronger and clearer is the flame; it ſmells ſulphureous, like napthæ, but not very offenſive.

Lime is burnt to great perfection by means of this phænomenon; the flame communicating itſelf to any diſtance where the earth is uncovered to receive it. The ſtones muſt be laid on one another, and in three days the lime is compleated.

Fire-*ball*, a compoſition of meal powder, ſulphur, ſalt-petre, pitch, &c. about the bigneſs of a hand granade, coated over with flax, and primed with the ſlow compoſition of a fuze. This is to be thrown into the enemies works in the night-time, to diſcover where they are; or to fire houſes, galleries, or blinds of the beſiegers; but they are then armed with ſpikes or hooks of iron, that they may not roll off, but ſtick or hang where they are deſired to have any effect.

Fire-*pots*, are ſmall earthen pots, into which is put a granade filled with fine powder till the granade be covered; and then the pot is covered with a piece of parchment, and two pieces of match laid acroſs and lighted. This pot, being thrown where it is deſigned to do execution, breaks and fires the powder, and thereby fires the powder in the granade, which ought to have no fuze, that its operation may be the quicker.

Fire-*ſhips*, in the navy, veſſels charged with artificial Fireworks; which, having the wind of an enemy's ſhip, grapple her and ſet her on Fire.

FI'SHES, in natural hiſtory, make one of the diſtinct claſſes of animals, the characters of which are, that they have either a naked or ſcaly body, that they have no feet, but always fins. *Linnæi Syſt. Nat.*

Fishes, *aboard a ſhip*, are pieces of timber uſed to ſtrengthen the maſts and yards, when they begin to fail in ſtreſs of weather. They both nail the Fiſhes on with iron ſpikes, and alſo would them, as they call it, that is, wind ropes hard round about them. There is alſo a tackle called the Fiſh, which hangs at the end of the davit by the ſtrap of the block, in which is the runner of the fiſh-hook, by which means the fluke of the anchor is haled up to the ſhip's bow or chainwaile. Perhaps this tackle was called a Fiſh, from that which the ancients called a dolphin, which was a pointed and vaſtly heavy piece of iron, which they uſed to heave up by a tackle to a good height, and then, when they came near enough to the enemies ſhip, let it fall at once, to break or pierce a hole through the bottom of the enemies veſſel, and ſink her.

Fish-*block*, in a ſhip, is the block which is hung in a notch at the end of the davit, and ſerves to hale up the fluke of the anchor to the ſhip's bow.

Fish-*ponds*, are not only a thing of convenience to great families, but may be made a profitable article with the farmer under due management. Watery and boggy lands are often fit for no other uſe, and theſe are then a great improvement on them. Ponds, made in dry grounds in the flat bottoms between hills, will alſo ſerve not only to ſupply the cattle with water, but the profit of the Fiſh that may be bred in them, is greater than many are aware of, and comes without any labour or expence. The head of a pond muſt be placed at the loweſt part of the ground, and the trench of the flood-gate, or ſluice, muſt have a good fall, that it may not be too long in emptying. The beſt way of making the head, is by driving three or four rows of ſtakes about ſix feet long, and at about four feet diſtance from one another, the whole length of the pond-head; the firſt row of theſe is to be driven in four feet deep, that they may be very firm and ſecure, and, if the bottom be not good but be of a looſe ſand, ſome lime is to be added, which will harden into a ſort of ſtone. The earth dug out of the pond is to be placed between theſe ſtakes and rammed hard down. Other rows of ſtakes muſt be added behind, and over theſe, and the ſpaces filled up, till the whole is as high and thick as is neceſſary. The face of it muſt be made even and ſlanting, and there muſt be a waſh left to carry off the ſuperfluous water in floods, &c. *Mortimer's Huſbandry.*

FI'STULA *in ano*, in ſurgery, an abſceſs, running upon, or into the inteſtinum rectum; though an abſceſs in this part, when once ruptured, does generally, if neglected, grow callous in its cavity and edges, and become, at laſt, what is properly called a Fiſtula.

That the anus is ſo often expoſed to this malady, in any criſis of the conſtitution, is chiefly aſcribed to the depending ſituation of the part; but what very much conduce to it likewiſe, are the great quantities of fat ſurrounding the rectum, and the preſſure the hæmorrhoidal veſſels are liable to, which, being ſuſtained upon very looſe membranes, will be leſs able to reſiſt any effort, that nature ſhall exert, to fling off a ſurcharge; and from one ſtep to another, that is, from inflammation to ſuppuration, lead on to the diſtemper we are treating of.

That the fat is the proper ſubject of abſceſſes, may be learned from an inflammation of the ſkin affecting the membrana adipoſa, and producing matter there; in which caſe, a ſuppuration runs from cell to cell, and, in a few days, lays bare a great quantity of fleſh underneath, without affecting the fleſh itſelf: nay, I think it may be doubted, whether, in thoſe abſceſſes which are eſteemed ſuppurations of the muſcles, the inflammation and matter are not abſolutely firſt formed in this membrane, where it is inſinuated between the interſtices of their fibres.

The piles, which are little tumors formed about the verge of the anus, immediately within the membrana interna of the rectum, do ſometimes ſuppurate, and become the forerunners of a large abſceſs; alſo external injuries here, as in every other part of the body, may produce it; but, from whatever cauſe the abſceſs ariſes, the manner of operating upon it will be according to the nature and direction of its cavity.

If the ſurgeon has the firſt management of the abſceſs, and there appears an external inflammation upon one ſide of the buttock only; after having waited for the proper maturity, let him, with a knife, make an inciſion the whole length of it; and, in all probability, even though the bladder be affected, the largeneſs of the wound, and the proper application of doſſils lightly preſſed in, will prevent the putrefaction of the inteſtine, and make the cavity fill up like impoſthumations of other parts.

If the ſinus is continued to the other buttock, almoſt ſurrounding the inteſtine; the whole courſe of it muſt be dilated in like manner; ſince, in ſuch ſpongy cavities, a generation of fleſh cannot be procured but by large openings; whence alſo, if the ſkin is very thin, lying looſe and flabby over the ſinus, it is abſolutely neceſſary to cut it quite away, or the patient will be apt to ſink under the diſcharge, which, in the circumſtance here deſcribed, is ſometimes exceſſive. By this method, which cannot be too much recommended, it is amazing how happy the event is likely to be; whereas, from neglecting it, and truſting only to a narrow opening, if the diſcharge does not deſtroy the patient, at leaſt, the matter by being confined, corrupts the gut, and, inſinuating itſelf about it, forms many other channels, which, running in various directions, often baffle an operator, and have been the cauſe of a Fiſtula being ſo generally eſteemed very difficult of cure.

Here I have conſidered the impoſthumation as poſſeſſing a great part of the buttock; but it more frequently happens, that the matter points with a ſmall extent of inflammation on the ſkin, and the direction of the ſinus is even with the gut: in this caſe, having made a puncture, you may, with a probe, learn if it has penetrated into the inteſtine, by paſſing your finger up it, and feeling the probe introduced through the wound into its cavity; though, for the moſt part, it may be known by a diſcharge of matter from the anus. When this is the ſtate of the Fiſtula, there is no heſitation to be made, but, immediately putting one blade of the ſciſſars up the gut, and the other up the wound, ſnip the whole length of it. This proceſs is as adviſeable, when the inteſtine is not perforated, if the ſinus is narrow, and runs upon or very near it; for, if the abſceſs be tented, which is the only way of dreſſing it, while the external orifice is ſmall, as I have here ſuppoſed, it will almoſt certainly grow callous; ſo that the ſureſt means of cure will be opening the gut, that proper applications may be laid to the bottom of the wound. However, it ſhould be well attended to, that ſome ſinuſes, pretty near the inteſtine, neither run into nor upon it, in which caſe they muſt be opened, according to the courſe of their penetration. There are abundance of inſtances, where the inteſtine is ſo much ulcerated as to give free iſſue to the matter of the abſceſs by the anus; but I believe there are none where there is not, by the thinneſs and diſcolouration of the ſkin, or an induration to be perceived through the ſkin, ſome mark of its direction; which, if diſcovered, may be opened into with a lancet, and then it becomes the ſame caſe as if the matter had fairly pointed.

If the ſinuſes into, and about the gut, are not complicated with an induration, and you can follow their courſe; the mere opening with ſciſſars, or a knife guided on a director, will ſometimes ſuffice; but it is generally ſafer to cut the piece of fleſh, ſurrounded by theſe inciſions, quite away, and, when it is callous it is abſolutely neceſſary, or the calloſities muſt be waſted afterwards by eſcharotic medicines, which is a tedious and cruel method of cure.

When the Fiſtula is of long ſtanding, and we have a choice of time for opening it, a doſe of rhubarb the day before the operation will be very convenient, as it not only will empty the bowels, but alſo prove an aſtringent for a while, and prevent the miſchief of removing the dreſſings in order to go to ſtool.

It ſometimes happens that the orifices are ſo ſmall, as not to admit the entrance of the ſciſſars, in which caſe, ſponge tents muſt be employed for their dilatation.

In performing theſe operations on the anus, I do not think, in general, any inſtrument ſo handy as the knife and ſciſſars; almoſt all the others which have been invented to facilitate the work, are not only difficult to manage, but more painful to the patient; however, in thoſe inſtances where the Fiſtula is very narrow, and opens into the inteſtines, juſt within the verge of the anus, the ſyringotomy may be uſed with advantage: but, where the opening into the gut is high, it cannot be employed without giving great pain. I do not caution againſt cutting the whole length of the ſphincter, experience having ſhewn it may be done with little danger of an incontinence of excrement; and, in fact, the muſcle is ſo ſhort, that it muſt generally be done in dilatations of the inteſtine.

The worſt ſpecies of Fiſtula, is, that communicating with the urethra, and ſometimes, through the proſtate gland, with the bladder itſelf. This generally takes its riſe from a former gonorrhœa, and appears externally firſt in peritonæo, and afterwards increaſing more towards the anus, and even ſometimes into the groin, burſts out in various orifices, through the ſkin, which ſoon becomes callous and rotten; and the urine, paſſing partly through theſe orifices, will often excite as much pain, and of the ſame kind, as a ſtone in the bladder.

This ſpecies of Fiſtula, taking its riſe from ſtrictures of the urethra, is only manageable by the bougie: for, ſo long as the urethra is obſtructed, the cure of the Fiſtula will be imperfect; but, if the canal is opened by this application, it is amazing what obſtinate indurations and foul ſinuſes will in conſequence diſappear; though there are ſome ſo callous and rotten, as to demand the knife and ſkilful dreſſings, notwithſtanding the urethra ſhould be dilated by the uſe of bougies. *Sharp's Surgery.*

FI'TCHES, a name given by our farmers to a ſort of pulſe they ſow in their fields. Many ſuppoſe it the ſame with the tare, but erroneouſly: it is the chich or chich pea of authors. There are two principal kinds of this in uſe among us, the winter and the ſummer Fitch. The one is ſown before winter, and abides the extremity of it; the other is ſown in ſpring. They are propagated in the ſame manner as peaſe, and they make a very good and nouriſhing food for cattle, whether given in the ſtraw, or threſhed out. They are ſometimes ſown only to improve the land. In this caſe, they are to be plowed in, juſt as they are beginning to bloſſom, and in this manner they finely enrich a tough ſtiff clay. *Mortimer's Huſbandry.*

FLAKE, in gardening, a name given by the floriſts to a ſort of carnations, which are of two colours only, and have very large ſtripes, all of them going quite through the leaves. *Miller's Gard. Dict.*

FLA'MMULÆ *auri*, in natural hiſtory, a name given by Dr. Woodward, and others, to thoſe ſmall pieces of gold found among the ſands of rivers in ſome places. They are ſometimes found in roundiſh pieces, but more uſually in their ſhining flakes, whence the name Flammulæ ſeems to have been given them, as being very bright and gloſſy. This ſort of gold is pure and malleable, and loſes ſcarce any part of its weight in fuſion.

The gold duſt, as it is called, which is brought from Guinea, is much of this kind; its particles are uſually very ſmall, though, ſometimes lumps of the ſize of a pea or horſe bean are found, and ſometimes maſſes of an irregular figure of three or four ounces weight; but theſe loſe the name of Flammulæ, when they become ſo thick and ſolid, and ſo large, and are called by the merchants rock gold.

All the Flammulæ of gold, found among the ſands in the beds of rivers, are doubtleſs parts of a rich ore, lodged in ſome neighbouring hills, and waſhed away by the impetuous rains, which carry them down in the currents they form, and afterwards drop them in the places where the waters of the river they mix themſelves with, run more ſlowly. This appears plainly from theſe particles of gold being always found towards the heads of the rivers; or near the mountainous countries, where the torrents, cauſed by ſudden rains, diſcharge themſelves into them near their entrances into the ſea; and alſo by this, that the people always find the gold moſt plentifully after great rains. *Woodw. Cat. Foſſ.*

FLA'TULENCIES, a relaxation of the periſtaltic motion of the guts; but this not extending to the whole canal, but only to ſome one part, the tranſpiration of the halituous matter being chiefly in this flaccid part, which it diſtends in a manner that it could not do by a part that had its natural tone and motions. And the defect in one part is always attended with an exceſs of the periſtaltic motion in another, in order to the driving off the cauſe; hence proceed alternate conſtrictions and relaxations, to which, in a great meaſure, the pain is owing; and, in caſes of the commotions of the blood about the vena portæ, the ſame conſtrictions and relaxations always happen. The material cauſes of Flatulencies, are thoſe ſubſtances ſwallowed in food, which are of a mucous and tenacious conſiſtence, and, by their obſtinately adhering to the bowels, are capable of giving great trouble. Of this kind are the herbs in uſe in food, which are of a thick tough juice; or the leguminous tribe, as peas, beans, and the like; alſo dried ſea fiſh, and all animal fats, as that of ſheep and calves, eſpecially if the perſon drink immediately after eating heartily of them. The drinking fæculent liquors will alſo occaſion them very violently; as new malt liquors, or the ſame, when the veſſels are almoſt out; the ſummer fruits alſo are to be accuſed in this ſenſe, and, above all things, honey. To all theſe cauſes the habit of the patient greatly concurs, and a general coolneſs of the body and dryneſs of the bowels are a frequent occaſion of them.

Method of cure.—In this, it is firſt to be conſidered, whether the Flatulencies have their origin in the bowels, or whether they affect them only by conſent, as is often the caſe in diſeaſes of the neighbouring parts in hypochondraic and hyſteric patients, and in perſons afflicted with hæmorrhoidal and nephritic complaints, and in caſes where women have been ill managed in lying-in, or in miſcarriages: in all theſe caſes the original cauſe is to be conſidered and treated with its proper remedies. But, in caſes of direct and ſimple Flatulencies, the following method will be uſually found effectual. The bowels muſt be carefully kept gently open, for, in caſes of coſtiveneſs, Flatulencies will always be increaſed. To this purpoſe, the common clyſters muſt be given at repeated times, and to theſe, by way of increaſing the ſtimulus, ſome of the leſſer centaury is to be added, and ſome common ſalt. After theſe the laxative medicines of the gentler kind are to be given, and, in the intermediate days, the digeſtive ſalts to attenuate the viſcous matter in the bowels; to theſe nitre and a little cinnabar may be added, and theſe always have a much better effect than all the hot carminatives uſually given. After theſe, thoſe things are to be given which reſtore the tone of the part; ſuch are the bitter and aromatic extracts, with ſpirit of ſalt of tartar, ſpirit of nitre dulcified, and the volatile urinous ſalts aromatiſed. Externally ſtomachic plaiſters may be applied to the pit of the ſtomach, as may alſo the ſtomachic balſams, ſuch as the oils of nutmeg, carui, fennel, and the like.

The general method of treating Flatulencies, is, by the hot aromatics, but theſe are to be given with great caution; for, when the commotions of the blood about the vena portæ are in fault, theſe things always irritate, rather than do good; but, beyond all things, the too common method of giving a vomit in theſe caſes is to be avoided, for the diſcharge of the Flatulencies upwards is inverted by this means, and then uſually follow exquiſite pains and tenſions of the parts, difficulty of breathing, and vertiginous complaints in the head, with noiſes in the ears, and many other complaints which are continually increaſing, till they are a little abated, for the preſent, by an eructation. The happy way of getting rid of theſe anterior flatuſes, is by driving the cauſe of them downwards, and the reſtoring the loſt tone of the parts. Continued exerciſe is alſo of the utmoſt ſervice. *Junker's Conſp. Med.*

FLAX, (*Dict.*)—There are ſeveral ſorts of this plant, which are preſerved in ſome curious gardens of plants for variety ſake; but, as they are of little uſe or beauty, it would be needleſs to mention them in this place.

The linum ſativum, or manured Flax, is that which is cultivated for uſe in divers parts of Europe, and is reckoned an excellent commodity: the right tilling and ordering of which is eſteemed a good piece of huſbandry.

This ſhould be cultivated upon a rich ſoil, that has not been plowed for ſeveral years, upon which Flax always makes the beſt improvement: but, as it draws greatly from the ſoil, it ſhould not be ſown two years together upon the ſame ground. The land muſt be well plowed, laid flat and even, upon which the ſeeds ſhould be ſown about the middle of March, when the weather is mild and warm. During the ſpring, you muſt carefully weed it; which if neglected (eſpecially in a moiſt ſeaſon) the weeds will overgrow and deſtroy the crop. There are ſome people who recommend the feeding of ſheep with flax, when it is a good height; and ſay, they will eat away the weeds and graſs, and do the flax good; and, if they ſhould lie in it, and beat it down, or flatten it, it will riſe again the next rain: but this muſt not be practiſed but in a moiſt ſeaſon, and upon a rich ſoil; for, if the ground be poor, or the ſpring dry, it will not riſe again to any conſiderable height.

The beſt ſeed is that which comes from the eaſt country, and is known by the name of Riga Flax; for, if the Engliſh ſeed be ſown three or four times, it is very apt to degenerate. If the ſeed be good, two buſhels will be enough to ſow an acre; but, if it be but middling, there ſhould be a greater allowance.

Toward the latter end of Auguſt the Flax will begin to ripen, when you muſt be careful, that it grow not over ripe: therefore you muſt pull it up as ſoon as the heads begin to change brown, and hang downwards, otherwiſe the ſeeds will ſoon ſcatter, and be loſt: ſo that the pluckers muſt be nimble, and tie it up in handfuls; ſetting them upright till they be perfectly dry, and then houſe them. If the Flax be pulled, when it firſt begins to flower, it will be whiter and ſtronger than if it ſtand till the ſeed is ripe; but then the ſeed will be loſt.

This is a plant of the greateſt uſe, in ſeveral of the moſt eſſential parts of life: from the ſeeds an expreſſed oil is drawn, which is of great uſe in medicine, painting, &c. from the bark of the ſtalks is made linen, and from the rags of linen is made paper; ſo that this plant may be eſteemed as one of the moſt valuable and neceſſary, in many of the principal conveniencies of life. *Miller's Gard. Dict.*

This plant has a more oily taſte than the mallow, and is the chief of the emollient tribe. The ſeeds afford an excellent medicine, ſince from them is expreſſed an oil, which is anodyne, demulcent, and extremely adapted to all manner of aſperities;

perities; it relaxes, and diſſolves acridities, whence it is of extraordinary ſervice in the moſt deſperate cholics. The ſtiff and rigid limbs, being anointed with this oil, are relaxed and rendered flexible. This oil, when freſh drawn, and taken at the mouth, is very good in a pleuriſy, and a cough, to help expectoration; and, injected in clyſters, is very proper in the hæmorrhoids, and indurated fæces, whence proceeds the cholic; mixed with ſealed and japan earth, it is a great arcanum in the dyſentery. An emulſion of the ſeeds is of ſervice in the pleuriſy and peripneumony; the oil is a very good remedy againſt the ſtone: the ſeeds reduced to a meal, and boiled and prepared in the form of a cataplaſm, are applied to tumors and abſceſſes, in order to mollify and ripen them. The ſeed, boiled in water, makes a mild oily decoction, preſcribed to be drank as an anodyne in inflammations of the ſmall inteſtines, the diarrhœa, the dyſentery, nephritic pains, and retention of urine. The oil, boiled with honey, clears the face and ſkin of ſpots, and all cutaneous blemiſhes. The leaves are emollient, and the ſmell of the flowers is not poiſonous, as ſome authors have written. To cloſe all, we ſhall obſerve, that whereas cotton can never be uſed about wounds, on account of its denticulated parts, which diſpoſe to inflammations; linen, the manufactured produce of this plant, is, by its extraordinary ſoftneſs, ſmoothneſs, and flexibility, of all other things, the beſt adapted to ſuch purpoſes. *Hiſt. Plant. aſcript. Boerhaave.*

As it is agreed, that the lighteſt loams and the thickeſt crop afford the fineſt Flax, it may be of uſe to let the farmer know how he may ſave ſuch crops from lodging, as they generally do. The method is a little expenſive; but, if it anſwers, it will quit coſt very well. When the Flax is in the ground, divide your field into equal ſquares, the ſides of which may be four or five feet long; and at each angle thruſt a forked ſtick ſteady in the ground. When your Flax is ſome inches high, lay from ſtick to ſtick a light croſs pole; and this will ſupport the Flax, and hinder it from lodging. Some uſe ropes inſtead of poles; but they yield too much, and anſwer but imperfectly.

High winds are ſo common in this country, that there is reaſon to apprehend, that the Dutch method of laying your Flax looſe upon the ground would be attended with conſiderable inconveniency. I believe the method I purſue is ſafer. I gently tie each handſul as cloſe as may be to the heads; and then, ſpreading out the ends, ſet it upright on the ground. Three or four of theſe, together, make one ſtook; and into ſuch ſmall ſtooks I divide all the Flax I have. They dry ſoon, becauſe the wind has free acceſs to the ſtalks, as the ſun has to the heads, and the rain cannot lodge in any quantity upon them.

Rippling comes next. Two men may work at every inſtrument, by fixing it on a bench, that one may ſit at either end. Let them take ſmall handfuls at a time, and draw the Flax through the ripple without violence. Two women to each bench are neceſſary to hand the Flax in bundles to the ripplers, to receive it from them again, to ſort it according to their ſeveral degrees of length, ſtrength, ripeneſs, and fineneſs, and to tie it looſely in little ſheaves.

After rippling, the ſeed muſt be carried to the grainary, and the Flax laid down to water. If poſſible, diſpoſe of the whole into your ponds together. The ſummer, which draws haſtily towards an end, is your fitteſt ſeaſon, and ſhould be huſbanded with care. However, let nothing tempt you to uſe bog-holes and running waters. It is better to delay to the next ſeaſon, than diſcolour or damage all your Flax.

Cover your Flax, to keep it down, with your ſlutch or mire at the bottom of your ponds, or, till that be gathered in ſufficient quantities, with clay, ruſhes, fern, or timber. From four to twelve or thirteen days is the time requiſite for watering. After the fourth, examine your Flax daily, and be particularly careful not to let it lie too long. It is a miſtake, on the ſafer ſide, to draw it off the ſooneſt.

In graſſing, the ſhorteſt graſs ſhould be preferred. Dry ſandbanks do well. On either the Flax muſt be turned every ſecond day, and generally lies from a fortnight to three weeks.

To dry your Flax, heat your oven thoroughly; then let it cool, till a man can ſtand in it without uneaſineſs; fill it over night, and your Flax will be ready for the break next morning. The dirt and ſtraws ſcutched out of the Flax, in one day, will heat the oven for the next.

When you break your Flax, take ſheaf by ſheaf out of the oven, as you uſe it: it comes criſp under the engine, works the better and more eaſily. It is an error to lay the Flax, as we do, as far as may be from the joint. The nearer it is placed to the center of motion in the break, the more readily it ſplits, and the leſs damage it receives.

In ſcutching, chuſe the broad round ſcutch: the ſquare and narrow one, in uſe among us, cuts and deſtroys the Flax.

By the time the Flax is ſcutched, and about the middle of October, it will be time to threſh the ſeed.

This may be done by driving horſes backwards and forwards on the bows, or by drawing over them a heavy rolling-ſtone upon a ſmooth hard floor.

Cleaning it requires more nicety. To do it thoroughly, it muſt firſt go through the winnow, which ſeparates it from the bows; through the riddle next, to take out ſtraws, ſtones, and larger dirt; then ſucceſſively through two different ſieves; the firſt bored with oval holes, to let through the ſeed and nothing elſe of greater bulk; the ſecond cloſer, to retain the ſeed, and afford a paſſage to all ſmaller bodies; and laſtly through the ſcreen or wire-harp, which frees it from all duſt. When the Flax-dreſſer has thus cleaned his ſeed, he ſhould return to his Flax, and put it through the fining-mills. The wheel in theſe turns alternately from right to left, and from left to right, twice each way; and, according to the number of theſe double turns, the Flax comes out the finer, the ſmoother, and the ſofter. Fourſcore ſuch turns is the moſt that any Flax requires, and probably as much as it will bear.

N. B. For want of theſe fining-mills in Scotland, beating of Flax is directed.

In hackling, women and children ſhould be employed from choice. They work with greater gentleneſs than men, and care and tenderneſs are the main excellencies in this buſineſs. For the beſt Flax, four ſets of hackles will be requiſite, each of them of a different fineneſs: through theſe it may be drawn ſucceſſively, and every time with proportionable caution. The laſt, whoſe teeth is like the fineſt needles, requires the utmoſt ſkill, and ſhould be truſted with few hands.

FLINTS, in the glaſs trade.—The way of preparing Flints for the niceſt operations in the glaſs trade is this:

Chuſe the hardeſt Flints, ſuch as are black and will reſiſt the file, and will grow white, when calcined in the fire. Cleanſe theſe of the white cruſt that adheres to them, and calcine them in a ſtrong fire, and throw them while red-hot into cold water; waſh off the aſhes that may adhere to them, and powder them in an iron mortar, and ſift them through a very fine ſieve; pour upon this powder ſome weak aqua fortis, or the phlegm of aqua fortis, to diſſolve and take up any particles of iron it may have got from the mortar; ſtir this mixture ſeveral times, then let it reſt, and in the morning pour off the liquor, and waſh the powder ſeveral times with hot water, and afterwards dry it for uſe. You will thus have a powder for making the pureſt glaſs as perfectly fine and faultleſs, as if you had uſed rock cryſtal itſelf. *Cramer's Art of aſſaying Metals.*

The waſhing off the ferrugineous particles with aqua fortis is not neceſſary, when the glaſs intended to be made is to be tinged with iron afterwards; but, when meant to be a pure white, this is the method to be ſure of ſucceeding.

FLOS *Aſiæ*, in natural hiſtory, a name given by Swenkfield and ſome other writers to that ſalt which is found on the ſurface of the earth in ſome parts of Aſia in form of an effloreſcence, and is called the Smyrna ſoap earth.

FLO'WER (*Dict.*)—Tournefort defines it to be a part of a plant very often remarkable for its peculiar colours, for the moſt part adhering to the young fruit, to which it ſeems to afford the firſt nouriſhment, in order to explicate its moſt tender parts. Which definition is ſtill more deficient than the ſucceding, by this uncertain mode of expreſſion.

Pontedera, profeſſor of botany, at Padua, defines it to be a part of a plant unlike the reſt in form and nature, always, when the Flower has a tube, adhering or fixed very near to the embryo, to the uſe of which it is ſubſervient; but, if the Flower has no tube, not adhering to the embryo. Which definition is not much clearer, being ſcarce intelligible to any perſon who has not ſtudied botany a conſiderable time, as Mr. John Martyn well obſerves; and alſo that it is liable to this objection, that it may include ſome parts, which no perſon ever called by the name. For a root, or a ſtalk, or a leaf, are parts of a plant unlike the reſt in form and nature, having no tube, and ſo adhering to no embryo's; and thus, by Pontedera's definition, are Flowers.

Monſ. Juſſieu, the Paris profeſſor, ſeems not to have ſucceeded much better in this affair: he ſays, that is properly called Flower, which is compoſed of chives and a piſtillum, and is of uſe in generation. But this is too defective; for that there are many plants in which the piſtillum or ſtyle is found a conſiderable diſtance from the chives; many Flowers that have no piſtillum, whether that word be taken to ſignify the embryo of the fruit, or its appendix; and many which have no chives. But the late Monſ. Vaillant ſeems to be happier, in forming a clearer idea of this part of a plant. We find in a lecture he read in the regal garden at Paris, that the Flowers, ſtrictly ſpeaking, ought to be reckoned the organs which conſtitute the different ſexes in plants, ſeeing they are ſometimes found without any covering, and that the coats, or petals, which immediately encompaſs them, are deſigned only to cover and defend them: but (ſays he) as theſe coats are the moſt conſpicuous and moſt beautiful part of the compoſition, which is called by the name of Flower; to theſe coats therefore I give the name of Flower, of whatſoever ſtructure or colour they be; whether they encompaſs the organs of both ſexes, together, or contain only one of them, or only ſome part depending on one of them; provided always that they be not of the ſame figure of the leaves of the plant.

But, in my opinion, Mr. John Martyn has been happier, in his definition of a Flower, than all thoſe abovementioned: he defines a Flower to be the organ of generation of both ſexes adhering to a common placenta, together with their common coverings; or of either ſex ſeparately, with its proper coverings, if it have any.

The parts of a Flower are, 1. The ovary, which is the rudiment of the fruit, and ſo is properly the female organ of generation.

2. The ſtyle, which is a body accompanying the ovary, either ariſing from the top of it, or ſtanding as an axis in the middle, with the embryo's of the ſeeds round it.

3. The ſummits, or apices, which are thoſe bodies that contain the prolific powder, analogous to the male ſperm in animals; and generally hang upon ſlender threads, which are called the chives.

The petals are thoſe tender fine-coloured leaves, which are generally the moſt conſpicuous parts of a Flower.

The empalement, or calyx, is thoſe tender leaves which cover the other parts of a Flower.

Flowers, according to the number of their petals, are called monopetalous, dipetalous, tripetalous, tetrapetalous, &c.

The ſtructure of Flowers is indeed very various: but, according to Dr. Grew, the generality have theſe three parts in common, viz. the empalement, the foliation, and the attire. *Miller's Gard. Dict.*

FLOS'CULOUS, in botany, a term uſed by Mr. Tournefort, and others, to expreſs ſuch Flowers of plants as are compoſed each of a great number of other ſmaller Flowers placed cloſe to one another, and incloſed in the ſame common cup; each of theſe ſmaller Flowers conſiſts of one petal, which is ſlender and hollow, and wider than the bottom, and uſually divided into many ſegments, which ſometimes are diſpoſed in the form of a ſtar. Each of theſe Flowers ſtands upon an embryo, or young fruit, from which there grows a capillament which reaches beyond the Flowers. Theſe embryo's are lodged in the bottom of the cup, which is called by authors the thalamus of the Flower, and finally become ſeeds winged with down, or ſometimes without that, and ſometimes are armed with prickles. Of this ſort are the flowers of thiſtles, knapweed, &c. See *Plate* XXII. *fig.* 5. *Tourn. Inſt.*

Preſervation of FLOWERS. The method of preſerving Flowers in their beauty, through the whole year, has been diligently ſought after by many people; ſome have attempted it, by gathering them when dry, and not too much opened, and burying them in dry ſand; but this, though it preſerves their figure well, yet takes off from the livelineſs of their colour. Muntingius gives a method which he ſays is preferable to all others; this is as follows: gather roſes or other Flowers, when they are not yet thoroughly open, in the middle of a dry day; put them into a good earthen veſſel glazed within, fill the veſſel up to the top with them, and, when full, ſprinkle them over with ſome good French wine with a little ſalt in it; then ſet them by in a cellar, tying the mouth of the pot carefully down. After this, they may be taken out at pleaſure, and on ſetting them in the ſun, or within the reach of the fire, they will open as if on the tree, and not only the colour, but the ſmell will be preſerved.

Sir Robert Southwell has communicated to the world a method of drying plants, by which all Flowers may be preſerved in their natural ſhape, and many in their proper colours. To this purpoſe two plates of iron are to be prepared of the ſize of a large half-ſheet of paper, or larger for particular occaſions; theſe plates muſt be made ſo thick as not to have any power of bending, and there muſt be a hole made near every corner for the receiving a ſcrew to faſten them cloſe together.

When theſe plates are prepared, lay in readineſs ſeveral ſheets of paper, and then gather the plants with their Flowers, when they are quite perfect; let this always be done in the middle of a dry day; and then lay the plant and its Flowers on one of the ſheets of paper doubled in half, ſpreading out all the leaves and petals, as nicely as can be. If the ſtalk be thick, it muſt be pared or cut in half, ſo that it may lie flat; and, if it be woody, it may be peeled and only the bark left; when the plant is thus expanded, lay, round about it, ſome looſe leaves and petals of the Flower, which may ſerve to compleat any part that may prove deficient; when all is thus prepared, lay ſeveral ſheets of paper over the plant, and as many under it; then put the whole into the iron plates, laying the papers ſmoothly on one, and laying the others evenly over them; then ſcrew them cloſe, and put them into an oven after the bread is drawn, and let them lie there two hours; after this make a mixture of equal parts of aqua fortis and common brandy; ſhake theſe well together, and, when the Flowers are taken out of the preſſure of the plates, rub them lightly over with a camel's hair pencil dipped in this liquor; then lay them upon freſh brown paper, and, covering them with ſome other ſheets, preſs them between this and other papers with a handkerchief, till the wet of theſe liquors is wholly dried away. When the plant is thus far prepared, take the quantity of a nutmeg of gum dragon, put this into a pint of fair water cold, and let it ſtand four and twenty hours; it will in this time be wholly diſſolved; then dip a fine hair pencil in this liquor, and with it daub over the back-ſides of the leaves, and lay them carefully down on a half-ſheet of white paper fairly expanded, and preſs them with ſome more papers over theſe. When the gum water is fixed, let the preſſure and papers be removed, and the whole work is finiſhed. The leaves retain their verdure in this caſe, and the Flowers uſually keep their natural colours. Some care muſt be taken, that the heat of the oven be not too great. When the Flowers are thick and bulky, ſome art may be uſed to pare off their backs, and diſpoſe the petals in a due order; and after this, if any of them are wanting, their places may be ſupplied with ſome of the ſupernumerary ones dried on purpoſe; and, if any of them are only faded, it will be prudent to take them away and lay down others in their ſtead; the leaves may be alſo diſpoſed and mended in the ſame manner. Another way of keeping both Flowers and fruit the whole year, without ſpoiling, is delivered by the ſame author in the following manner: take ſalt-petre, one pound; bole armeniac, two pounds; clean common ſand, three pounds; mix all well together; then gather fruit of any kind, that is not full ripe, with the ſtalk to each; put theſe in one by one into a wide-mouthed glaſs, laying them in good order; tie over the top with a ſail-cloth, and carry the glaſs into a dry cellar, and ſet the whole upon a bed of this prepared matter of four inches thick in a box; fill up the remainder of the box, with the ſame preparation, and let it be four inches thick over the top of the glaſs and round all its ſides. Flowers are to be preſerved in the ſame ſort of glaſſes in the ſame manner, and they may be taken up after a whole year as plump and as fair as when buried.

Sexes of FLOWERS.—The learned and ingenious Mr. Watſon, in the 47th volume of the Philoſophical Tranſactions, has given us the following curious obſervations on this ſubject:

It is in the Flowers of vegetables only, that the parts ſubſervient to generation are produced. Simple Flowers (I uſe this term in oppoſition to the compound Flowers of the botaniſts) are either male, female, or hermaphrodite. By male Flowers, I would be underſtood to mean thoſe which are poſſeſſed only of thoſe organs of generation, analogous to the male parts of animals; and theſe are what former botaniſts have denominated ſtamina and apices, but are named more properly, by Linnæus ſince, filamentum and anthera. The female Flower is only endowed with parts like thoſe, which perform the office of generation in females; and theſe are the piſtillum and its appurtenances, which by Linnæus, with his accuſtomed accuracy, are divided into three parts, viz. the germen, ſtylus, and ſtigma. The hermaphrodite Flower, which conſtitutes the great bulk of the vegetable creation, is poſſeſſed of all theſe parts in itſelf, and is itſelf thereby capable of propagating its ſpecies without any foreign aſſiſtance; which, by many inconteſtable experiments it has been found neither the male nor female Flower ſimply is able to do.

Much the greater number of plants, as I have juſt hinted, have hermaphrodite Flowers; but there are ſome, which have both the male and female Flowers growing from the ſame root. Such are mays or Indian corn, nettles, box, elm, birch, oak, walnut, beech, hazel, hornbeam, the plane-tree, pine, fir, cypreſs, cedar, the larch-tree, melons, cucumbers, gourds, and ſeveral others. In many of theſe, though the male and female Flowers are at conſiderable diſtances, the farina fœcundans, which providence, on account of its being liable to be ſpoiled by rain, or diſſipated by winds, has provided in great abundance, is conveyed to the female by means of the atmoſphere. It is this claſs of vegetables, and the following, the quantity of the produce of which is much more precarious than thoſe plants which have hermaphrodite flowers; as the impregnation of theſe laſt may be performed within their own calyx; whereas the former muſt neceſſarily commit their farina to the circumambient air. It is for this reaſon, that, if during the time of the flowering of theſe plants, the weather is either very wet or ſtormy, their produce of fruit will be very inconſiderable, from the ſpoiling or haſty diſſipation of the male farina. Thus, independent of froſts, the fruit of the nut and filberd-tree will be moſt numerous in thoſe years, in which the months of January and February are the leaſt ſtormy and wet; as at that time their Flowers are produced. For the ſame reaſons, a ſtormy or wet May deſtroys the cheſnuts; and the ſame weather in July prodigiouſly leſſens the crop of mays or Indian corn, as its ſpikes of male Flowers ſtand lofty, and at a conſiderable diſtance from the female. In like manner a judgment may be formed of the reſt of theſe.

Some of the more ſkilful modern gardeners put in practice, with regard to melons and cucumbers, the very method mentioned by Theophraſtus two thouſand years ago, in regard to the palm-tree. As theſe plants, early in the ſeaſon, are in this climate confined to frames and glaſſes, the air, in which they grow, is more ſtagnant than the open air, whereby the diſtribution of the farina fœcundans, ſo neceſſary towards the production of the fruit for the propagation of the ſpecies, is much hindered; to obviate which, they collect male Flowers, when fully blown, and, preſenting them to the female ones, by a ſtroke of the finger they ſcatter the farina fœcundans therein, and this prevents the falling of the fruit immaturely. Beſides the vegetables before-mentioned, which bear both male and female Flowers upon the ſame root, there are others, which produce thoſe neceſſary organs upon different roots. In the number of thoſe are the palm-tree, hops, the willow-tree, miſletoe, ſpinach, hemp, poplar, French and dog's mercury, the yew-tree, juniper, and ſeveral others. Among theſe the valiſneria of Linnæus, as to the manner, in which its male Flower impregnates the female, is one of the moſt ſingular prodigies in nature. The manner of this operation is figured by Micheli, in his Nova Plantarum Genera, and deſcribed by Linnæus, in the Hortus Cliffortianus. As that elaborate and expenſive work is in very few hands, in ſuch only as owe it to the munificence of Mr. Clifford of Amſterdam, of which number I with pleaſure acknowledge myſelf one, I will here lay before you a ſhort account thereof: The valiſneria grows in rivulets, ditches, and ponds, in many parts of Europe. The male plant, which is continually covered with water, has a ſhort ſtalk, upon the top of which its Flowers are produced. As this top never reaches the ſurface of the water, the flowers are thrown off from it, and come unopened to the ſurface of the water; where, as ſoon as they arrive, by the action of the air, they expand themſelves, and ſwim round the female Flowers, which are blown at the ſame time.

Theſe laſt have a long ſpiral foot-ſtalk, by which they attain the ſurface of the water, and, remaining there in Flower a few days, are impregnated by the male Flowers detached from the ſtalk at the bottom. This operation ſeems to be thus directed, as the farina fœcundans could not exert its effects in ſo denſe a medium as water; and we find, that even the hermaphrodite Flowers of water-plants, ſuch as thoſe of potamogiton, ranunculus aquaticus, hottonia, and nymphæa, theſe, I ſay, never expand themſelves, until they reach the ſurface of the water.

But to return: it was not poſſible for me, without premiſing theſe things, to make evident what I intended, in relation to the falſely denominating the ſexes of plants; as it is to this laſt claſs that the wrong application has been made by botanical writers. This error ſeems to have been firſt introduced ſo early as by Dioſcorides, and has been continued through a great variety of writers even to our own time. It is moſt certain, that thoſe plants, which produce the ſeed, ought to be conſidered as females; but it happens that, in the French and dog's mercury, the ſeeds are produced in the female plants by pairs; and theſe are contained in a capſule, which was thought to reſemble the ſcrotum of animals; and from this teſticulated appearance they called theſe plants males, and the others females.

Diſcorides, when treating of mercurialis, or what we here call French mercury, ſays, that 'the ſeed of the female is produced 'in bunches, and is copious; that of the male grows near the 'leaves; that it is ſmall and round, and is diſpoſed in pairs 'like teſticles'. Dodonæus, Lobel, Delechamp, John and Caſpar Bauhin, Morriſon, Tournefort, and Boerhaave, in their ſeveral works, have in this followed Dioſcorides, and have denominated the ſeed-bearing plant of this kind, the male; and the other, the female. Fuchſius and John Bauhin likewiſe call the cynocrambe or dog's mercury, which bears fruit, the male; and the ſpiked one with male flowers only, the female. This miſtake is obſervable in hemp, hops, and ſpinach.

We obſerve, that the operations of nature are carried on moſt uſually by certain general laws, from which however ſhe ſometimes deviates. Thus almoſt all plants have either hermaprodite Flowers, or male and female Flowers, growing from the ſame root, or male and female Flowers from different roots: but there are a few of another claſs, which from the ſame root furniſh either male and hermaphrodite Flowers, or female and hermaphrodite Flowers. Of this kind are the mulberry-tree, the mura or plantain-tree, white hellebore, pellitory, arrach, the aſh-tree, and a few others. But of this claſs the empetrum or berry-bearing heath is the moſt extraordinary; as of this are found ſome plants with male Flowers only, others with both male and female Flowers ſeparately, and ſtill others with herphrodite flowers. *Philoſ. Tranſ.* Vol. XLVII.

The learned Dr. Alſton, king's botaniſt in Scotland, has endeavoured to overturn the whole doctrine of the ſexes of plants, by ſhewing that the farina fœcundans, is not neceſſary to the producing of the fertile ſeeds. We ſhall add the following inſtances which he has brought to ſupport his doctrine:

In the ſpring 1737, I tranſplanted three ſets of common ſpinage, long before it could be known, whether they were flowering or ſeed-bearing plants, from a little bed on which they were raiſed, into a place of the garden, full eighty yards diſtant, and almoſt directly ſouth; there being two haw-thorn, and three holly hedges, all pretty thick and tall, between them and their ſeed bed; and no other ſpinage in the garden, nor ſo near them by far: all the three proved fertile plants, and ripened plenty of ſeeds. I ſowed them, they grew, and proſpered as well as any ſpinage ſeed poſſibly could do. This, I own, made me, at firſt, call in queſtion the ſexes of plants, which I formerly too implicitly believed.

The ſame year, a few plants of the common hemp, which I had raiſed for a ſpecimen from the ſeed, being accidentally deſtroyed when very young; and finding afterwards, about the end of June, a pretty ſtrong but late plant of hemp, growing in the incloſure to the eaſt of Holyrood houſe, commonly called the bowling green, by itſelf: I cauſed great care to be taken of it; there not being that year any hemp raiſed within a mile of it, that I could find. This plant grew luxuriantly; and, though bad weather in the autumn made me pluck it up a little too ſoon, yet I got about thirty good ſeeds from it, which the ſucceeding ſpring produced as thriving male and female plants as if the mother hemp had ſtood ſurrounded with males. And, In the ſpring 1741, I carried too young ſeedling plants of the French mercury, long before there was any in flower, from the city phyſic garden, the only place where it was then to be found in this country, to the king's garden at the abbey, which are more than 700 yards diſtant from one another, with many high houſes, trees, hedges, and part of a hill between them: and planted one of them in one incloſure, where it was ſhaded from the ſun the greateſt part of the day; and the other, in another, twenty-five yards diſtant, expoſed to the ſouth and weſt. Both plants ripened fertile ſeeds; and the laſt ſhed them ſo plentifully, that it proved a troubleſome weed for ſeveral years: though none of the ſpecies was to be found in that garden, for more than twenty years preceding.

Hence, the duſt of the apices of theſe ſpecies of plants cannot, on any account, be called their genitura. And the ſame may be ſaid of the lupulus, according to Mr. Tournefort's obſervation; of the bryonia, as noticed by Mr. Miller; alſo of Mr. Geoffroy's mays.

One year, obſerving two ſtrong tulips growing together, in an incloſure ſurrounded with a tall and thick quick-ſet haw-thorn hedge; I cut down two or three more tulips, which ſtood at ſome diſtance from them ſo as to leave none within that incloſure, ſave the two I mentioned: out of theſe, gently opening the petala, I plucked all the ſtamina with their apices ſtill intire. The conſequences of this too rude caſtration, were a conſiderable extravaſation of the juices, in the bottom of the flower, and a ſudden decay of the ovarium or fruit, which never increaſed, but turned yellow, ſhrunk, and withered. In order to diſcover whether this abortion was owing to the wounds, or to the want of the duſt of the apices; I ſuffered theſe two tulips to remain in the place where they were: and next ſeaſon, with the ſame precaution that no other tulips ſhould flower within the incloſure, I opened the petala, and took out carefully, not the ſtamina, only, but all the apices; which prevented any ſenſible bleeding of the parts. This more gentle caſtration they bore perfectly well; the ovarium ſuffered nothing, in either of them, but increaſed, and came to maturity, quite full of ſeeds. See the *Eſſays, Phyſical and Literary, read before a Society in Edinburgh*, Vol. I.

FLOWER-*root worm*, in natural hiſtory, a peculiar ſpecies of fly-worm, which makes its habitation only in the bulbous roots of Flowers. The roots of the narciſſus, at the time they are taken up out of the earth toward the end of autumn, very frequently are found to contain in each a ſingle worm, which eats and deſtroys them. Sometimes one root is found to contain two of them; but this is but rarely the caſe. The roots which have them may eaſily be known, by having each a round hole in ſome part, at which the deſtroyer has entered, while it was ſmall, and which probably ſerves it now in its larger ſtate for the reſpiration of the freer air. The interior part of theſe bulbs is always found rotted and deſtroyed, and the worm is found in theſe, lying in a brown ſort of dirt made by its own liquid excrements, mixed among the fragments of the coats of the root which it has deſtroyed. *Reaumur's Hiſt. Inſect.*

FLOWE'RING *of bulbous plants.* — The beſt method of managing the whole proceſs is this: place the bulbs at firſt only on the ſurface of the water; for thus they will ſtrike out their fibres moſt ſtrongly. When they have ſtood thus ſix weeks, pour in the water ſo high as to cover them intirely, and keep them at this ſtandard till they have done Flowering.

Sometimes the roots will become mouldy in ſeveral parts, while they ſtand above the water; and the cleaning them of it is to no purpoſe, for it will eat and ſpread the farther, and frequently eat through two or three of their coats. In this caſe, they muſt be immediately covered with water, and the mould will be ſtopped, and they will become ſound, and flower as well as thoſe which never had any ſuch diſtemperature. If the roots are ſuffered to remain in water all the year, they will not decay, but will flower again at their proper ſeaſon, and that as vigorouſly as thoſe which are taken out and dried. The old fibres of theſe roots never rot till they are ready to puſh out new ones. It is found by experience, that the hyacinth, and many other plants, grow to a greater perfection thus in water, than when in the ground. There is a peculiar ſpecies of hyacinth, called Keyſer's jewel; this never, or however very rarely, produces ſeed veſſels in the common way of Flowering in the ground, but it often will produce ſome pods when blown in water. Mr. Miller has intimated, in the Philoſophical Tranſactions, that bulbs, ſet in water, grow weaker, and ſhould be renewed with freſh ones every other year; but it is found that, when they are managed in this manner, and kept under water, at the time of taking them up, they are as large, and ſome of them larger and ſtronger than when planted; and, if theſe be dried in a proper ſeaſon, they will flower year after year as well as the freſh ones.

Ranunculus and anemone roots have been found to ſhoot up their ſtalks very well in this way, but the flowers are uſually blaſted, which ſeems to ariſe from want of free air. Pinks will flower very well in this manner, and auriculas thrive very well, and may with care be brought to flower, but not ſtrongly. Roſes, jeſſamines and honey-ſuckles, may alſo be made to flower this way, and will thrive and ſend out ſuckers; the beſt pieces to plant are ſuckers cut off about three inches under ground, without any fibres.

The ſucculent plants may alſo be raiſed this way, for inſtance an opuntia or Indian fig. If a fragment of a leaf of this plant be cut and laid by to dry for a month, till it is an abſolute ſkin, as ſoon as it is put in this manner into water, it begins to plump up, and ſoon ſends out fibrous roots, and produces new leaves, at leaſt as quickly as it would do in the ground. *Philoſ. Tranſ.* N°. 432.

FLOX, in the colour trade, a very well cleaned wool uſed to abſorb the colours of cochineal, &c. It is prepared in this manner: infuſe a pound of the fineſt ſheering of woollen cloth in cold water for one day, then take them up, and preſs them well together to waſh off the unctuoſity the wool naturally has. This is the ſimple Flox, which, when impregnated with a ſolution of alum, is called alumed Flox; this is done in the following manner: take four ounces of roach alum, and two ounces of crude tartar, both in fine powder; put them into an earthen veſſel with three quarts of water, ſet it over the fire, and, when it begins to boil, then put it into the Flox; let the liquor now boil half an hour over a gentle fire, then take it off, and when all is perfectly cooled, waſh the Flox with fair water, letting them ſtand in it two hours, then preſs them in the hand and let them dry. *Neri's Art of Glaſs.*

FLUVIA'TILES *Cochleæ*, freſh water ſhell fiſh, a term uſed by naturaliſts to expreſs thoſe kinds of ſhell fiſh which never inhabit the ſea, but are found in our ponds, rivers, and ditches. Theſe, though greatly leſs numerous than the ſpecies of ſea ſhells, are yet of greater variety and beauty, than is uſually ſuppoſed.

FLU'IDS (*Dict.*) — Under this article in the Dictionary, we have obſerved that the ſurface of a Fluid becomes level by its own gravity, when no external force prevents its being ſo. The demonſtration of this is founded upon a ſuppoſition, that bodies tend downwards by their gravity in lines parallel to each other; which, though phyſically true, is not ſtrictly ſo, their tendency being towards the center of the earth, and conſequently in lines which meet in a point: and therefore, if we would be accurate, the Fluid contained in a veſſel ſhould be conſidered, as divided into columns and ſtrata, as repreſented *plate* XXX. *fig.* 6. in the Dictionary, where A B D is the earth, C its center, E F G H a Fluid contained in a veſſel, and divided into columns, which, if continued down to the center of the earth, would there terminate in a point C; and into the concentric ſtrata, *a b*, *c d*, &c. having the center of the earth for the center of their convexity. And then we ſhould find that the particles of the Fluid will not be in æquilibrio with each other, till all the parts of its ſurface are at equal diſtances from the center of the earth, forming thereby the ſurface E F, concentric to that of the earth. For, ſuppoſing the Fluid E F G H continued down to C, ſo as to fill the ſpace E C F; it is evident the columns, into which the Fluid is divided, cannot be of equal lengths, and therefore cannot be of an exact counterpoiſe to each other, unleſs the ſurface E F is a portion of a ſphere, whoſe center is C: but the action of the parts of the Fluid upon each other, at the ſurface, is the ſame, whether the lower part G C H be a Fluid, or not. Conſequently the ſurfaces of Fluids are not level or plain, but convex, having the center of the earth for the center of their convexity.

This convexity, by reaſon of the great diſtance of the earth's center, approaches ſo near to a plane, that, in ſmall portions of it, the difference is not ſenſible, and therefore may be neglected: but at ſea it is evident to ſenſe; for, when the mariners put to ſea, the ſhore firſt diſappears, then the lower buildings, afterwards the towers, mountains, &c. in like manner, when they approach a diſtant ſhip, the top of its maſt and ſails appears firſt, while the ſhip itſelf is intercepted from their view, by the convexity of the water between them.

FLY, in natural hiſtory. — As weak and contemptible as this creature may appear to us, there is ſcarce any ſpecies of the inſect, but what is furniſhed with five or ſix advantages that are perpetually ſerviceable to it in all its neceſſities. For inſtance, it has excellent eyes, it has likewiſe antennæ, or horns, wings, claws, ſponges, and a trunk.

Its eyes, as well as thoſe of beetles and dragon flies, are of a peculiar ſtructure: they are two little creſcents, or immoveable caps, diſpoſed round the head of the inſect, and comprehending a prodigious number of minute eyes, or cryſtalline humours, ranged like lentils, in lines croſſing each other, in the form of lattice work. Under theſe one may diſcover a ſet of fibres, or optic nerves, correſponding in number to the external diviſions, or little planes; and curious obſervers will tell you, they have counted ſeveral thouſands in each combination. But, whatever their number may be, it is certain that all theſe planes are a collection of eyes, on which, as on ſo many mirrors, outward objects are painted. One may ſee the figure of a lighted taper multiplied almoſt to infinity, on their ſurfaces, and ſhifting its beams into each eye, in proportion to its being varied in its motions by the obſerver's hand.

The eyes of other creatures are multipled by motion, if I may uſe that expreſſion; whereas thoſe of a Fly are fixed and immoveable, and can only ſee what lies directly before them; they are very numerous therefore, and placed on a round ſurface, ſome in a high, others in a low ſituation, to inform the Fly of every thing wherein ſhe can be intereſted. She has a number of enemies, but, with the aid of theſe eyes that ſurround her head, ſhe diſcovers whatever danger threatens her from above, behind, or on either ſide, even when ſhe is in full purſuit of a prey directly before her; and the ſame object is as diſtinctly perceived by that profuſion of eyes, as it by us, who behold it with no more than a couple.

In the microſcope, the round edgings, together with the glazed ſubſtance and fringe of its wings, appear ſurprizingly beautiful. There we obſerve ſeven or eight articulations, two bending claws, and ſeveral minute points, on each of its paws; the double packet of ſponges, placed below, at the juncture of its claws, is admirable. Some naturaliſts ſuppoſe, that, when this animal marches over any poliſhed body, on which neither her points nor claws can faſten, ſhe ſometimes compreſſes her ſponge, and cauſes it to evacuate a fluid, which fixes her in ſuch a manner as prevents her falling, without diminiſhing the facility of her progreſs. But it is much more probable that ſponges correſpond with the fleſhy balls, which accompany the claws of dogs and cats; and that they enable the Fly to proceed with a ſofter pace, and contribute to the preſervation of its claws, whoſe pointed extremities would be ſoon impaired without this prevention. Beſide theſe ſponges, her paws are ſhaded with a growth of hair, which ſhe employs inſtead of a bruſh to clean her wings and eyes.

Her trunk is compoſed of two parts, one of which folds over the other, and both of them are ſheathed in her mouth. The extremity of this trunk is ſharp like a knife, to enable her to cut what ſhe eats. She likewiſe forms it into two lips, that ſhe may the better take up proper quantities of food; and, when ſhe ſucks up the air it contains, ſhe employs it, as a pump, for drawing up liquors. Several Flies, at the other extremity of their body, are furniſhed with a piercer, above three twelfths of an inch in length, with which they penetrate wherever they pleaſe, and then ſheathe it between their ſcales. This inſtrument conſiſts of ſeveral parts, as particularly one or two ſaws, finely pointed at the end, and well indented through the whole length; a long caſe to incloſe them; a ſyſtem of muſcles to unſheathe them; and a ſet of fibres, to bring them back to their ſocket. Its laſt piece of furniture is a bag of corroding water, to eat into the cavities that have been firſt opened by the ſaws. Thoſe Flies that penetrate the leaves of the oak, are furniſhed with ſuch a piercer as I have already deſcribed.

Thoſe, whoſe punctures are ſeen in the bark of roſe-trees, have one of a very different ſtructure. It is formed into a long tube, which terminates in a bending point, like a pruning-knife, and is accompanied, through its whole length, with ſeveral ranges of teeth. The Fly firſt traces out, with the ſharp part of this inſtrument, a ſmall furrow on the branch of a roſe-tree, after which ſhe places the long indented tube on that furrow, and then, by twining and returning the whole inſtrument, ſhe opens, on all ſides, a number of cells, which appear like ranges of teeth, diſpoſed in pairs, along the extent of a line that ſeparates them.

The ſame tube likewiſe enables her to depoſit an egg in each cavity, and, when the heat has at laſt hatched the little worm in the egg, it quits its manſion, to gnaw a leaf of the roſe-tree, and gradually increaſes in growth, like a ſmall caterpillar. The animal, at the end of ſix weeks, and after it has frequently changed its ſkin, ceaſes to eat, and deſcends to the lower part of the tree, where it ſpins a covering around its body. The Fly, contained in this worm, endeavours to force itſelf a paſſage through the ſkin of that creature, and accompliſhes her purpoſe by degrees. The ſkin of the worm cleaves open, and ſhrinks with the head and inteſtines, that are now become uſeleſs. The fluid in which the Fly ſwims, and which might poſſibly contribute to its diſengagement from the worm, begins to dry all around the new animal, and is then converted into a kind of bag or ſhell, which makes the Fly ſeem in a ſtate of inactivity, and even without any ſymptoms of life. She either continues but a ſhort ſpace of time in the ſtate of an aurelia, or elſe paſſes the whole winter in that ſituation, according to the degree of heat ſhe then experiences. Theſe few inſtances will enable us to judge of the inſtruments with which each ſpecies is accommodated, and of the various changes through which they paſs.

The common Fly, inſtead of a piercer qualified for penetrating wood, has only a tube, with which ſhe depoſits her eggs, in fleſh that has been ſoftened by heat, and likewiſe in all ſubſtances that are ſucculent or milky, and ſalted but little; becauſe the ſharp particles of ſalt are more apt to tear the tender organs of her young, than contribute to their preſervation. From theſe eggs proceed a brood of worms, who, afterwards change to aurelia's, and then to Flies; I omit the conſequences of their extreme fecundity, and ſhall only obſerve, that neither the lion's threat, nor the wolf's teeth, nor all the horns and fangs of wild beaſts, in their united rage, are ſo pernicious to man, as this little piercer, which nature has beſtowed on a common Fly, to dig a repoſitory for her eggs. The caſe is not the ſame with ichneumon Flies, and ſeveral other ſpecies; for they are in ſome meaſure beneficial to us. The generality of theſe creatures ſuſtain and ſhelter themſelves in ſome particular plant, and it is to their ſollicitude to lay their eggs there that we owe both the invention and materials of the fineſt colours, uſed either in dying or painting, as alſo the deepeſt black, common ink, ſcarlet, and many more.

Fly-*tree*, in natural hiſtory, a name given by the common people of America to a tree, whoſe leaves, they ſay, at a certain time of the year, produce Flies. On examining theſe leaves about the middle of ſummer, the time at which the Flies uſe to be produced, there are found on them a ſort of bags of a tough matter, of about the ſize of a filbert, and of a duſky greeniſh colour; on opening one of theſe bags with a knife, there is uſually found a ſingle full-grown Fly, of the gnat kind, and a number of ſmall worms, which in a day or two more have wings and fly away in the form of their parent. The tree is of the mulberry kind, and its leaves are uſually very largely ſtocked with theſe inſect bags, and the generality of theſe are found to contain the inſects in the worm ſtate; when they become winged, they ſoon make their way out. The bags begin to appear when the leaves are young, and afterwards grow with them; but they never rumple the leaf, or injure its ſhape. They are of the kind of leaf galls, and partake in all reſpects, except ſize, of a ſpecies we have frequent on the large maple, or, as it is called, the ſycamore. *Philoſ. Tranſ.* N°. 431.

The Fly-tree is found in many parts of France, where it grows in great abundance, and is there ſaid to bear fruit, which give origin to vaſt numbers of Flies.

The truth of the matter is this: the tree is a ſpecies of turpentine-tree, and frequently produces or gives origin to certain tubercles, which in the common turpentine-tree are called horns. Theſe are a ſort of long bladders of the length and thickneſs of a finger, which ariſe not from the ſtalks as fruits do, but from the ſurface of the leaves, and are only a kind of an elongation of its outer membranes, occaſioned by the punctures of a number of inſects contained within it, which occaſions a derivation of freſh juices to the part. Theſe inſects are not Flies of the common kind, but are the pucerons ſo well known for feeding on the leaves and tender ſtalks of trees; and ſome few of theſe only are winged, the others being deſtitute of them. The origin of theſe tubercles or bladders is this: the female puceron, as ſoon as produced from the parent, makes a way under the membrane that covers the leaf by means of a hole bored in it with her trunk. The hole ſoon heals up after ſhe is in, and the young ones which ſhe afterwards produces, by their wounding and ſucking the ſides of the lodgement in which they find themſelves placed, occaſion all the ſwelling and growth of the tubercle. *Reaumur's Hiſt. of Inſects.*

Fly, in the ſea language, that part of the mariner's compaſs on which the thirty-two winds are drawn, and to which the needle is faſtened underneath.

FLY'ING *Fiſh*, a name given by the Engliſh writers to ſeveral ſpecies of fiſh, which by means of their long fins have a method of keeping themſelves out of water for ſome time. The Flying fiſh, moſt properly ſo called, is the exocœtus of the ancient authors, and of Artedi. See *plate* XXII. *fig.* 8. It is called alſo the Adonis, hirundo, and mugil alatus or winged mullet, by others; but they uſe theſe words indeterminately for this and the other kinds.

FOAL, or Colt, the young of the horſe kind. The word colt, ſimply ſpoken, is among the dealers underſtood to mean the male kind; the female, or mare colt, being called a filly.

Colts are uſually foaled in the beginning of ſummer, and it is the cuſtom to let them run with the mare till Michaelmas, when they are to be weaned. This is to be done ſooner or later according as the cold weather comes in. Some are for not having them weaned till the middle of November, and three days before the full of the moon, if it happen near that time. And ſome of the beſt writers on this ſubject are of opinion, that we do not let the Foals ſuck long enough, and that this is the reaſon, why they are ſo very long before they are fit for uſe. Theſe authors are of opinion, that a colt ought always to ſuck the whole winter, and that this would make them fit for ſervice a great deal ſooner than they are at preſent.

When firſt weaned, they muſt be kept in a convenient houſe with a low rack and manger for hay and oats, that they may eat freely and eaſily; and the hay muſt be very ſweet and fine, eſpecially at firſt; a little wheat bran ſhould be mixed with the oats, in order to keep their bodies open, and make them eat and drink freely.

It has been obſerved, that the eating too much oats has rendered colts blind; but the cauſe has been wrongly attributed to the heating quality of the oats. If the oats are bruiſed in a mill before they are given them, though they eat ever ſo much of them, there never happens any miſchief of this kind; but, endeavouring with their teeth to break and chew them, when whole, they are apt to ſtretch and ſwell the veſſels of the head, and occaſion a fulneſs of blood about the eyes, which often terminates in inflammations, and in blindneſs.

The difficulty of chewing oats, and not their heating nature, is therefore the true reaſon of this miſchief; and, if this be obviated by the firſt bruiſing the grain, the colt always grows the better for eating it. His legs do not grow thick, but he becomes broader and better knit, and, as he grows up, will bear fatigue much better than if he had been fed only with bran and hay. Above all things, theſe creatures ſhould be kept from wet and cold, while they are young; for nothing is more tender than a colt, and the miſchiefs he gets at this time are not ſo eaſily got over. Experience ſhews the great advantage of houſing and taking care of colts: for, if the ſame ſtallion covers two mares, both alike in age, beauty, and other particulars, and theſe bring both Foals of the ſame ſex, ſo that there is no room to expect the leaſt difference between them; let one of theſe colts be houſed every winter, and let the other always run abroad, it will be found, as they grow up, that the colt which has been kept abroad, ſhall have large fleſhy ſhoulders, flabby and gouty legs, weak paſterns, and bad hoofs, and ſhall be a dull heavy creature; and that the other which has been houſed and taken care of, ſhall have a fine fore-hand, be well ſhaped, have good legs, and good hoofs, and be of good ſtrength and ſpirit. From this it may be learned, that it is of no conſequence to have a good ſtallion, and a good mare, if the colts are ſpoiled in the breeding up.

FŒNI'CULUM, *fennel, or finckle*, in natural hiſtory, a genus of plants whoſe characters are:

The root is fibrous; the leaves capillaceous; the petals of the flowers entire, the ſeeds oblong, ſomewhat thick, gibbous, and ſtriated. Our ordinary fennel has pretty large, thick, white roots, which run deep into the earth without much dividing, beſet with ſmall fibres. It has large winged leaves, branched into ſeveral ſegments of long, ſlender, very fine, capillaceous parts, of a dark-green colour, and ſometimes a little reddiſh; the ſtalk grows to be four or five feet high, much divided, and full of whitiſh pith: the flowers grow on the tops of the branches, in flat umbels, of ſmall yellow five-leaved flowers, each of which is ſucceeded by a couple of roundiſh, ſomewhat flat, ſtriated ſeed. The whole plant has a pretty ſtrong but not unpleaſant ſmell. It is generally planted in gardens to be near at hand, but it grows wild in ſeveral places towards the ſea-coaſt; and, at Woolwich and Graveſend, it is frequently met with: it flowers in June. The leaves, root, and ſeed are in uſe; the root being one of the five opening roots, and the ſeed one of the great carminative ſeeds.

Nutrition of the FŒTUS. How the nutrition of the Fœtus is performed, is diſputed among the learned. Mr. Monro is of opinion, that the Fœtus in viviparous animals is nouriſhed by the navel alone. He has given a curious diſſertation on this ſubject in the Medical Eſſays. Where he obſerves, 1. That the Fœtus is capable of receiving its whole nouriſhment by the umbilical vein alone, whereas no Fœtus can ſubſiſt without the umbilical veſſels. 2. That the liquor of the amnios is ill calculated, in its natural ſtate, for the food of a Fœtus, and becomes altogether unfit food in morbid caſes. 3. That it is highly improbable that a creature ſhould furniſh its ſubſiſtance out of its own body, which muſt be the caſe, if the Fœtus feeds on the liquor of the amnios. 4. That it cannot be inferred, from any reſemblance of the liquor of the ſtomach and amnios, nor from any other appearances, that the liquor of the amnios is ever ſent down into the ſtomach. 5. That no direct proof can be had of the liquor of the amnios being preſſed or ſwallowed down; but, on the contrary, all circumſtances make it probable, that it does not go down. 6. That all the phænomena of a Fœtus can moſt reaſonably be accounted for, without ſuppoſing the liquor of the amnios to be any part of its food; hence, he thinks it reaſonable to exclude the mouth from the office of conveying the aliment of the Fœtuſes of viviparous animals, and to believe that all their nouriſhment is conveyed by the umbilical veſſels. Hippocrates among the ancients was of opinion, that the Fœtus was nouriſhed both by the mouth, and by the umbilical veſſels. He maintains, that the child in the womb with its lips compreſſed together attracts nouriſhment, for which he aſſigns this reaſon, that, unleſs the child had ſucked in utero, it neither could depoſit excrement, nor know how to ſuck, ſo ſoon as it is born. Mr. Gibſon, in the Medical Eſſays of Edinburgh, has lately adopted this opinion, that the Fœtus is nouriſhed by the mouth and by the navel alſo, as moſt probable. Mr. Monro has anſwered him, loc. cit.

St. FOIN. See SAINTFOIN.

FOLDI'NG *of ſheep*, a term uſed by our farmers to expreſs the keeping theſe creatures on their arable lands, within folds made of hurdles, which they remove about, ſo that, when the ſheep have dunged one place, they are ſet upon another. This is a very great advantage to the land; the dung of theſe creatures being a very rich manure. It ought only to be done in ſummer time, and in good weather, for the Folding them in bad weather is apt to give them the rot. Care muſt be taken that they are only driven into theſe folds over night, and let out again in the morning, half an hour after ſun-riſe, into places where there is good food; for, being hungry at this time, they will eat whatever comes next them. Many ſheep are ruined by this practice in moiſt ground, and ſome farmers who think all Folding very bad for ſheep, only ſtick up ſloping ſtakes in ſuch parts of the lands as they would have dunged, and never fold the ſheep at all, but truſt to their coming to theſe ſtakes to rub themſelves for the dunging the ground, as they conſtantly void their dung and urine at that time. *Mortimer's Huſb.*

FOOD *of plants*, that matter, which, being added and united to the firſt ſtamina of plants, cauſes their increaſe.

It is agreed, that all the following materials contribute, in ſome manner, to the increaſe of plants; but it is diſputed which of them is that very increaſe or food.

1. Nitre. 2. Water. 3. Air. 4. Fire. 5. Earth.

Nitre is uſeful to divide and prepare the Food, and may be ſaid to nouriſh vegetables in much the ſame manner as my knife nouriſhes me, by cutting and dividing my meat: but, when nitre is applied to the root of a plant, it will kill it as certainly as a knife miſapplied will kill a man: which proves, that nitre is, in reſpect of nouriſhment, juſt as much the Food of plants, as white arſenic is the Food of rats. And the ſame may be ſaid of ſalts.

Water, from Van-Helmont's experiment, was by ſome great philoſophers thought to be it. But theſe were deceived, in not obſerving that water has always in its intervals a charge of earth, from which no art can free it. This hypotheſis having been fully confuted by Dr. Woodward, no-body has, that I know of, maintained it ſince: and to the doctor's arguments I ſhall add more in the ſequel.

Air, becauſe its ſpring, &c. is as neceſſary to the life of vegetables, as the vehicle of water is; ſome modern virtuoſi have affirmed, from the ſame and worſe arguments, than thoſe of the water-philoſophers, that air is the Food of plants. Mr. Bradley being the chief, if not only author, who has publiſhed this phantaſy, which at preſent ſeems to get ground; it is fit he ſhould be anſwered: and this will be eaſily done, if I can ſhew, that he has anſwered this his own opinion, by ſome or all of his own arguments.

His firſt is that of Helmont, and is thus related in Mr. Bradley's general Treatiſe of Huſbandry and Gardening, Vol. I. 'Who dried two hundred pounds of earth, and planted a willow of five pounds weight in it, which he watered with rain, or diſtilled water; and, to ſecure it from any other earth getting in, he covered it with a perforated tin cover. Five years after, weighing the tree, with all the leaves it had borne in that time, he found it to weigh one hundred ſixty-nine pounds three ounces; but the earth was only diminiſhed about two ounces in its weight.'

On this experiment Mr. Bradley grounds his airy hypotheſis. But let it be but examined fairly, and ſee what may be thence inferred.

The tin cover was to prevent any other earth from getting in. This muſt alſo prevent any earth from getting out, except what entered the roots, and by them paſſed into the tree.

A willow is a very thirſty tree, and muſt have drank in five years time ſeveral tons of water, which muſt neceſſarily carry in its interſtices a great quantity of earth, probably many times more than the tree's weight, which could not get out, but by the roots of the willow.

Therefore the two hundred pounds of earth not being increaſed, proves that ſo much earth as was poured in with the water, did enter the tree.

Whether the earth did enter to nouriſh the tree, or whether only in order to paſs through it (by way of vehicle to the air) and leave the air behind for the augment of the willow, may appear by examining the matter of which the tree did conſiſt. If the matter remaining after the corruption or putrefaction of the tree be earth, will it not be a proof, that the earth remained in it, to nouriſh and augment it? For it could not leave what it did not firſt take, nor be augmented by what paſſed through it. According to Ariſtotle's doctrine, and Mr. Bradley's too, in Vol. I. 'Putrefaction reſolves it again into earth, its firſt principle'.

The weight of the tree, even when green, muſt conſiſt of earth and water. Air could be no part of it, becauſe air, being of no greater ſpecific gravity than the incumbent atmoſphere, could not be of any weight in it; therefore was no part of the one hundred ſixty-nine pounds three ounces.

Nature has directed animals and vegetables to ſeek what is moſt neceſſary to them. At the time when the fœtus has a neceſſity of reſpiration, it is brought forth into the open air, and then the lungs are filled with air. As ſoon as a calf, lamb, &c. is able to ſtand, it applies to the teat for Food, without any teaching. In like manner Mr. Bradley remarks, in his Vol. I. 'That almoſt every ſtem and every root are formed in a bending manner under-ground; and yet all theſe ſtems become ſtraight and upright when they come above-ground, and meet the air; and moſt roots run as directly downwards, and ſhun the air as much as poſſible'.

Can any thing more plainly ſhew the intent of nature, than this his remark does? viz. That the air is moſt neceſſary to the tree above-ground, to purify the ſap by the leaves, as the blood of animals is depurated by their lungs: and that roots ſeek the earth for their Food, and ſhun the air, which would dry up and deſtroy them.

No one truth can poſſibly contradict or interfere with any other truth; but one error may contradict and interfere with another error, viz.

Mr. Bradley, and all authors, I think, are of opinion, that plants of different natures are fed by a different ſort of nouriſhment; from whence they aver, that a crop of wheat takes up all that is peculiar to that grain; then a crop of barley all that is proper to it; next a crop of peaſe, and ſo on, till each has drawn off all thoſe particles which are proper to it; and then no more of theſe grains will grow in that land, till, by fallow, dung, and influences of the heavens, the earth will be again repleniſhed with new nouriſhment, to ſupply the ſame ſorts of corn over again. This, if true (as they all affirm it to be,) would prove, that the air is not the Food of vegetables. For the air, being in itſelf ſo homogeneous as it is, could never afford ſuch different matter as they imagine; neither is it probable, that the air ſhould afford the wheat nouriſhment more one year, than the enſuing year; or that the ſame year it ſhould nouriſh barley in one field, wheat in another, peaſe in a third; but that, if barley were ſown in the third, wheat in the firſt, peaſe in the ſecond, all would fail: therefore this hypotheſis of air for Food interferes with, and contradicts this doctrine of neceſſity of changing ſorts.

I ſuppoſe, by air, they do not mean dry particles of earth, and the effluvia which float in the air: The quantity of theſe is too ſmall to augment vegetables to that bulk they arrive at. By that way of ſpeaking they might more truly affirm this of water, becauſe it muſt be like to carry a greater quantity of earth than air doth, in proportion to the difference of their different ſpecific weight; water, being about 800 times heavier than air, is likewiſe to have 800 times more of that terreſtrial matter in it; and we ſee this is ſufficient to maintain ſome ſort of vegetables, as aquatics; but the air, by its charge of effluvia, &c. is never able to maintain or nouriſh any plant; for, as to the ſedums, aloes, and all others, that are ſuppoſed to grow ſuſpended in the air, it is a mere fallacy; they ſeem to grow, but do not; ſince they conſtantly grow lighter, and though their veſſels may be ſomewhat diſtended by the ferment of their own juices, which they received in the earth, yet, ſuſpended in air, they continually diminiſh in weight (which is the true augment of a plant) until they grow to nothing. So that this inſtance of ſedums, &c. which they pretend to bring for proof of this their hypotheſis, is alone a full confutation of it.

Yet if granted, that air could nouriſh ſome vegetables by the earthy effluvia, &c. which it carried with it, even that would be againſt them, not for them.

They might as well believe, that martins and ſwallows are nouriſhed by the air, becauſe they live on flies and gnats, which they catch therein; this being the ſame Food, which is found in the ſtomach of the chameleon.

If, as they ſay, the earth is of little other uſe to plants, but to keep them fixed and ſteady, there would be little or no difference in the value of rich and poor land, dunged or undunged; for one would ſerve to keep plants fixed and ſteady, very near, if not quite, as well as the other.

If water or air was the Food of plants, I cannot ſee what neceſſity there ſhould be of dung or tillage.

Fire. No plant can live without heat, though different degrees of it be neceſſary to different ſorts of plants. Some are almoſt able to keep company with the ſalamander, and live in the hotteſt expoſures of the hot countries. Others have their abode with fiſhes under water, in cold climates: for the ſun has his influence, though weaker, upon the earth covered with water, at a conſiderable depth; which appears by the effect the viciſſitudes of winter and ſummer have upon ſubterraqueous vegetables.

Though every heat is ſaid to be a different degree of fire, yet we may diſtinguiſh the degrees by their different effects. Heat warms, but fire burns: the firſt helps to cheriſh, the latter deſtroys plants.

Earth. That which nouriſhes and augments a plant, is the true Food of it.

Every plant is earth, and the growth and true increaſe of a plant is the addition of more earth.

Nitre (or other ſalts) prepares the earth, water and air move it, by conveying and fermenting it in the juices; and this motion is called heat.

When this additional earth is aſſimilated to the plant, it becomes an abſolute part of it.

Suppoſe water, air, and heat, could be taken away, would it not remain to be a plant, though a dead one?

But, ſuppoſe the earth of it taken away, what would then become of the plant? Mr. Bradley might look long enough after it, before he found it in the air amongſt his ſpecific or certain qualities.

Beſides, too much nitre (or other ſalts) corrodes a plant; too much water drowns it; too much air dries the roots of it; too much heat (or fire) burns it; but too much earth a plant never can have, unleſs it be therein wholly buried; and, in that caſe, it would be equally miſapplied to the body, as air or nitre would be to the roots.

Too much earth, or too fine, can never poſſibly be given to roots; for they never receive ſo much of it, as to ſurfeit the plant, unleſs it be deprived of leaves, which, as lungs, ſhould purify it. And earth is ſo ſurely the Food of all plants, that with the proper ſhare of the other elements, which each ſpecies of plants requires, I do not find but that any common earth will nouriſh any plant. *Tull's Horſe-hoeing Huſbandry.*

FORCE *of bodies in motion.* It has been a famous diſpute among philoſophers, 'whether the Force of bodies in motion, ſtriking each other, be proportional to the ſimple velocity of the motion, or to the ſquare of the velocity'? The Engliſh and French maintain the former; the Dutch and Germans the latter.

This diſpute firſt commenced between Mr. Huygens and the abbot Catalan, about the Force of oſcillating bodies; it continued ſome time between theſe two gentlemen; at laſt, another ſubject of the ſame kind engaged the ſaid abbot with the famous Leibnitz, who is to be eſteemed the firſt author, that plainly declared, in expreſs words, ‘ That the Forces of bodies ‘ were as their maſſes multiplied by the ſquare of the velocity.’ Catalan, and afterwards Mr. Papin, anſwered Leibnitz; he replied again, and ſeveral papers were written on the ſubject. It then became a matter of general enquiry, and the philoſophers of every nation began to conſider which ſide to be of, and whether they ſhould declare for the old or for the new opinion. However, they did here, as they do in religion, go by a whole nation together; the common herd of philoſophers following the dictates of their leaders. Thus Leibnitz, Polenus, S'Graveſande, and Muſchenbroek led the German and Dutch; Papin, Mairan, &c. the French; and Pemberton, Eames, Deſaguliers, Clarke, &c. the Engliſh.

In this controverſy alſo, as in thoſe of religion, the opponents diſputed with very great warmth, wondered at each other's ſlowneſs of apprehenſion, or backwardneſs of belief; and I wiſh I could ſay, that they had always obſerved ſuch an impartial, free, and generous behaviour and ſtile of expreſſion, as the dignity of philoſophy demands. We ſhould then perhaps have found Dr. Deſaguliers better employed than in blaming Dr. Samuel Clarke for uncivil treatment, for rude and impertinent expreſſions, &c. in regard to thoſe who defend the new opinion of the ſquare of the velocity.

As it uſually falls out in other caſes, ſo here, when men find themſelves preſſed with difficulties and abſurdities in their ſchemes and notions, they have recourſe to the ſubtilties of metaphyſical diſtinctions, though ſeldom to any good purpoſe. Thus when it appeared too plainly by all experiments, and even to common ſenſe, that the natural Force of bodies was proportional to the ſimple velocity and maſs of matter conjointly; we were told it was neceſſary to diſtinguiſh the Force of bodies into two kinds, viz. the vis viva or living Force; and the vis mortua, or the dead Force.

By this vis viva, or living Force, we were to apprehend that which reſulted from the viſible action of one body upon another, as that of a falling weight; but the vis mortua or dead Force was to be underſtood of that which was deſtroyed by a contrary agent, as a weight in one ſcale of a balance is kept from deſcending by a counter-poiſe in the other ſcale. But, unluckily for the author of this refinement, both thoſe Forces appear, even by the balance, to be in the ratio of the ſimple velocity into the maſs.

Thus for the living Force, if on the proportional balance you place 4 lb. at the diſtance of ſix inches on one ſide, and 2 lb. at the diſtance of twelve inches on the other ſide, and, if the balance be put into motion, they will each of them have a vis viva, or an active force, becauſe they will keep the beam in motion for ſome time, till, by militating, they murder or kill each other; and then ſurely enough they become vires mortuæ, or dead Forces.

But let us ſee how they exerted their power, while living. One (A) acted againſt the other (B,) with the gravity of every particle in a maſs of 4 lb. and with the velocity in each ſtroke that ſix inches diſtance could give; but, ſince all allow the weight to be as the maſs of matter, and the velocity as the diſtance from the center of motion, therefore all the Force which A exerted was as $4 \times 6 = 24$. In the ſame manner it is ſhewn the whole Force of B acting againſt A was as $2 \times 12 = 24$; that is, in each caſe, the Force was as the velocity into the maſs of matter. And, becauſe they were equal, they deſtroyed each other.

But, had thoſe combatants A and B been armed with Forces proportioned to the ſquares of the velocities, that of A would have been but $4 \times 6 \times 6 = 144$; whilſt B would have had a Force equal to $2 \times 12 \times 12 = 288$; by which he would have demoliſhed A at one ſingle ſtroke, and been the ſurviving conqueror.

Let us now conſider theſe two bodies A and B as dead, and ſee what Forces they exert (verbo detur venia) in that ſtate. In order to this they muſt be hanged upon the arms of the balance, one on each ſide, till they are dead, i. e. motionleſs; but this will not happen till their diſtances from the center of motion become reciprocally proportional to their maſſes of matter; and then it is plain the caſe is the ſame as before; for the dead Force of A will be as $4 \times 6 = 24 = 2 \times 12 =$ dead Force of B. Whereas, if theſe Forces were as the maſſes into the ſquare of the velocities, A of 4 lb. and B of 2 lb. ought to die at the diſtances 6 and 8, 4 inches from the center reſpectively; but, if the experiment be tried there, ſuch ſtrong ſymptoms of life will be found in A, as manifeſt the falſity of this hypotheſis.

Being driven from this ſubterfuge, they ſeek another in a critical diſtinction between Force and preſſure. Preſſure, ſay they, is the power with which bodies act by means of inſtruments; thus a weight in one ſcale acts againſt the weight in another by preſſure; but the power by which bodies act on each other alone, is properly called Force, as when one ſtone ſtrikes another by falling on it, or a hammer ſtrikes an anvil. The former they allow is proportional to the velocity and maſs of matter conjointly; but the latter, they ſay, is as the maſs multiplied by the ſquare of the velocity.

But this Eclairciſſement boots them as little as the former, if they mean a momentary impact or ſtroke, or ſuch whoſe effect is produced in a moment of time. For in ſuch a caſe we ſay, the ſtroke is in proportion to the maſs of matter, and alſo to the degree of velocity, and therefore as both conjointly; but we deny there is any other ſource of power from whence a body can derive any Force for producing a momentary effect: nor have any of thoſe gentlemen been able to ſhew there is, though ſome (bewildered in the labyrinth) have attempted it, but in how weak and ridiculous a manner may be ſeen in a piece intitled, De Conſervatione Virium vivarum, &c. And it is worth the reader's while to ſee the jocular confutation of this ludicrous piece by Phileleutherus Londinenſis.

If they ſay, they would not be underſtood of momentaneous effects, but ſuch as are produced in time, then they have no antagoniſts. And, it is plain from their experiments, that this is their meaning, after all. For their experiments which they ſo much inſiſt on, are ſuch as are made by letting bodies fall on ſoft ſubſtances, as clay, butter, &c. or by the action of bodies on yielding ſprings, or ſpringy bodies; in all which caſes, the effect is not produced inſtantaneouſly, but in time; the clay takes time to recede, the ſpring to bend, &c.

If the time be taken into conſideration, then every body muſt know that the effect will be proportional to the intenſity of the cauſe, and the time of its continuance: thus, for example, the effect of gravity on bodies left to themſelves cauſes them to deſcend; their deſcent therefore will be proportionate to the power of gravity upon them, and therefore greater in thoſe which fall freely, than in others which deſcend on inclined planes in a given time, where part of the Force of gravity is deſtroyed by the re-action of the plane. But, ſince the action of gravity is not inſtantaneous, but continual, therefore its effect, i. e. the deſcent of the body, will be greater in proportion to the time of its continuing to act on the body, ſeparately conſidered from its intrinſic Force. But this Force is as the velocity produced by it in a given time; alſo the time is as the velocity, when the Force is given; therefore the effect, viz. the deſcent of the body, is as the ſquare of the velocity.

Or in ſymbols thus: let $E =$ the effect produced by any power $= P$, acting in any ſpace of time $= T$, upon any body $= Q$, moving with any degree of velocity V. Then it is plain, E will be as $Q =$ maſs of matter in the body, when P, T, and V are given; alſo the effect E will be as the intenſity of the power P, when T, Q, and V are given; again, when P, Q, T are given, E muſt be as V; and laſtly, we ſhall have E as T, when P, Q, V are given. Therefore, when neither of theſe are given, $E : Q \times P \times V \times T$; and, in caſe of any different effect, let $e : q \times p \times v \times t$.

Then ſuppoſing the bodies equal, viz. $Q = q$, we have $E : e :: P\,V\,T : p\,v\,t$. Thus the ſame or two equal bodies, deſcending on two planes unequally inclined, will deſcend through ſpaces, which will be as the different powers of gravity P and p, as the different velocities V and v in any point of time, and as the different times T and t of their deſcent, conjointly.

If not only the bodies Q and q, but alſo the powers P and p which actuate them, be ſuppoſed equal, or $P = p$; then $E : e : T\,V : t\,v$. Thus, in equal bodies falling freely by gravity, the effect, or the ſpace which they deſcribe, will be as the time T and t of the falls, the velocities V and v at any point of time in the fall. And becauſe in this caſe the velocity is always proportional to the time, that is, $T : t :: V : v$; if we multiply each ratio by the ſame ratio $V : v$, the analogy will ſtill be the ſame, viz. $T\,V : t\,v :: V^2 : v^2$; whence $E : e :: V^2 : v^2$; or the effect of falling bodies, in deſcribing the ſpace, will be as the ſquare of the velocities.

If we ſuppoſe the times given, that is, $T = t$, then (the reſt as before) we have $E : e : V : v$; that is, the Forces or effects of equal bodies, falling in equal times, are proportional to the ſimple velocities.

If $V = v$, or the velocities given; then $E : e :: T : t$. Thus, if two equal bodies, lying on an horizontal plane, receive a ſtroke each from ſprings of equal Force, then will the velocities be equal in every part of the motion, and the effects E and e, in this caſe, being the ſpaces deſcribed, will be as the times of their motion.

Hence we have ſeen every poſſible caſe wherein the Forces of bodies or their effects can be ſuppoſed to vary; and it is plain there is none where the Force is as the ſquare of the velocity but where the time is concerned; or where ſome one of the factors Q, P, V, T, is proportional to the velocity; thus in ſpouting-water, becauſe Q is always as V, therefore, though T be given, E will be as $Q\,V$, or as V^2; for P alſo in this caſe is given, the power of gravity which gives motion to the particles of the fluid being always conſtant.

Nor have they any experiment which ſhews the Force or effects of bodies proportional to the ſquares of the velocities, but where the time in which the effect is produced ought to be conſidered. Thus in their famous experiment of cavities, formed in ſoft clay by falling bodies, it is true, thoſe cavities are the effect of the falling bodies, and proportional to the ſquares of the velocity. But what is this to the purpoſe, unleſs they will ſay, thoſe pits are inſtantaneouſly produced, which I believe none will pretend to do?

It is evident, this cavity muſt be proportional to the quantity of matter put in motion in the clay, by the falling body; but this is proportional to the velocity on two accounts; the firſt is, that every particle which comes in contact with the ſtriking body, receives a ſtroke proportional to the velocity; therefore alſo the number of particles which each of theſe can move, will be as the Force of the ſtroke, or as the velocity of the falling body. Secondly, among yielding particles, the number which the falling body can apply to in a given time, will be as the velocity; conſequently the whole number of particles which can be moved, both immediately by the body itſelf, and by the motion communicated to the particles, will be as the ſquare of the velocity; and therefore the cavity will be in the ſame ratio alſo.

We hence obſerve, the ſame method of reaſoning may be applied to ſoft and yielding ſubſtances, as has always been uſed in the caſe of unelaſtic fluids; and for this reaſon only, that, in every caſe of yielding particles, the effect of a body in ſtriking them is not deſtroyed momentaneouſly, but in time, which time (cæteris paribus) will be as the velocity; and therefore, E being as T V, and T, in all theſe caſes, being as V, it will be univerſally for all ſoft and yielding ſubſtances $E : V^2$.

Hence we may obſerve that, as bodies are more or leſs yielding or ſoft, ſo the effect will be more or leſs approaching to the ratio of the ſquare of the velocity. This conſideration is of great uſe in mechanical affairs. Thus a hammer with a double velocity will produce much more than a double effect in driving a nail; the ſame may be ſaid of a rammer driving a pile: hence the reaſon why a ſmall hammer will by its velocity do more execution upon red-hot iron, than the large hammer by its momentum. In ſhort, all theſe things are ſo plain and eaſy to be underſtood, that it is ſurprizing to think how ſuch a diſpute could ſubſiſt ſo long, and occaſion ſo much to be ſaid about it.

The learned Dr. Jurin, in the Philoſophical Tranſactions, number 476, propoſes the following experiment, which he looks upon as ſufficient to put a final end to this controverſy, which has now ſubſiſted above ſixty years.

Upon an horizontal plane, at reſt, but moveable with the leaſt Force, ſuppoſe upon a boat in a ſtagnant water, let there be placed, between two equal bodies, a bent ſpring, by the unbending of which the two bodies may be puſhed contrary ways.

In this caſe it is evident, that the velocities, which the two bodies receive from the ſpring, will be exactly equal, and their moving Forces will alſo be exactly equal; and that the plane they move upon, and alſo the boat upon which it lies, will have no motion given them either way. Let us call the velocity of each body 1, and the moving force alſo 1.

Now, let us ſuppoſe the ſpring to be bent afreſh to the ſame degree as before, and to be again placed between the two bodies lying at reſt; then let the plane, upon which the ſpring and the bodies lie, be carried uniformly forwards, in the direction of the length of the ſpring, with this ſame velocity 1. In this caſe it is manifeſt, that each of the bodies will have the velocity 1, and the moving Force 1, both in the direction of the axis of the ſpring.

During this motion, let the ſpring again unbend, and puſh the two bodies contrary ways, as before, the one forwards, the other backwards: then the ſpring will give to each of theſe bodies the velocity 1, as before, when the plane was at reſt.

By this means the hindmoſt body, or that which is puſhed backwards, will have its velocity 1, which it had before by the motion of the plane, now intirely deſtroyed, and will be abſolutely at reſt.

But the body, which is puſhed forwards, will now have the velocity 2, namely, 1 from the motion of the plane, and 1 from the action of the ſpring.

Thus far every body agrees in what will be the event of this experiment.

But the queſtion is, what will be the moving Force of the foremoſt body, or of that which is puſhed forwards, and which has the velocity 2; viz. 1 from the motion of the plane, and 1 from the action of the ſpring.

By the Leibnitian doctrine, its moving Force muſt be 4: and, if ſo, it muſt have received the moving Force 3 from the action of the ſpring; for it had only the moving Force 1 from the motion of the plane.

Let us examine, whether this be poſſible, or reconcileable to their own doctrine.

Their doctrine is, that equal ſprings, equally bent, will, by unbending themſelves, give equal moving Forces to the bodies they act upon, whatever thoſe bodies are.

We agree to this, not generally indeed; but in the caſe before us, where the bodies are of equal maſſes or weights, we agree to it.

Let us therefore imagine the bent ſpring, which is placed between the two bodies, to be divided tranſverſly into two equal parts. In this caſe it is plain, that the two halves of the ſpring may be conſidered as two intire ſprings, equal, and equally bent, each of which reſts at one end in æquilibrio againſt the other ſpring, and, at the oppoſite end, preſſes againſt the body it is to move.

Conſequently, by the Leibnitian doctrine, to which, in this particular caſe, where the bodies are equal, we alſo agree, the two ſprings will give equal moving Forces to the two bodies.

But the moving Force, received by the hindmoſt body from the hinder ſpring, was undoubtedly the moving Force 1: for, by that Force given it in the direction backwards, the moving Force 1, which it had before from the motion of the plane in the direction forwards, is exactly balanced and deſtroyed, the body remaining, as was obſerved before, in abſolute reſt. Therefore the moving Force, received by the foremoſt body from the foremoſt ſpring, was alſo the moving Force 1. And this, added to the other moving Force 1, which it had before from the motion of the plane, makes the moving Force 2, and not the moving Force 4, as the Leibnitian philoſophers pretend.

Conſequently, that body, which had before the velocity 1, and the moving Force 1, and now has the velocity 2, has alſo the moving Force 2: that is, the moving Forces are proportional to the velocities.

FO'RCING, in the wine trade, a term uſed by the wine-coopers for the fining down wines, and rendering them fit for immediate draught.

The principal inconvenience of the common way of fining down the white wines by iſinglaſs, and the red by whites of eggs, is, the ſlowneſs of the operation; theſe ingredients not performing their office in leſs than a week, or ſometimes a fortnight, according as the weather proves favourable, cloudy, or clear, windy, or calm: this appears to be matter of conſtant obſervation. But the wine merchant frequently requires a method that ſhall, with certainty, make the wines fit for taſting in a few hours. A method of this kind there is, but it is kept in a few hands a valuable ſecret. Perhaps it depends upon a prudent uſe of a tartarized ſpirit of wine and the common Forcing, as occaſion is, along with gypſum, as the principal; all which are to be well ſtirred about in the wine for half an hour before it is ſuffered to reſt. *Shaw's Lect.*

FORCING, among gardeners, is uſed for producing ripe fruits from trees before their natural ſeaſon. The method of doing it is this: a wall ſhould be erected ten feet high; a border muſt be marked out on the ſouth ſide of it, of about four feet wide, and ſome ſtakes muſt be faſtened into the ground all along the edge of the border; theſe ſhould be four inches thick. They are intended to reſt the glaſs lights upon, which are to ſlope backwards to the wall, to ſhelter the fruit, as there ſhall be occaſion; and there muſt be at each end a door to open either way, according as the wind blows. The frame ſhould be made moveable along the wall, that, when a tree has been forced one year, the frame may be removed to another, and ſo on, that the trees may be each of them forced only once in three years, at which rate they will laſt a long time. They muſt be always well grown trees that are choſen for Forcing, for young ones are ſoon deſtroyed, and the fruit that is produced from them, is never ſo well taſted. The fruits moſt proper for this management are the avant, or ſmall white nutmeg, the Albemarle, the early Newington, and the brown nutmeg peaches; Mr. Fairchild's early, and the elrugo and Newington nectarines; the maſculine apricot, and the May-duke and May-cherry. For grapes, the white and black ſweet-water are the propereſt; and, of gooſeberries, the Dutch-white, the Dutch early-green, and the walnut gooſeberry; and the large Dutch-white and large Dutch-red currants.

The dung before it is laid to the wall ſhould be laid together on a heap for five or ſix days, that it may heat uniformly through; and, when thus prepared, it muſt be laid four feet thick at the baſe of the wall, and go ſloping up till it is two feet thick at the top. It muſt be laid at leaſt within three or four inches of the top of the wall, and, when it ſinks, as it will ſink two or three feet, freſh dung muſt be laid; for the firſt heat will do little more, than juſt ſwell the bloſſom buds. The covering the trees with glaſſes is of great ſervice, but they ſhould be taken off to admit the benefit of gentle ſhowers to the trees, and the doors at the ends ſhould be either left intirely open, or one or both of them opened, and a mat hung before them, at once to let the air circulate and to keep out the froſts.

The dung is never to be applied until toward the end of November, and three changes of it will be ſufficient to ripen the cherries, which will be very fine in February. As to the apricots, grapes, nectarines, peaches, and plums, if the weather be milder, the glaſſes are to be opened to let in ſun-ſhine, or gentle ſhowers. If a row or two of ſcarlet-ſtrawberries be planted at the back of the frame, they will ripen in February, or the beginning of March; the vines will bloſſom in April, and the grapes will be ripe in June.

It ſhould be carefully obſerved not to place early and late ripening fruits together, becauſe the heat, neceſſary to force the late ones, will be of great injury to the early ones, after they have fruited.

The maſculine apricot will be ripe in the beginning of April, and the early nectarines will be ripe about the ſame time, and the forward ſort of plums by the latter end of that month. Gooſeberries will have fruits fit for tarts in January or February, and will ripen in March, and currants will have ripe fruit in April.

The trees need not be planted ſo diſtant at theſe walls as at others, for they do not ſhoot ſo freely as in the open air: nine feet aſunder is ſufficient. They ſhould be pruned about three weeks before the heat is applied. *Miller's Gard. Dict.*

FO'RMICA-*Leo*, the lion piſmire, a very remarkable inſect, as long as the common palmer, but ſomething thicker; it has a very long head, and the body grows round, as it lengthens towards the tail. The animal is of a dark grey, marked with black ſpots. Its body is compoſed of ſeveral flat rings, that ſlide over one another. It has ſix feet, four of which are inſerted in the breaſt, and two in the neck. Its head is ſmall and flat, and, from the fore part of it, two little horns ſhoot out: theſe are ſmooth and hard, extend two twelfths of an inch in length, and bend like hooks in the extremity. Towards the baſe of theſe horns, appear two ſmall eyes, very black and lively, and which are very ſerviceable to the creature, for he ſtarts from the ſmalleſt objects he diſcovers. Other animals are furniſhed with wings, or feet at leaſt, to make them expeditious in the purſuit of their prey; but this is only capable of marching backward. He never follows his prey, and would ſooner die than advance a ſtep towards it. The prey muſt come to him, and he is gifted with the ſecret of making it fall into the ambuſcade he has prepared. This is the only method he has for his ſubſiſtence, and is all the ſcience he is maſter of; but however it ſuffices for his purpoſe.

He chuſes for himſelf a bed of dry ſand, at the foot of a wall, or under ſome ſhelter, that the rain may not diſconcert his work. He is obliged to make uſe of ſand, and of the drieſt he can get, becauſe a ſolid ſoil, as well as a moiſt ſand, would not prove tractable under his operations. When he intends to hollow the trench where he enſnares his game, he bends the hinder part of his body, which tapers into a point, and then plunges it, like a plough-ſhare, into the ſand, which he throws up in his rear, with a backward motion of his body; and thus, by repeating his efforts, and taking ſeveral rounds, he at laſt traces out a circular furrow, whoſe diameter always equals the depth to which he intends to ſink it. Near the edge of the firſt furrow, he opens a ſecond, and then a third, and ſeveral others, which are ſmaller than the preceding, and ſinks himſelf from time to time, deeper in the ſand, which he throws aſide with his horns, on the edges of the furrows, and to a much greater diſtance, always marching backward in a ſpiral line. The repeated ſtrokes of his head whirl the ſand out of the circle, and gradually ſcoop out a cavity, in which operation he exceeds the beſt engineers; he deſcribes a perfect circle, and draws out a volute, without the aſſiſtance of a pair of compaſſes. He likewiſe gives the ſlope of earth, which he hollows with all poſſible ſolidity. In this dexterous and indefatigable manner he compleats his trench, which reſembles a cone reverſed, or rather the inſide of a funnel.

When this creature is newly hatched, he opens a very ſmall furrow, but, when he increaſes in bulk, he digs one more ſpacious, the cavity of which may contain two inches or more in diameter, and as many in depth. When the work is compleated, he forms his ambuſcade, and conceals himſelf under the ſand, in ſuch a manner, that his horns exactly wind round the point in which the bottom of the funnel terminates. In this ſituation, he watches for his prey, and woe to the ant, the palmer, or any other inſect who is ſo indiſcreet as to play round the edge of this precipice, which deſcends in a ſlope, and that too in the ſand, to give a downfal to the little animals who are too incautious in their approaches. It is for the female ant that the lion-piſmire thus adjuſts his kitchen. She is not aided with wings, like the generality of inſects, to diſengage herſelf from this cavern; but then ſhe is not the only prey, for other animals are alſo deſtroyed by the dexterity of this hunter. When he knows by the fall of ſome grains of ſand, that a prize is near, he ſhrinks back and moves the ſand, which immediately rolls to the bottom with the prey. If this prey has agility enough to be capable of remounting in an inſtant, and, with this advantage, is likewiſe aſſiſted with wings; the lion-piſmire whirls a quantity of ſand into the air, above the height of the flying animal. This is a dreadful ſhower of ſtones to ſuch a tender creature as a gnat or an ant. The unfortunate inſect, blinded and overwhelmed in this manner, by the tempeſt that pours down from every quarter, and hurried away by the inſtability of the ſand that rolls from under her feet, falls between the jaws of her enemy, who plunges them into her body, drags her under the ſand, and then feaſts upon the victim. And, when nothing is left but the carcaſe drained of all its juices, he is particularly careful to remove it out of ſight. The appearance of a dead body would deprive him of future viſits, and bring his place of reſidence under a bad reputation: he therefore extends his horns, and, with a ſudden ſpring, toſſes the ſlain half a foot beyond the trench; and, if this ſhould happen to be diſconcerted and filled up, by ſuch an expedition, or if the aperture becomes too large for the depth, and the declivity loſes its proper ſlant, he repairs the whole with all ſpeed; he rounds, he deepens, he clears the cavity, and then watches for a new prey.

An hunter's profeſſion, they ſay, generally requires patience, and the lion-piſmire has as large a ſhare of this quality as he has of craft. He ſometimes paſſes whole weeks and months without motion, and, what is moſt ſurprizing, without food itſelf.

His abſtinence, which is very ſerviceable to him, is ſo extraordinary, that I have known him live above ſix months in a box exactly cloſed up, where he had no other accommodation than ſand. I have ſeen them complete their work as uſual, and then change into nymphs like others, whom I have carefully nouriſhed. It is true, thoſe who eat improve both in growth and vigour.

When he has attained a certain age, and would undergo a ſtate of renovation, in order to appear in his laſt form, he then troubles himſelf no more with his trench, but begins to work in the ſand, where he ſtrikes out a multitude of irregular tracts, and certainly engages in this labour, in order to warm himſelf into a ſweat; after which he plunges into the ſand, and the viſcous humidity which flows from every part of his body, fixes and unites all the grains he touches. With theſe ſandy particles, and the dried glue that conſolidates them, he forms a cruſt which encompaſſes his whole body, like a little ball of five or ſix twelfths of an inch in diameter, in which the animal reſerves himſelf a competent ſpace for motion. He is not ſatisfied with a bare wall, which would inevitably chill him; but ſpins out of his own bowels a thread, which, in fineneſs, infinitely ſurpaſſes that of the ſilk-worm, which we have ſo much admired. This thread he faſtens firſt to one place, and then extends it to a ſecond, ſtill croſſing and interlacing it. By theſe means he hangs all his apartment with a ſattin tinged with the colour of pearls, and perfectly beautiful and delicate. In this work all the propriety and convenience is confined to the inſide, for nothing appears without but a little ſand, which confounds and incorporates the manſion with the contiguous earth. And now he lies ſecreted from the purſuit of ill-diſpoſed birds; he reſts in oblivion, and lives in perfect tranquillity; whereas he would infallibly be loſt, were the outſide of his habitation ornamental enough to attract the view of any creature, whoſe curioſity might prove injurious to him.

In this manner he lives, ſecluded from the world, ſix weeks or two months, and ſometimes more, and then diveſts himſelf of his eyes, his horns, his paws, and ſkin. His ſpoils ſink to the bottom of the ball, like a heap of rags; all that now remains is a nymph, who hath other eyes and paws, other entrails and wings enfolded with a ſkin, and laid in a nutrimental liquor that gradually dries around her, in the ſame manner as is cuſtomary with all papilio's, when they diveſt themſelves of their vermicular ſpoils, to aſſume the form of aurelias.

When the limbs of the new animal have acquired their neceſſary tone and activity, he tears away the tapeſtry of his apartment, and pierces through the walls; for which purpoſe, he employs a couple of teeth, like thoſe with which the graſhopper is furniſhed. And now he makes his efforts, enlarges the opening, thruſts out half his body, and, at laſt, intirely quits his ſolitary ſeat. His long form, that winds like the volute of an Ionic capital, and poſſeſſes only three twelfths of an inch in ſpace, begins to unfold and extend itſelf, and, in an inſtant, ſtretches to the length of an inch and three or four twelfths. His four wings, that were contracted in little folds, and whoſe dimenſions did not exceed two twelfths of an inch, in the film that ſheathed them begin to be expanded, and, in the ſpace of two minutes, ſhoot into a greater length than the whole body. In a word, the malignant lion-piſmire aſſumes the form of a large and beautiful dragon-fly, who, after ſhe has for ſome time continued immoveable and aſtoniſhed at the glorious proſpect of nature, flutters her wings, and enjoys a liberty with which ſhe was unacquainted in the obſcurity of her former ſtate; and, as ſhe hath caſt off the ſpoils of her firſt form, ſo ſhe is likewiſe diveſted of her cumberſome weight, as well as her barbarity and pernicious inclinations. In fine, ſhe appears entirely a new creature, is all gaiety and vigour, graced at the ſame time, with a noble and majeſtic air.

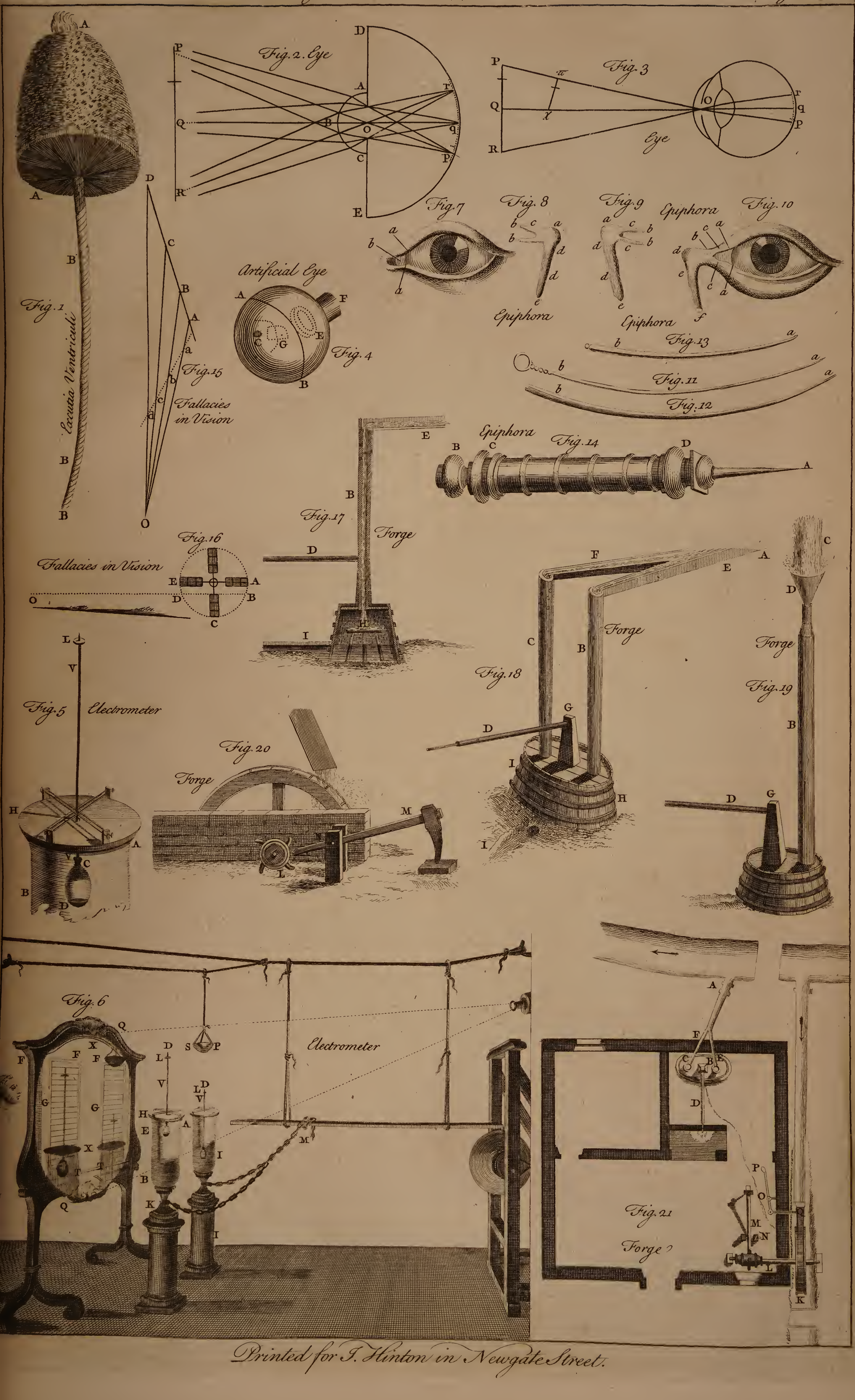
Along the edges of ſtanding waters, one may find other animals like this in form, but painted with colours much more radiant and lively, and their original is alſo very different. The inſect that ariſes from the lion-piſmire, lays her eggs in the ſand, that her young may be ſupplied with food, when it forſakes the egg. Sand is no part of its ſuſtenance, but then it facilitates its manner of life. The creature immediately ſinks a commodious trench, and in leſs than an inſtant becomes completely ſkilled in hunting and geometry. The other dragon-fly, that flutters along the ſurface of ponds, plunges the extremity of her body into the water, and there depoſits her eggs. The animals that iſſue from them, inhabit the fluid element for ſome time, after which they aſſume a new figure, and live upon earth in form of aurelias.

FORGE, in manual arts, a place where iron is ſmelted, and formed into different pieces.

The iron ore being taken from the mine, if it be found to be incorporated with a ſtony ſubſtance, it is broke in ſtamping mills before it is waſhed and melted: but, if mixed with a coarſe ſand or earth, it is not ſtamped, but put immediately into a flat tub ten feet ſquare, and about two feet deep, through which runs a conſtant ſtream of water; and the ore kept conſtantly ſtirring and pounding in the tub, by which means the earthy particles are carried away by the current, while the metalline particles, by their ſpecific gravity, ſubſide to the bottom.

When the ore is ſufficiently purified by ſtamping and waſhing,

PLATE XX. *Engraved for the Supplement.* *Facing* Forge.



Printed for J. Hinton in Newgate Street.

It is taken out and carried to the Forge, where it is melted; and the fire, which muſt be prodigiouſly fierce, is generally blown by means of a fall of water.

The flux-ſtone is preferred by the workmen for this uſe, forаſmuch as it abounds with particles of iron, and therefore increaſes the quantity of metallic matter: it does alſo facilitate the buſineſs of fuſion. The ore conſiſts of metallic, ſandy, and earthy particles; now, the buſineſs is to ſeparate theſe three diſtinct kinds of matter, or elſe to extract the metal from the ſand and the earth. The firſt of theſe offices is performed by lotion in the trough or waſhing-tub, the water carrying off a pretty large quantity of theſe extraneous matters. The melted metal is nothing but a torrent of liquid fire, which rarefies and keeps in motion the metallic particles, which, upon the extinction of the fire, coaleſce and ſubſide one upon another. The vitrified ſand is alſo a liquid maſs of fire, keeping in a ſtate of agitation the finer grains of ſand, and the ſaline particles, which, after ignition, fix into a conſiſtent body. The calcined earth is a ſubject conſiſting of parts eaſily ſeparable, which, being penetrated by the fire, are reduced to aſhes. The ſand being put into a ſtate of fuſion by the fire, the metallic matter, which is more weighty by nature, diſengages itſelf from it, and ſubſides to the bottom; for theſe two bodies, being of different ſpecific gravities, are eaſily ſeparated by the action of the fire; whereas the earth, which is compoſed of light flaky maſſes, is eaſily entangled in the fuſed metal, the vitrified ſands, and the alkaline or ſpongy ſalts that are mixed with them. The greater the quantity there happens to be of this earth or calcined powder in the metal, the coarſer, more brittle, and imperfect it proves; the leſs of this heterogeneous matter there is in the iron, the more malleable, ductile, and ſolid it is, and approaches nearer to the nature of ſteel, which is only pure unmixed iron. Now, in order to purge and purify the metal as much as poſſible from this powder which infects it, they muſt, at the time of its fuſion, inject into it ſome matter, which may lay hold of as many particles of the calcined earth as poſſible, without imbibing the metal; and this is performed by vitrification. The ſands and ſalts of the flux-ſtone, being ſeparated by the fire, give free liberty to the particles of iron to diſengage themſelves, and at the ſame time abſorb a great part of the earth that was mixed with the ore. For want of flux-ſtone, flints or river ſand may be made uſe of, which, when vitrified, purge the iron from the droſs, in proportion to the quantity of ſcoriæ or calcined earth which they lay hold of. Some maſters of Forges uſe lime, inſtead of flux-ſtone or ſand; but, as this is nothing but calcined earth itſelf, it cannot have any abſorbing power, and ſerves to foul inſtead of purifying the ore. The only reſpect in which lime can be ſerviceable, and ſupply the place of flux-ſtone or ſand, is, by ſerving as a cruſt or covering to reverberate the heat, and to make it act with more force inwardly on the ore which is mixed with the coals.

The ore is no ſooner melted than it runs along the bottom of the furnace, which is made ſloping, to a ſort of flood-gates, which are drawn up for it to pour down in a torrent of liquid fire, into long trenches made in the ſand, or into moulds of different figures, to be caſt for cannons, chimney-backs, bomb-ſhells, granado's, mortar-pieces, pipes for the conveyance of water, caldrons, &c.

After having diffuſed itſelf equally from one end of the trench to the other, it conſolidates into a triangular maſs, which they call a pig of iron, weighing from twelve to eighteen hundred pounds; this they run on wooden rollers to the mouth of the fining furnace, where they gradually melt it, not to a degree of liquefaction, but till it reſolves into a ſoft paſte, which the workmen keep ſtirring with their iron prongs; then they take from it a piece of about ſixty pounds weight, which they beat with a light hammer, till it comes to a conſiſtency; this done, they give it a heating in the fining furnace, and thence carry it on an iron ſledge, and ſubject it to the diſcipline of a monſtrous hammer, weighing upwards of ſix hundred pounds, the noiſe of which may be heard above three miles off. It is made to riſe and fall by the motion of a wheel turned by a running water. They turn the iron under this hammer, till it is beat out into an oblong ſquare.

They tell you that the force of percuſſion inflicted, by this hammer on the iron, is ſo great, that it penetrates the very heart of the maſs, agitates the fineſt particles of the iron, diſſipates the calcined earth with the ſcoriæ and other heterogeneous matter, and makes the whole perfectly malleable, by conſolidating the metallic particles, and uniting them in cloſe contact.

After the maſs of iron has paſſed the operation of the great hammer, it is carried back again to the fining furnace, to be thoroughly purged of its droſs and ſcoriæ; where, while it is perfecting, it facilitates another operation; for it thereby contracts ſo intenſe a heat, as is ſufficient to reſolve the pig iron that is near it. Laſt of all, it is carried to the Forge or nealing furnace to ſoften it, and fit it for the anvil, on which they hammer it into flat triangular pieces for plough-ſhares, into ſquare bars for all ſorts of ſmiths works, or into plates of different dimenſions.

In order to give the reader a better idea of a Forge, we have given a plan, &c. of it, on *Plate* XX. where *fig.* 21. exhibits a plan of the conſtruction of one of theſe Forges, and the ſituation of the bellows with regard to the furnace; this pair of bellows is compoſed of a tub turned upſide down, of an oval figure, repreſented by H I ſeven feet deep, three or four feet over, expreſſed by the figures 18, 19; its extremities are buried five or ſix inches to prevent the intromiſſion of external air; on the bottom of this tub are faſtened two wooden pipes B, C ten or twelve feet high, between which is fixed on the tub a kind of pyramid G made of planks, which has a third tube near its top at D, which carries the wind to the Forge; all theſe tubes are well joined and caulked, ſo as to exclude all air.

A ſmall canal one foot broad, about ſeven or eight inches deep, and which divides itſelf into two branches E F, conducts the water into the pipes B C in greater or leſſer quantities, as you would increaſe or decreaſe the action of the wind; which thoſe that work at the Forge regulate by a little flood-gate placed at the entrance of the canal A, as the pipes B C are perforated towards the top, with ſeveral holes inclining on the inſide, through which the air introduces itſelf, a great deal of which the water carries with it into the tub; which, being compreſſed, ſeeks to dilate itſelf, and, having no other vent but through the pipe D, which grows leſſer towards the end, it comes out with impetuoſity, and blows the fire of the Forge with ſo much ſtrength, that they are ſometimes forced to mitigate the blaſt by opening a little hole made on the pyramid G, not permitting it to act at its full power but when there are large pieces to Forge.

Under each of the pipes B, C in the tub is placed a kind of little ſtool H, *fig.* 17. that the air may ſeparate itſelf more eaſily from the waters, by ſpouting upon them, after which the water goes off by a trench which is always ſtopped with it, that the air may not eſcape through the opening neceſſary to be made in the tub.

Fig. 20. repreſents a wheel by the ſide of a mill, turned by a current of water, as exhibited in *fig.* 21, at K Q. The arbor of this weel L moves the hammer M, the handle of which is faſtened at N; and the motion of the wheel is regulated by the means of a flood-gate at Q which is drawn up or put down by the help of the lever Q P, *fig.* 21.

FO'REST-*trees.* Many are wholly averſe to pruning Foreſt-trees; but, though it is to be done with care, and under proper regulations (ſee LOPPING) yet, it is by no means to be wholly omitted. It may be obſerved in Foreſts and large woods, that, for one tree which thrives well, there are twenty that grow faulty, and all this is owing to the want of pruning or lopping in a proper manner; for this, when wiſely executed, is a renewal of their age, and of their growth too; the want of it being what occaſions trees to run out into ſuckers, and to load themſelves with uſeleſs boughs, which draw away the ſap from the upper part, and make it grow knotty and diſtempered, and uſually covered with moſs.

If a tree grow crooked, the buſineſs of the owner is to cut it off ſloping at the crooked place, and nurſe up ſome young bough that grows upright from that part, and it will make it a ſtraight body. This is not to be done when trees are very large, but the careful owner will not ſuffer them to grow very large without doing it.

The beſt time for pruning young Foreſt-trees is in February; and it ſhould be done where there is occaſion every year, or, at the utmoſt, every ſecond year, ſo that the tree may be able to overgrow the knot, and the place not liable to put out ſuckers, becauſe the ſap has had no great recourſe to it. When it is neceſſary to cut off a bough of any bigneſs, there muſt always be given a chop or two underneath, oppoſite to the part where it is cut above, otherwiſe the weight of the bough, in its fall, is apt to ſtrip off the bark from the remaining ſtump, to the great detriment of the tree. When trees are kept for pollards, they muſt be regularly lopped every two years; for, if the branches are ſuffered to grow longer than that, they are apt to be faulty at the wound when cut off, and to let in water, the conſequence of which will be the decay of the tree, and it can no more bear any great quantity of branches or lop. *Mortimer's Huſbandry.*

FO'RTRESS, in military affairs, a caſtle or fortified town.—The method of fortifying a town, &c. may be ſeen in the following problems.

Prob. 1. The maſter line of a Fortreſs being given, to draw the plan of the rampart.

1. Draw the lines *a g* (*Plate* VI, *fig.* 29.) perpendicular to each face, flank, and curtin.

2. In each of the lines *a g* take *a g* = 24 yards.
a b = 20 yards.
a c = 8 yards.
a d = 6 yards.

3. Through the points *d*, *c*, *b*, *g*, draw lines parallel to the maſter line; that is, to each face, flank, and curtin, interſecting one another.

		yds.
Then the breadth of the rampart is repreſented	by *a g* =	24
of the parapet	by *a d* =	6
of the foot-bank	by *d c* =	2
of the walk of the rampart	by *c b* =	12
And of the ſlope of the rampart	by *b g* =	4

The breadths of theſe parts of the rampart are ſometimes different, according to the quality of the earth, or other materials the work is to be built with.

Sometimes the baſtions are made ſolid; that is, the rampart fills up the whole ſpace contained within the faces, flanks, and neck: the plans of ſuch are repreſented by continuing the pair of lines *b g*, forming the inner ſlope of the rampart, againſt the adjacent curtins, till they meet the capital in the breaſt of the baſtion, as at R: but then this pair of lines is to be omitted againſt the flanks and faces of ſuch baſtions.

In plans drawn from a large ſcale, it is uſual to expreſs the outſide ſlope of the rampart by a pair of lines; that is, by drawing a parallel to the maſter line at about five or ſix feet diſtant from it on the outſide.

The maſter line is to be drawn the thickeſt; the inſide of the parapet ſomething finer; and the other lines as fine as they can be drawn.

Before any of the lines are drawn in ink, for it ſhould be remarked that every thing is firſt to be drawn in black lead pencil, let the ramps be put in the inner ſlope of the rampart; the embraſures in the parapets of the flanks; the barbets in the ſaliant angles of the baſtions, *fig.* 16. with their ramps; and the cavaliers, if any are to be, in the ſolid baſtions, *fig.* 23, with their ramps and embraſures.

All theſe ſeveral parts being laid down with black lead pencil, let the lines be neatly drawn with Indian ink, taking care not to draw them beyond their proper terminations; for, wherever ſuperfluous ink lines are ſcraped off, thoſe plans will never look well, when they come to be waſhed with any colour.

When the plan is to be waſhed, that is, coloured, either with tints of Indian ink or other colours, leave the lower line of the inner ſlope of the rampart in lead pencil, which will make it appear ſofter, when the drawing is cleaned off.

In the middle of baſtions, *fig.* 26, it is uſual to build magazines for the ſtores of powder, bombs, and other fireworks, and alſo to contain the proviſion for the troops: for in theſe places they are not only more out of the way of doing damage to the town on an accident of blowing up, but they are alſo nearer at hand to be tranſported to the ſeveral works where they may be wanted.

Prob. 2.—The maſter line of a Fortreſs being given, to draw the plan of the foſs and eſplanade.

1. On the flanked angle B (*fig.* 12.) of each baſtion, with the radius B C equal to the breadth of the foſs, deſcribe an arc C C.

2. Lay a ruler to touch each arc at C, and the angle E of the neareſt ſhoulder of the next baſtion, and in that direction draw the lines C *p*, meeting one another in *p*.

3. From the flanked angle of each baſtion, draw lines B *q* at right angles to C *p*.

4. In each of the lines B *q*, take C *a* = 10 yards,
C *o* = 12 yards,
and C *q* = 60 yards.

5. Through the points *a*, *o*, *q*, draw lines parallel to C *p*, meeting before the middles of the curtins at C and *t*, *fig.* 13, and before the flanked angles of the baſtions in *v*, *x*, *y*.

Then will B C repreſent the breadth of the foſs.
C *q* of the eſplanade.
C *o* of the covered-way.
a o of the foot-bank.
o q of the glacis.

The arcs C C repreſent the roundings of the foſs.

The lines C *p* the counterſcarp.
x C the head
x y the ridges
s t the vallies
And *y t* the foot
} of the glacis.

The head of the glacis is to be drawn ſtrong, and all the other lines are to be fine.

When the plan is to be waſhed, if the foot of the glacis be drawn in lead pencil only, the termination of the glacis, or its concourſe with the adjoining lands, will appear more ſoft and neat.

In the colouring of the glacis, it is uſual firſt to lay a very light tint of colour over every plane, and then to ſtrengthen the colour on every ſecond plane, beginning at any ſaliant angle; the ſtrongeſt tint to be next the head of the glacis, and to be waſhed gradually off; ſo that the limits of the lighteſt ſhade ſhall lie in a diagonal line from the foot of the glacis at a ridge, to the head of the valley, as from *y* to *s*.

Give a light touch of the pencil or bruſh, with a middling tint of Indian ink along the inſide of the line, denoting the foot-bank.

Waſh the borders of the ditch near the ſcarp and counterſcarp, ſoftening the edge of the colour with a bruſh wet with fair water: in wet ditches the colour uſed is diſtilled verdigreaſe; but in dry ditches uſe biſter.

The parapet is generally coloured with a middling tint of Indian ink.

By this method of drawing the counterſcarp, all the foſs is ſeen from the flanks, and conſequently is defended by them, and muſt be more advantageous than if the counterſcarp was directed to any other part of the flank, the intercepted part next the ſhoulder being thereby rendered uſeleſs for the defence of the ditch; nevertheleſs, if it was on any account neceſſary, the direction of the wall of the ditch may point within the ſhoulder by the thickneſs of the parapet of the face, and ſtill the foſs would have the whole defence of the flank.

Fortifications in general would be very defective without foſſes; for the wall or rampart need not be raiſed ſo high when there is a ditch, as they muſt be without one, to ſecure the place from ſurprizes by ſcaling, &c. Neither is a low wall ſo much expoſed as a high one is in the modern methods of attack: beſides, a place is not ſo liable to the attempts of a ſurprize with a foſs as it would be without one; for the enemy, if diſcovered, may eaſily retreat while he is on a level with the country, which he would find ſome difficulty in doing from the bottom of a deep foſs bounded by walls or banks nearly upright: add to theſe, that the earth taken out of the ditch ſerves to make the ramparts, parapets, glacis, &c.

It may appear to ſome perſons, that, the broader and deeper a foſs is, the better, as it would throw more difficulties in the way of the beſiegers, when they wanted to paſs it: but it muſt be obſerved that ſome advantages are beſt waved, when, by taking them, greater diſadvantages would enſue. For, beſide the great expence that the digging and removing of ſo much earth would occaſion, the enemy might ſee the foot of the wall at a greater diſtance in a broad ditch; and, in a deep one, the cannon of the flanks could not dip low enough to defend the bottom. And on the whole, if the foſs by its magnitude furniſhed more earth than was wanted, ſome inconvenience might ariſe in the diſpoſing of the overplus.

Thoſe foſſes are beſt which can be filled with water and drained at pleaſure by the help of ſluices or flood-gates; becauſe all the advantages that may be reaped either from a wet or dry foſs, are by theſe means obtained: but, as theſe cannot be had every-where, the ditch muſt be adapted to the ſituation of the place.

In dry foſſes, a row of paliſades is ſometimes planted along the middle, either upright, or ſloping towards the counterſcarp 20 or 30 degrees from the upright.

In ſome dry foſſes, where water can be had, a trench called cuvette *n n*, *fig.* 30, is dug along the middle, of about 15 feet wide and 9 feet deep, for the water to run in.

The breadth of the foſs, although unequal in itſelf, is reckoned from the flanked angles, before which it is always rounded; the depth here may be from 15 to 20 feet, and thence riſe gradually to the middle of the curtin, where the depth is 4 or 5 feet leſs.

To draw a bridge in the plan of a FORTRESS.— Before the gates draw four lines acroſs the ditch, making three intervals or ſpaces, the middle one being 10 feet broad, and the ſpace, on each ſide, three feet.

Divide the length of the bridge into parts of about 16 feet long each, to expreſs the diſtance between pier and pier, or the bays of building; and againſt each diviſion, on the outſide of the lines, make a ſquare of a foot, to expreſs the ends of the piers ſupporting the bridge.

Allow the bay next the gate for a draw-bridge; and, if the length of the bridge exceeds 40 yards, allow the middle bay for another draw-bridge: theſe are to be diſtinguiſhed by drawing two diagonals acroſs the middle interval of theſe bays; that of the other bays having lines drawn acroſs them at a foot diſtance from one another, and the ſpace on each ſide left white for the footway; which are to be broke off at each draw-bridge. See *fig.* 17, 21.

To conſtruct the orillon and retired flank.— 1. As right angles to the face A S, *fig.* 14, draw from the angle of the ſhoulder the line S *b* equal to 8 or 9 yards, and make *b* the center of the arc, S *a* forming the orillon.

2. From a point *z* in the face of the next baſtion, *fig.* 16, about 15 yards from the point A, draw through *a* a line *z m*; in which, and alſo in the line of defence A *r* produced, take the briſures or breaks *a m* and *r n*, each 10 yards.

3. From *m* and *n*, with the radius *m n*, deſcribe arcs cutting in *d*, which make the center of the arc *m n*, or concave flank.

4. In *d m* produced lay the ſeveral breadths of the parts of the rampart; as the parapet = 6 yards, foot-bank = 2 yards, walk 12 yards, and the ſlope = 4 yards; then from the center *d*, through thoſe points, deſcribe arcs, meeting in the continuation of the correſponding lines from the face of the next baſtion.

The parapet of the orillon is drawn parallel to S *a* at 6 yards diſtance.

The axis or middle line of each embraſure ſhould tend towards a point about the middle of the foſs oppoſite the flanked angle of the next baſtion.

The wall in the upper briſure *a m*, as it cannot be battered, need not be above 2 or 3 feet thick to ſupport the earth behind it.

Through this wall there ſhould be a ſally port coming out at the bottom of the foſs, if a dry one, or a little above the water-line in a wet foſs: the deſcent to this port is by a paſſage under the rampart of the flank; but, in ſtraight flanks, the ſally port is in the curtin next the angle of the flank, the paſſage to it being under the rampart of the curtin.

As the progreſs of the works of the beſiegers generally depends on their having a greater army than is in the town beſieged, and on forming a greater fire on the town than they can return; therefore ſome engineers have endeavoured to hinder the progreſs of the beſiegers batteries, by furniſhing the town with an equivalent, or rather a ſuperior fire ; and this has been propoſed to be effected, by making ſecond and third flanks one behind another, gradually more elevated than thoſe before : For as it is found convenient to ſilence the fire of the flanks, before the beſiegers can avail themſelves of the breach they make in the face of the baſtion ; therefore batteries to ruin the flanks are made, and play at the ſame times as thoſe for the breaches in the faces. Now, the batteries for the ruin of the flanks can be conveniently made only within about 10 yards of the head of the glacis, and their length not greater than about 40 yards, containing at moſt about 6 or 7 cannon : but if the beſieged can by any artifice preſerve the cannon in the oppoſite flank, and have a greater number there than are in the battery oppoſed, conſequently their fire will be ſuperior, and ruin the battery intended to offend them ; and this was expected to be accompliſhed by double, or cazemated flanks. In ſome places two or three tier of cannon were placed one above the other, the upper ones being ſupported by vaulted work, as in the Tower of London ; but, ſuch having been found very inconvenient, on account of the great ſmother contained in the vaults, they have been generally conſtructed open.

The cazemated flanks have been condemned by many writers, becauſe they may be rendered uſeleſs by the enemy's bombs ; was this objection juſt, it would hold againſt any ſmall work ; for, the beſiegers having once got the length to any place, they may be ſuppoſed to render that place alſo uſeleſs to the beſieged ; and it would thence follow, that it were beſt not to have any places of defence : but, as the utility of ſuch works have been commended by ſome of the moſt eminent engineers, it was judged proper here to mention how theſe flanks may be conſtructed. For the reſt of the works uſually conſtructed : See OUTWORKS.

FO'UNDERY *of cannon* (*Dict.*)— Braſs cannon, as they are commonly called, are not made of pure braſs. They cannot be made either of pure braſs or pure copper, but it is always found neceſſary to mix with theſe metals ſome coarſer ones, in order to make the whole run cloſer and founder : ſuch are lead, and what the founders call pot-metal, which is a compoſition of copper and lead. About twenty pounds of lead is uſually put to an hundred weight of pot-metal, but about ſix pounds is ſufficient for an hundred weight of gun-metal, and is of vaſt ſervice.

The method of caſting iron differs very little from that of braſs. That the iron ore may melt the more eaſily, it was formerly a common practice to mix it with a ſulphureous ſtone, which vitrifies a great part of the groſs earth adhering to the native iron ore ; but this practice is now diſcontinued, the cannon caſt of iron ſmelted in that manner being found to be brittle, and incapable of ſtanding proof.

Foundery *of backs.*— Theſe are in moulds of ſand, into which the melted metal is conveyed by a canal from the furnace.

FOU'NTAIN (*Dict.*)— *Plate* XXXVII. *fig.* 7, in the Dictionary, is a perſpective view of a Fountain in a garden.

FRA'GARIA, *ſtrawberry*, in botany, a genus of plants, whoſe characters are :

It hath a perennial fibroſe root : the leaves are veined, growing three upon each footſtalk : the ſtalks trail upon the ground : the cup of the flower conſiſts of one leaf, which is divided into ten equal parts, and expands in form of a ſtar : the flower conſiſts, for the moſt part, of five leaves, which expand in form of a roſe, and have many ſtamina in the middle, round the baſe of the ovary : the fruit is globoſe or oval, and conſiſts of a fleſhy eatable pulp, full of protuberances.

Theſe ſpecies are, 1. The common or wood ſtrawberry. 2. The common ſtrawberry, with white fruit. 3. The hautboy ſtrawberry. 4. The Virginian ſtrawberry, with ſcarlet fruit, commonly called ſcarlet fruit. 5. The large Chili ſtrawberry. 6. The globe-hautboy ſtrawberry. 7. The ſtrawberry with a ſmall greeniſh white fruit.

The firſt and ſecond ſorts of ſtrawberry are found wild in the woods in divers parts of England, from whence the plants are taken, and tranſplanted into gardens, by which the fruit is improved. The beſt ſeaſon for this work is in September, that the plants may be rooted in their new quarters before the froſt begins ; which is very apt to looſen the earth ſo much about their roots, that, when the froſt goes off, the plants are apt to be turned out of the ground. They may alſo be tranſplanted in February ; but then, if the ſpring ſhould prove dry, they will require a great expence of water to keep them alive.

The ſoil which is moſt proper for theſe plants, is a freſh hazelly loam, not over rich, which would cauſe the plants to ſpread and flouriſh ; but they would not be ſo fruitful as upon a moderate ſoil. The ground ſhould be well dug, and cleared from the roots of all noxious weeds ; and, after it is levelled even, you muſt mark it out into beds about three feet and an half wide ; leaving a path between each bed two feet broad, for the conveniency of walking between them to water and clean them, as alſo to gather the fruit. In theſe beds may be planted four rows of plants, whereby they will be about a foot aſunder row from row ; and, in the rows, they ſhould be planted at leaſt eight inches diſtant plant from plant ; for, if they are planted nearer, they will in one year's time be ſo thick, that they will not have room to thrive.

Note, The diſtance here deſigned being for the wood ſtrawberry, which is of the leaſt growth, the other large-growing kinds muſt have a greater ſhare of room, according to their different degrees of growth ; as for example, the ſcarlet ſtrawberry ſhould be planted a foot ſquare plant from plant ; and the hautboy ſixteen or eighteen inches diſtance each way, and the Chili ſtrawberry twenty inches, or two feet.

In the ſpring of the year, when the ſtrawberries begin to flower, if the ſeaſon be dry, you muſt obſerve to water them plentifully, otherwiſe the flowers will fall away without producing any fruit. You muſt alſo carefully clean your beds of ſtrawberries from weeds from time to time, as they ſhall require ; for, if they are once ſuffered to overbear the plants, they will decay in large patches, and alſo greatly weaken all thoſe that may continue alive. About Michaelmas, you ſhould clear off all the weeds from the beds, as alſo cut off all the ſtrings or runners from the roots, pulling out all weak plants where they are too cloſe ; then dig up the walks between the beds, burying the ſeeds that came off in the bottom, and throw a little fine earth over the beds between the plants ; being very careful not to lay it ſo thick as to bury the plants : this will greatly ſtrengthen them, and cauſe their fruit to be larger, and in greater quantities, than they would be, if left undreſſed.

Theſe few rules will be ſufficient, if duly regarded for cultivating theſe plants. I would only farther obſerve, that theſe beds will not continue bearing well more than three years ; therefore, in order to have a conſtant ſupply, you ſhould plant a freſh plat of ground a year before you deſtroy the old beds ; otherwiſe, your young plantation producing few or no fruit the firſt year, you will be deſtitute a whole ſeaſon.

The wood ſtrawberry is by many people preferred for the firmneſs of its fruit, and delicacy of its flavour : others greatly admire the ſcarlet ſort for its goodneſs ; and the hautboy is eſteemed for the largeneſs of its fruit : but the ſort with white fruit is by far the beſt-flavoured of all the kinds, though it is a bad bearer.

The ſcarlet ſtrawberry is a native of America, and was firſt brought into England from Virginia ; but this is now become ſo common in the gardens, as to be thought, by many, a native of this country. This is the earlieſt ſort, always coming a fortnight ſooner than either the wood or hautboy ſtrawberries ; and is an excellent well-flavoured fruit ; ſo is generally eſteemed.

The hautboy is alſo a firm well-flavoured fruit ; and the globe hautboy, as it is generally called, is a very good bearer, and a large fruit.

The wood ſtrawberry, both the red and white, will bear in greater plenty, when they are planted in a ſtrong moiſt ſoil, than when they are on a dry light ground ; where, if they are not well ſupplied with water in dry ſeaſons, they will produce very little fruit.

The green ſtrawberry is the lateſt of all the ſorts ; this produces its fruit in large bunches upon long footſtalks ; ſo requires to have ſome ſupport, eſpecially in wet ſeaſons ; otherwiſe the fruit will lie upon the ground, and the earth will be waſhed over them. This ſort ſeldom produces much fruit in warm dry land ; but upon ſtrong ſtiff ground bears plentifully, and is the richeſt fruit of all the kinds yet known ; being very firm, and of a remarkable quickneſs in its flavour. This ſort is by ſome perſons ſtiled the pine-apple ſtrawberry, from an affinity, as they ſuppoſe, between the flavour of this fruit and that of the pine-apple ; and ſome others have given it the name of Drayton ſtrawberry, from its having been much cultivated there.

The Chili ſtrawberry was brought firſt into Europe by Monſieur Frezier, engineer to the late French king, and given to Monſieur de Juſſieu, profeſſor of botany to the royal garden at Paris ; who hath ſpread it into divers parts of Europe. This plant, Monſieur Frezier ſays, is cultivated in the fields near Chili in great plenty ; and that it differs from the European kinds, in having larger, thicker, and more hairy leaves : the fruit is generally as large as a walnut, and ſometimes as big as an hen-egg, of a whitiſh red colour, and ſomewhat leſs delicious in taſte than our wood ſtrawberries. This has produced fruit ſeveral years in the royal garden at Paris, where Monſieur Juſſieu aſſured me it was commonly as large as a ſmall apple. I brought ſome of the plants from Holland, anno 1727, which thrive and increaſe exceedingly ; but theſe bear very indifferently, and, the fruit being leſs delicate than the hautboys, few perſons care to propagate this ſort in England. Theſe plants have been placed in the ſun, and cultivated with care ; but have never ſucceeded where they have been thus treated. I have obſerved, they have ſucceeded beſt where they have grown under the ſhade of trees, in a loamy ſoil, and little more care taken of them than to keep them clear from weeds, and to diveſt them of their runners every autumn ; for they are the old plants only which produce fruit, and thoſe ſeldom, except in very ſtrong land, for in the clays I have ſeen plenty of this fruit. *Miller's Gard. Dict.*

Fragria has the ſame virtues as cinquefoil: the decoction of the herb, and the immature fruit, are ſtrengthening and aſtringent: the fruit is emollient, nutritive, relaxing, cooling, diuretic, aperitive, and corrects acrimony; hence it becomes proper in the higheſt burning fevers, and under the greateſt degree of an inflammation, when the thirſt is extremely urgent. The fruit eaten cures a gonorrhœa. A very good drink in fevers is thus prepared: take of the juice of ſtrawberries and lemons, and of ſpring water, an equal quantity; of ſugar, enough to render it grateful; mix them together. The pulp, applied in a cataplaſm, is good for all external inflammations; and I have frequently experienced its virtue in a relaxation of the veſſels of the uterus. In tertian and quartan fevers, it does the ſervice of the Peruvian bark: it is, alſo, a lithontriptic. Take the ripe berries, and put them in water; then ſhake the veſſel, and the ſeeds will fall to the bottom: theſe dried, and taken to the weight of one or two drachms in white wine, in the morning, faſting, are an excellent and uſual remedy with lithotomiſts, to prevent the regeneration of the ſtone in thoſe who have been cut for the ſame. The berries gathered in watery and marſhy places, though larger, are of leſs virtue than the mountain ſtrawberries, as Geſner obſerves. This uſeful plant has one inconvenience, in that it has always toads concealed under it; which, as we are aſſured by authors, have rendered it mortal to many who have eaten of the fruit; for which reaſon, ſome will never eat ſtrawberries before they are waſhed. In Italy they bruiſe the pulp in roſe water, and make it into a conſerve with juice of citrons, for the purpoſes before mentioned. *Hiſt. Plants, aſcribed to Boerhaave.*

FRANCINI's *Engine*, a particular kind of machine, or joint-pump contrived by M. Francini.

This ingenious machine was contrived and put in execution by Mr. Francini, in the year 1668, by Mr. Colbert's orders, in the garden of the king's old library. To judge of it well, you muſt know that near the houſe there is a natural ſpring, which uſed formerly to diſcharge its water in a baſon ſituated in the middle of the garden, and that the waſte water uſed to run along a canal into a well, where it was loſt. Mr. Francini, taking advantage of the waſte water, and the depth of the well, raiſed an artificial jet in the middle of the garden, which produced a fine effect.

The firſt and ſecond figures of *Plate* XXIII. repreſent the profile and elevation of this machine, compoſed of a couple of double endleſs chains made of ſmall iron bars joined together by joints or hinges: to theſe are faſtened buckets making two joint-pumps of unequal height, which turn upon a rag-wheel FEDG, that has notches where the chains go, to hold them always in the ſame direction; and the intervals of the bars of this wheel are equal to the length of one of the links of the chain, that, the great joint-pump turning with the rag-wheel, the other joint-pump may be forced to turn along with it.

The axis of the rag-wheel is ſuſtained by two poſts P framed into cills on the curb at top of the well, and ſo brought up to their height, and kept faſt by two croſs pieces Q R, the loweſt of which ſuſtains the ciſtern A, which the waſte water of the baſon runs into.

The buckets B of the great joint-pump are made of plates of braſs, making a veſſel wider at top than bottom, the better to receive the water from the ciſtern A, which runs continually through the trough X; this figure is ſo much the more convenient for theſe buckets, that, when one of them is full, the ſurplus of the water that runs along its ſurface, runs naturally into the next bucket below, and from that into the third, and ſo on, ſo that no water can be loſt by ſpilling over.

The buckets C and S of the leſſer joint-pump, *fig.* 2, have the ſame figure as the others, with this difference, viz. that they are cloſed all round, except at the place S, where they have a little neck towards the bottom, where the bucket is leaſt, which neck is upwards when the buckets riſe full of water to diſcharge it into the upper ciſtern M I. To make the thing plainer, we have drawn by themſelves, between *fig.* 1. and *fig.* 2, one bucket of the great joint-pump, and one of the ſmall one, which ſhews the ſituation in which they are, when, being full of water, thoſe of the great pump deſcend into the well, and thoſe of the ſmall one riſe to empty themſelves into the upper ciſtern.

Though the firſt figure repreſents only one joint-pump ſeen ſide-wiſe, it may ſerve to ſhew the working of each in particular. For example, you may conſider the buckets B, as thoſe of the great pump, when they go down into the well, and the others H of the ſame, when they riſe empty. If on the contrary we conſider the ſmall pump, you may judge of the ſituation of its buckets H, when they riſe full of water, and of the ſituation they have at B, when they come down empty.

A wheel with teeth O has been fixed to the axis of the rag-wheel, whoſe teeth take a pinion or lantern N, *fig.* 1. and *fig.* 2. that has a fly to keep the uniformity of the motion of the machine, that it may not go by jerks, and not feel the ſmall alterations that may be cauſed by obſtacles met with in the way, *fig.* 1.

As the great joint-pump is ſuppoſed to go down into the well to a depth ſomething greater than the height to which the water is to be raiſed above the level of the ground, there will always be a greater number of its buckets that will go down full of water, than there will be of the little pump that will carry up theirs full to the rag-wheel; conſequently, the weight of the water that deſcends being ſuperior to that which riſes, the great pump will neceſſarily make the little one turn, whoſe buckets will fill themſelves, as they go through the ciſtern A, which upon that account muſt have a certain depth, that the water may have time to fill them.

As to velocity proper for this machine, it can only be determined by experience, by increaſing or diminiſhing the number of the buckets of the great pump, to know how much the power muſt be ſuperior to the weight; which muſt alſo depend upon the quantity of water the ſpring is able to give.

When the buckets of the great pump are of the ſame bigneſs as thoſe of the ſmall one, and the firſt chain of buckets is ſomething more than double the length of the ſecond, ſomething leſs water will riſe in the upper ciſtern than is loſt in the well; that is, there will be raiſed ſomething leſs than half of what the ſpring affords. If you would have more than half raiſed, but to an height leſs than the fall, you muſt then make the contents of the buckets of the ſmall pump greater than the buckets of the other, in a reciprocal ratio of the fall of the water to the height to which it is raiſed: and on the contrary, when you would raiſe the water to a greater height than the fall, you muſt make the buckets of the ſmall pump leſs than thoſe of the great one, again in the reciprocal ratio of the deſcent and the riſe of the water; then there will riſe leſs than what is loſt in the well, in the reciprocal ratio of the ſame terms.

You ſee that in the caſe where Francini made uſe of this machine, after the water had been raiſed into the upper ciſtern M I, it came down by a conduit-pipe, and went and played a jet in the baſon of the garden, whence it came back into the ciſtern A, and united again with that of the ſpring, to help to play the two joint-pumps, ſo that, by means of this circulation, a ſpring, affording but little water, raiſed without interruption ſo great a quantity of water, that one might borrow a part for other uſes.

The chief difficulty here is to have a well deeper than the fall, in a ſoil where the water can be loſt; unleſs you can find a lower place to conduct the water to from the bottom of the well.

FREE-*ſtone.*—The qualities of the ſeveral kinds of Free-ſtone in common uſe in the ſeveral parts of Europe are very different. They all agree in this general property indeed, that they are ſofter while in the quarry, than when they have been ſome time expoſed to the air: but even this general property differs greatly in degree. They have a ſort of grey Free-ſtone in uſe at Paris, of which we do not ſeem yet to have met with any quarries in England, though probably enough there are ſuch, which has this property in ſo eminent a degree, that the expence of working it is in a great meaſure ſaved.

This ſtone lies every-where on the ſouth ſide of the river Seine, and is of a coarſe and large grit. It is ſo ſoft, when newly taken out of the ſtrata, that they cut it very conveniently with a ſort of broad axe, and faſhion as many ſtones for building in this manner in an hour, as an equal number of our people do in a day or two. Though this ſtone is as ſoft as dry clay, when firſt taken up, it is found to harden ſo conſiderably in the air, that it becomes more than equal to our ordinary Free-ſtone.

Our Portland ſtone of the fineſt kind, which is white, and of a cloſe grit, is very fit for hewing or carving; but it will neither reſiſt water nor fire, which is a very ſingular circumſtance in ſo denſe a ſtone; while the Free-ſtone of Kent, which is leſs beautiful to the eye, and is of a greyiſh colour, and conſiderably cloſe, though of a larger grain, reſiſts the air and water very well.

The Free-ſtone of Derbyſhire, on the other hand, is ſo brittle as to be unfit for any fine working, and ſo coarſe and open in its texture that it lets water through; yet it bears the fire extremely well, and is fit for ovens, hearths, &c. *Phil. Tranſ.* Numb. 93.

FREEZING *of wines*, a method propoſed by Dr. Shaw, for depriving wines of their aqueous parts, by the means of cold. In the Freezing of wines and the like liquors, the aqueous parts freeze firſt, and are by this means ſeparated from the truly vinous; an obſervation which may be made of great uſe, in the wine trade. The experiment may be made by art, at any time: take a quart of common red port, put into a Florence wine flaſk, and bury it in a mixture of one part of common ſalt, and two parts ſnow or beaten ice, the conſequence will be, that the aqueous part of the wine ſoon turns to ice, and the rich thick remainder of the true vinous parts may be poured off by inclination. Natural cold, however, in Freezing wines, performs this experiment much better. By this means, wines, vinegars, and malt liquors may be all reduced to a fourth part of their quantity for exportation, without any conſiderable loſs of their eſſential parts, little more than the mere water freezing, and the eſſential part of the wine remaining thus admirably cured, and capable of keeping ſeveral years. It is eaſy to ſee, that a great uſe may be made of this in the wine trade, as large quantities of the pooreſt wines might thus be converted into rich ones, and the quinteſſence of the richer wines might be procured for the amending the poor ones; and vaſt advantages might be reaped from this in wine countries.

Wines and vinegars concentrated by Freezing, though they keep unaltered for ſeveral years, yet are liable to ſome accidents, in proceſs of time.

Thus wines, on being concentrated, ſeem to acquire a more auſtere taſte than they had originally; and this is not wonderful, as the condenſation brings the ſaline and rough matter into a third or a fourth part of the compaſs that it originally lay in; ſo that this is properly no addition or increaſe of the rough taſte, but probably, on the contrary, ſome mitigation of it, in regard to the cloſeneſs to which this rough matter is brought, which of itſelf ought rather to multiply the effect in a greater proportion.

The change may be conceived owing to this, that all wines are obſerved to grow mild and ſoft by lying long; which effect is greatly promoted in them by a ſucceſſive ſeparation of their tartar, and a gentle evaporation of ſome part of their water occaſioning that neceſſity which is frequently found in the ſummer months of filling up the caſks: but in our concentrated wine, though the ſame tartar be ſucceſſively ſeparated, yet there is found no concurrent ſlow evaporation, for the concentrated wine grows ſoft and mellow in a well ſtopped glaſs, where no diminution of the quantity is perceived; the effect in this caſe proceeds principally from a cloſer and more intimate combination of the ſpirituous with the groſſer and more terreſtrial part. *Stahl de Concentrat.*

Beſide this, there ſeems another remarkable change incident to the concentrated wine, not only in the taſte, but more abundantly in the ſmell. For, if an auſtere and rough wine, and of the uſual ſmell of ſuch wines, be put up in bottles, its taſte, after two or three years, not only becomes more mellow and ſmooth, but its ſmell, at this time, perfectly reſembles ſack or canary. This is a high degree of melioration, and will give a poor auſtere German wine, for ſuch were thoſe on which Stahl made the experiments, the flavour of ſo rich a wine as canary, and that ſo perfectly, that very good judges may not find out the difference by their ſmell, though the taſte is abundantly different. Whatever advantage the dealer in wines may foreſee from the ſucceſs of theſe experiments, there is this farther inducement to his bringing them into practice in the large way, that every thing will anſwer better, and not worſe, than the experiments in the ſmaller quantities. All theſe experiments have been made with little portions, which are very well known not to keep ſo well as larger; and it is evident both from reaſon and experience that great bulks of liquor are much leſs ſubject to changes and alterations from the external effects of air and heat, which are the two great incentives to fermentative motions; and that, if ſuch ſmall parcels ſuffered no change for the worſe, much leſs need it be apprehended that any larger would. *Shaw's Chem. Eſſay on concentrating Wines.*

FREEZING *rains.*—Our own annals give us many accounts of the damage done to our trees by rains Freezing, as they fall, and conſequently forming cakes of ice about all the branches, which by degrees increaſe to a weight that the branch is unable to ſupport. In the year 1672, there fell ſuch a rain as this at Briſtol, and over all the country thereabouts. Moſt of the orchards, expoſed to the north-eaſt, were deſtroyed by it, and, had it continued longer, and been attended with guſts of wind, ſcarce any thing could have ſtood before it. A piece of an aſh-tree of juſt three quarters of a pound weight was weighed, with its coat of ice upon it occaſioned by this rain; the ice weighed ſixteen pounds, beſides what was melted off by the perſon's hands who brought it. The ſtalks of graſs were ſurrounded with coats of ice, ſome of which were five inches round by meaſure. All the time that the orchards and hedges were thus breaking under the loads of ice, the waters were all free, and not ſo much as a puddle frozen over. The roads were rendered impaſſable by the parts of trees every-where fallen acroſs them, and the noiſe of the icy boughs rattling againſt one another, as ſhook by the wind, was very terrible. Where this rain fell upon the ſnow, it immediately became ice as on the trees.

It is remarkable that men who were out on the road, complained of the moſt exceſſive colds, and were in agonies on coming into a warm room; though all the while, in ſome places, there only fell a kind of ſleet, which was wet under the feet, and gave no appearance of froſt upon the ground.

This ſort of temper in the air preceded alſo the Freezing rains, in the very places where they happened. Though this ſevere weather happened in December, as ſoon as it was over, which was in a few days, there was a ſudden change, into not only a mild, but a hot ſeaſon. People complained of exceſſive ſweating, both by night and day, and the trees and hedge-buſhes put forth their buds for leaves and bloſſoms, as if it had been April; ſome of the apple-trees flowered before Chriſtmas, and had the young fruit before New-year's day. *Phil. Tranſ.* Numb. 90.

FREIGHT (*Dict.*)—The laws of England relating to Freight are as follows.

1. Reſpect is always had herein to the ſhip itſelf, or a certain part of it. Again, merchants freight either by the month, the voyage, or the ton; for to freight a ſhip, or take certain tonnage to Freight, are different things, as are alſo to be a cap-merchant, or an under freighter.

2. There was of old another way of freighting, the merchant agreeing with the maſter, for a ſum, to convey his goods inſured againſt all peril, being reſponſable for any loſs; but it is now out of uſe.

3. Freight is governed generally by the written agreement called a charter-party, executed between the owners or maſter and merchants, or elſe by parole.

The maſter or owners generally covenant to provide a pilot, and all neceſſaries for the voyage, and for lading and delivering. If there be agreement and earneſt, but no writing, the merchant breaking off loſeth his earneſt, but the owners or maſter double the earneſt.

But, by the common law of England, the party oppreſſed may bring his action, and recover all damages on the agreement.

If a time be appointed by charter-party, and either the ſhip be not ready to take in, or the merchant to put on board, the parties are at liberty, with remedy by action for the detriment.

If part be on board, and ſome misfortune prevent the merchant's ſending the whole in time, the maſter may contract with another, and have Freight as damage for the time they were on board longer than limited. And, though it be not prudent for every merchant or maſter to break the contract, though the agreement as to lading be not according to promiſe (ſeldom or ever done, if part be aboard) yet it is the higheſt juſtice, that ſhips and maſters be unfettered and free: as, by the bare lading of a caſk or bale, they may loſe the paſſage or ſeaſon of the year.

So on the other hand, if the veſſel is not ready, the merchant may ſhip the remainder of his goods on board another, and recover damages againſt the firſt maſter, or owners. This is grounded on the like reaſon.

Therefore, by the law marine, chance, or other notorious neceſſity, will excuſe the maſter, but he loſes his Freight till he breaks ground.

But, if the merchant be in fault, he muſt anſwer the damage, or be liable to maintain the crew ten days; but, if after that, the full Freight; if damage afterwards, it is the merchant's riſque. But, by the common law, while the goods are on board, the maſter muſt ſee them forth-coming.

4. Charter-parties have always, by the common law, had a genuine conſtruction as near as may be, not according to the literal ſenſe of traders, yet muſt be regularly pleaded.

5. If goods are fully laded, and the ſhip hath broke ground, the merchant afterwards declines the adventure, and will unlade again; by the law marine the Freight is due. And if the ſhip on her voyage become unable without the maſter's fault, or he be arreſted by ſome prince or ſtate in her voyage, he may either mend his ſhip or freight another. But, if the merchant will not agree to it, the Freight becomes due for what the ſhip has earned, otherwiſe the maſter is liable for all damages that ſhall happen. If therefore the ſhip to which the goods were paſſed periſhed, the maſter ſhall anſwer; but, if both periſh, he is diſcharged. But if there be extreme neceſſity, as the ſhip a ſinking, and an empty ſhip paſs by, or at hand, he may tranſlate the goods; and, if that ſhip periſh, he is excuſed: but it muſt appear the ſhip ſeemed probable and ſufficient.

6. If a ſet time be agreed on, between the merchant and maſter, to begin and end the voyage, it may be altered by the ſupercargo without ſpecial commiſſion.

If a maſter ſhall ſail on his voyage after the time agreed on for his departure, if damage happens afterwards, he ſhall make it good. Yet, if a charter-party is made, that the plaintiff ſhall ſail from London to Liſbon with the firſt opportunity, &c. in conſideration of which the merchant covenanted for ſo much Freight; the ſhip departs not with the firſt wind, yet afterwards breaks ground, and arrives at her port, the Freight here is due; for nothing can debar the ſhip of it but the not departure, which only is in law traverſable, being material to avoid payment of Freight.

7. If the ſhip be freighted from one port to another, thence to a third, &c. and ſo home to the port whence ſhe firſt ſailed (commonly called a trading voyage) it is all but one and the ſame voyage, if in conformity to the charter-party.

8. If a ſhip freighted by the ton be full laden according to the charter-party, the Freight is payable for the whole, otherwiſe for the amount of the tons only.

9. If the ſhip, by any fault of the freighter, as lading aboard prohibited goods, be detained, he ſhall anſwer the Freight contracted.

If a ſhip be freighted out and in, no Freight is due till the voyage be performed: if, therefore, the ſhip periſh coming home, the whole Freight is loſt.

10. A maſter freighting his ſhip, and afterwards ſecretly taking in other goods, loſes his Freight; and, if any of the freighter's goods ſhould, for the ſhip's ſafety, be caſt overboard, the reſt ſhall not be ſubject to average, but the maſter muſt make it good: but, if the goods are ſhipped unknown to him, it is otherwiſe, and they are ſubject to what Freight the maſter thinks fit. The ſhip putting into any other port than ſhe is freighted to, the maſter ſhall anſwer damage to the

merchant; but, if forced in by ſtorm, enemy, or pirates, he then muſt ſail to the port conditioned at his own coſts.

Generally, the touching at ſeveral ports by agreement imports not a diverſity, but a voyage entire.

11. If paſſengers having goods die on ſhip-board, the maſter is to inventory their concerns, which if none claim within a year, he becomes proprietor defeaſible: but the bedding and furniture becomes the maſter's and his mates, and the cloathing muſt be brought to the maſt-head, and there appraiſed and diſtributed amongſt the crew, as a reward for their ſeeing the body put into the ſea.

If the captain die leaving money on board, the mate becomes captain, and if he improves the money; he ſhall, on allowance for his care, account both for intereſt and profits.

12. The ſhip's lading, in conſtruction of law, is tacitly obliged for the Freight, it being, in point of payment, preferred before any other debts to which the goods laden are liable, though ſuch were precedent to the Freight, for the goods remain as it were bailed for the ſame: nor can they be attached in the maſter's hands, though it is vulgarly conceived otherwiſe. Ships deſerve wages, like a labourer; and, therefore in the eye of the law, actions touching them, are generally conſtrued favourably, for the ſhip and owners: and, therefore, if four part-owners of five account with freighters, and receive their proportions, yet the fifth may ſue ſingly both by common and marine law.

FRITILLA'RIA, *fritillary, or chequered tulip*, in botany, a genus of flowers whoſe characters are:

The flower conſiſts of ſix leaves, and is of the bell-ſhaped lily-flowers, pendulous, naked, and, for the moſt part, chequered; the ſtyle of the flower becomes an oblong fruit, which is divided into three cells, and filled with flat ſeeds, lying in a double row: the root conſiſts of two fleſhy knobs, which are, for the moſt part, ſemiglobular, betwixt which ariſes the flower ſtalk.

Theſe plants are propagated either by ſeeds, or off-ſets from the old roots: by the firſt of which methods new flowers will be obtained, as alſo a larger ſtock of roots in three years, than can be obtained in twenty or thirty years in the latter method: I ſhall therefore only treat of their propagation by ſeeds.

Having provided yourſelf with ſome good ſeed, ſaved from the faireſt flowers, you muſt procure ſome ſhallow pans or boxes, which muſt have ſome holes in their bottoms to let out the moiſture: theſe you ſhould fill with light freſh earth, laying a few potſherds over the holes, to prevent the earth from ſtopping them: then having laid the earth very level in the boxes, &c. you muſt ſow their ſeeds thereon pretty thick, covering it with fine ſifted earth a quarter of an inch thick. The time for ſowing the ſeeds is about the beginning of Auguſt; for, if it be kept much longer out of the ground, it will not grow: then place the boxes or pans where they may have the morning ſun until 11 o'clock, obſerving, if the ſeaſon proves dry, to water them gently, as alſo to pull up all weeds, as ſoon as they appear; for, if they are ſuffered to remain until they have taken deep root into the earth, they would draw ſeeds out of the ground, whenever they are pulled up. Towards the latter end of September you ſhould remove the boxes, &c. into a warmer ſituation, placing them under an hedge or wall expoſed to the ſouth; in which place they may remain until the middle of March; by which time the plants will be come up an inch high: you muſt therefore remove the boxes, as the weather increaſes hot, into a more ſhady ſituation; for, while the plants are young, they are liable to ſuffer by being too much expoſed to the ſun: and, in this ſhady ſituation, they may remain during the heat of the ſummer, obſerving to keep them clear from the weeds, and to refreſh them now and then with a little moiſture; but be careful not to give them much water after their leaves are decayed, which would rot the roots. About the beginning of Auguſt, if the roots are very thick in the boxes, you ſhould prepare a bed of good light freſh earth, which muſt be levelled very even, upon which you ſhould ſpread the earth in the boxes in which the ſmall roots are contained, equally covering it about one fourth of an inch thick with the ſame freſh earth: this bed ſhould be ſituated in a warm poſition, but not too cloſe to hedges, walls, or pales, which would cauſe their leaves to be long and ſlender, and make the roots weaker than if placed in a more open expoſure.

In this bed they may remain until they flower, which is generally the third year from ſowing; at which time you ſhould put down a mark to the roots of all ſuch as produce fair flowers, that, at the time of taking them out of the ground (which ought to be ſoon after their green leaves are decayed) they may be ſelected into a bed amongſt your old roots of this flower, which for their beauty, are preſerved in the beſt gardens; but the other leſs valuable flowers may be planted in the borders of the parterre garden for their variety, where, being intermixed with other flowers of different ſeaſons, they will make a good appearance. *Miller's Gard. Dict.*

FRITT, or FRIT, in glaſs-making, the calcined matter to be run into glaſs. To make this for cryſtal glaſs, take of the fineſt tarſo, powdered fine and ſifted, two hundred pounds; of the ſalt of polverine, an hundred and thirty pounds; mix them well together, and put them into the calcar, or calcining furnace, which muſt be thoroughly heated firſt, otherwiſe the operation will be very difficult; a moderate fire is to be kept up for an hour, and the matter continually ſtirred together with a rake, and then the firſt muſt be made very violent, and kept up for five hours. After this, take it out and cover it from duſt, it will be white as ſnow. It muſt be kept in this ſtate, three or four months, and is then ready to make the fineſt cryſtal glaſs. *Neri's Art of Glaſs.*

FROTH *Spit*, or *cuckow ſpit*, a name given to a ſort of white Froth or ſpume very common in the ſpring, and firſt months of the ſummer, on the leaves of certain plants, particularly on thoſe of the common white field lychnis, or catch-fly, thence called by ſome ſpattling poppy. All writers on vegetables have taken notice of this Froth, though few have underſtood the cauſe or origin of it, till of late. Many imagined it an exhalation of the earth, ſome have eſteemed it, as its name expreſſes, the ſaliva of the cuckow, others the extravaſated juices of the plant, and ſome a hardened dew. But all theſe are erroneous opinions, and the true account of it is that it owes its origin to a ſmall inſect.

There are very frequently to be ſeen in the ſummer months a ſort of ſmall leaping animals, called by ſome the flea graſhoppers, becauſe they are very ſmall, and leap like a flea; theſe little creatures have each a pointed proboſcis, by means of which they ſuck the juice of the plants, they are found upon. Theſe animals lay their eggs in autumn, from which in the ſpring following the young ones are hatched; and theſe are at firſt tenderly ſheltered from injuries by a delicate and thin membrane, which makes a ſort of nymph, having the lineaments of all the parts of the animal, which is to iſſue from it. When it is firſt hatched from the egg, it is a ſmall white point on the leaf, not larger than the point of a needle; a few days after, it is greeniſh, its colour changing with the juices of the plant on which it feeds: in this ſtate it not unaptly reſembles that ſmall ſpecies of frog, called the tree-frog, which is common on the branches of trees in many places; it moves about very ſwiftly in this ſtate, though ſtill covered with its membrane; but, till it gets rid of that, it can neither leap nor fly.

The manner in which the little creature forms this Froth upon the plant is this: it applies its anus cloſe to the leaf, and diſcharges upon it a ſmall drop of a white viſcous fluid, which, containing ſome air in it, is ſoon elevated into a ſmall bubble; before this is well formed, it depoſits ſuch another drop, and ſo on, till it is every way overwhelmed with a quantity of theſe bubbles, which form the white Froth which we ſee. It adds to this upon occaſion, but never moves from under it, till it has got rid of its enveloping membrane, or arrived from the nymph ſtate to that of the perfect animals. It throws out theſe globules of viſcous humor, by a ſort of dilatation, and contraction of its belly; and, as they ſucceed one another, it diſpoſes them every way round it with its feet. A proof, that, while theſe animals are in this imperfect ſtate, and covered with Froth, they yet feed on the juices of the plant, is, that, if one of them be placed on a leaf of mint, or any other ſuch plant, the leaf on which they live will never grow beyond the ſize it was of, when the animal was placed upon it, while the oppoſite leaf will acquire its full dimenſions. When the animal has quitted its nymph ſtate, it make no more Froth, but leaves that under which it had lived, and takes its courſe freely about the plant.

FRUCTIFICA'TION. The organs of Fructification in plants are the pointal, generally contained in the middle of flowers; and the threads, which ſurround it, furniſhed at their extremities with little heads; theſe the botaniſts term, the firſt the piſtillum, the ſecond the ſtamina, and the third, or heads of the ſtamina, the antheræ, or apices.

The apices contain the farina fœcundans, a fine ſubtile matter analogous to the ſemen maſculinum in animals; the ſtamina ſerve only for their ſupport, and to convey nutrition to them; and the piſtillum is the part deſtined to receive this farina, and convey it to the ſeeds.

It is upon theſe principles that the excellent Linnæus has founded his ſyſtem of the vegetable world, and formed his claſſes. This author's work has been received by the learned world in all nations with the reſpect it merits; but has been too generally cenſured among the ſlighter proficients in botanical reſearches, as abſtruſe, difficult, and unintelligible. The viewing theſe things in a new light, and the neceſſity of making new words to convey new ideas, has indeed given this great attempt ſomething of the face of an abſtruſe piece; but, premiſing a few general hints, it may not be difficult to vindicate the author from the heavy charges which have been laid againſt him, and give the Engliſh reader a clear and perfect view of his work.

From the ſtructure and uſe of the piſtillum, ſtamina, and apices, it is eaſy to conceive that the former muſt be accounted the female, and the two latter the male parts of flowers. This is the great baſis of his ſyſtem. To expreſs the different combinations of theſe in the different claſſes of plants, by formal deſcriptions of each, had been tedious, and an overburden to the memory: to avoid this, he has excellently contrived the compriſing that deſcription, or general character, in one word. It is eaſy to conceive there could be no words already in uſe, that could expreſs what had never before been thought of; he has therefore been neceſſitated to invent new ones for this purpoſe. He has ventured therefore to form twenty-four ſuch, for his claſſes, which are of that number, and has taken them from that language which all the learned have ever uſed on the ſame occaſion, the Greek; and this with the leaſt oſtentation or ſhew of learning imaginable: in ſhort, to underſtand all theſe, there is no need of knowing more Greek than that ἀνὴρ ſignifies a man, or any thing male; and γυνὴ, a woman, or female; that δυνάμις, is power or efficacy; ἀδελφὸς, a brother; and thence ἀδελφὰ, brotherhoods or communities; that σὺν is together; γένεσις, generation or origin; and οἶκος, a houſe, or habitation; that ϖολὺς. ſignifies many; γάμος, marriage; and κρυπτὸς, hidden or concealed; and that the numbers one, two, three, four, five, ſix, ſeven, eight, nine, ten, twelve, and twenty, or their derivations, once, twice, &c. are expreſſed by the Greek words μόνος, δὶς, τρὶς, τέτρα, ϖέντε, ἓξ, ἑπτὰ, ὀκτὼ, ἐννέα, δεκὰς, δώδεκα, εἴκοσι: there needs, I ſay, no more knowledge of Greek than this, to underſtand perfectly the meaning of all the terms this author, to avoid tedious deſcriptions, has uſed as the characters of his claſſes. To begin with certainty and regularity,

He firſt divides the whole vegetable world into ſuch ſpecies as have their flowers viſible and obvious to the eyes, and ſuch as have them inviſible, or at the utmoſt ſcarce diſcernable.

Thoſe which have them viſible he then divides again into ſuch as have the ſtamina, apices, and piſtillum, that is, the male and female part, of Fructification, in the ſame flower:

Theſe he, for that reaſon, calls hermaphrodite flowers.

And ſuch as have the male and female parts of Fructification, that is, the apices and piſtillum, either in different flowers upon the ſame ſtalk, or upon different plants of the ſame ſpecies: theſe he calls the diſtinct male and female flowers.

Thoſe which have the different organs of Fructification lodged in the ſame flower, he again divides into ſuch as have the ſtamina in no part growing together, or cohering to one another: and ſuch as have them either growing together or cohering together mutually in ſome part, either with one another, or with the piſtillum.

Thoſe which have them in no part cohering either with the piſtillum, or with one another, he again ſubdivides into ſuch as obſerve no exact or accurate proportion of length one among another, and ſuch as have ever two of the ſtamina ſhorter than the reſt.

From theſe general diviſions he deſcends to his particular claſſes, of which he eſtabliſhes twenty-four.

The firſt thirteen are of the plants which have hermaphrodite flowers, with the organs of Fructification disjunct, no where cohering with one another, and obſerving no exact proportion in length.

The firſt is of the monandria: the word is derived from the Greek μόνος and ἀνὴρ one male part, and ſignifies a flower which has only one ſuch. This claſs accordingly comprehends thoſe plants with an hermaphrodite flower, and in it only one ſingle ſtamen: of this claſs are the blite, turmeric, &c.

The ſecond is of the diandria; the word, derived from the ſame ἀνὴρ and δὶς, twice, and ſignifying a flower that has two male parts, comprehends all thoſe plants which have hermaphrodite flowers with two ſtamina on each: of this claſs are the jaſmine, philleree, olive, roſemary, butterwort, &c.

The third is of the triandria; the word, derived from the ſame ἀνὴρ and τρὶς, thrice, ſignifies a flower that has three male parts in it, and comprehends thoſe plants which have hermaphrodite flowers with three ſtamina in each: of this claſs are the valerian, ſaffron, many of the graſſes, &c.

The fourth is of the tetrandria; the word, derived from the ſame ἀνὴρ and τέτρα, four times, ſignifies a flower that has four male parts, and accordingly comprehends thoſe plants which have hermaphrodite flowers with four ſtamina in each; of this claſs are the teaſel, madder, plantain, &c.

The fifth is of the pentandria; the word, derived from the ſame ἀνὴρ and ϖέντε, five, ſignifies a flower with five male parts, and accordingly comprehends thoſe plants which have hermaphrodite flowers with five ſtamina in each; of this claſs are the primroſe, willow-herb, bind-weed, &c.

The ſixth is of the hexandria; the word, derived from the ſame ἀνὴρ and ἓξ. ſix, ſignifies a flower that has ſix male parts, and accordingly comprehends thoſe plants which have hermaphrodite flowers with ſix ſtamina in each; theſe ſtamina, the author obſerves, are either all equal in length, or alternately one ſhorter than another: of this claſs are garlic, hyacinths, meadow ſaffron, &c.

The ſeventh is of the heptandria; the word, derived from the ſame ἀνὴρ and ἑπτὰ, ſeven, ſignifies a flower with ſeven male parts, and comprehends thoſe plants which have hermaphrodite flowers with ſeven ſtamina in each: of this claſs are the horſe cheſnut and trientalis.

The eighth is of the octandria; the word, derived from the ſame ἀνὴρ and ὀκτὼ, eight, ſignifies a flower with eight male parts, and comprehends thoſe plants which have hermaphrodite flowers with eight ſtamina in each: of this claſs are the maple, rue, heath, &c.

The ninth claſs is of the enneandria; the word, derived from the ſame ἀνὴρ and ἐννέα, nine, ſignifies a flower that has nine male parts, and comprehends thoſe plants which have hermaphrodite flowers with nine ſtamina in each: of this claſs are the bay, rhubarb, &c.

The tenth claſs is of the decandria; the word, derived from the ſame ἀνὴρ and δεκὰς, ten, ſignifies a flower which has ten male parts, and comprehends all thoſe plants which have hermaphrodite flowers with ten ſtamina in each: of this claſs are the judas tree, baſtard dittany, caltrop, &c.

The eleventh is of the dodecandria; the word, derived from the ſame ἀνὴρ and δώδεκα, twelve, ſignifies a flower which has twelve male parts in it, and comprehends thoſe plants which have hermaphrodite flowers with twelve ſtamina in each: of this claſs are the aſarabacca, agrimony, &c.

The twelfth is of the icoſandria; the word, derived from the ſame ἀνὴρ and εἴκοσι, twenty, ſignifies ſtrictly a flower with twenty male parts in it; the author however does not underſtand it in that ſtrict ſenſe, but, uſing it as we frequently do words expreſſing large quantities, as indefinite and in an indeterminite ſenſe, defines it to mean only a larger number of ſtamina than are expreſſed under any other of the diſtinctions; and comprehends under it, in this claſs, all thoſe plants which have hermaphrodite flowers and more than twelve ſtamina in each; thoſe ſtamina alſo growing to the inner ſide of the cup of the flower, not to the receptacle of the future ſeeds: of this claſs are the torch thiſtle, the myrtle, ſtorax, the almond, &c.

The thirteenth is of the polyandria; the word, derived from the ſame ἀνὴρ and ϖολὺς, many, ſignifies, in an exact ſenſe, no other than what he makes the icoſandria, the title of the laſt claſs, expreſs: theſe are, perhaps, the only two words in which his expreſſion is deficient, the names he has given the claſſes not at all importing their particular difference from one another: this, however, he has very accurately done in the character which follows them; and comprehends under this claſs thoſe plants which have hermaphrodite flowers with more than twelve ſtamina in each, but which grow in this to the receptacle of the future ſeed, not as in the other claſs to the inner ſide of the cup of the flower; of this claſs are the water lily, poppy, celandine, &c.

Theſe are the claſſes this accurate diſtinguiſher has eſtabliſhed among the hermaphrodite flowers, whoſe ſtamina have no regular proportion of length, in regard to one another. To theſe he next ſubjoins two claſſes of ſuch of them as have two of their ſtamina ſhorter than the reſt.

The firſt of theſe (the fourteenth claſs of the general order) is of the didynamia: the word, derived from the before-mentioned δὶς and δύναμις, power or efficacy, ſignifies with him ſuch flowers as have two of their male parts of more efficacy than the reſt; and, in this claſs, he accordingly comprehends all thoſe plants which have hermaphrodite flowers, two of whoſe ſtamina are longer, and of greater efficacy in the great work of fecundating the ſeeds, than the reſt: of this claſs are the thyme, lavender, baſil, &c.

The ſecond of theſe (the fifteenth claſs of the general order) is of the tetradynamia; the word, derived from the before-mentioned τέτρας and δυνάμις, ſignifies a flower with four of its male parts of more efficacy than the reſt; and in this claſs he comprehends the plants with the hermaphrodite flowers, four of the ſtamina of which are longer than the reſt: of this claſs are the ſcurvy-graſs, radiſh, muſtard, &c.

From theſe he proceeds to thoſe hermaphrodite flowers whoſe ſtamina cohere, either mutually among one another, in different manners, or with the piſtillum of the flower: theſe coalitions of the ſtamina he calls brotherhoods or communities; and according to the different ſtate of theſe, and their conjunctions with the piſtillum, he eſtabliſhes five claſſes of them.

The firſt of theſe (the ſixteenth in the general order) is of the monadelphia; the word, derived from the before-mentioned μόνος, ſingle, and ἀδελφὰ, brotherhoods, or communities, ſignifies, with him, a flower whoſe ſtamina, by the filaments running in one among another, are all formed into one body; and under this claſs he comprehends thoſe plants with hermaphrodite flowers, whoſe ſtamina, or male parts, are all bound together in one body: of this claſs are the crane's bill, mallow, &c.

The ſecond of theſe (the ſeventeenth claſs in the general order) is of the diadelphia; the word, derived from the before-mentioned δὶς and ἀδελφὰ, ſignifies, with him, a flower whoſe ſtamina are, by the conjunction of their filaments, formed into two bodies; and under this claſs he comprehends thoſe plants with hermaphrodite flowers, the ſtamina of which are ſo cluſtered together into two bodies: of this are the fumitory, milkwort, broom, &c.

The third of theſe (the eighteenth in the general order) is of the polyadelphia; the word, derived from the before-mentioned ϖολὺς and ἀδελφὰ, ſignifies with him a flower whoſe male parts are cluſtered into three or more ſeparate bodies; and in this he comprehends theſe plants with hermaphrodite flowers, whoſe ſtamina, by the conjunction of their filaments, are formed into three or more cluſters: of this claſs are the orange, St. John's wort, &c.

The fourth of theſe claſſes (the nineteenth in the general order) is of the ſyngeneſia: the word, derived from σὺν, together, and γένεσις, generation, origin, or formation, ſignifies, with him, ſuch flowers as have their male parts naturally formed into a ſingle regular congeries; and accordingly he comprehends under this claſs ſuch plants as have hermaphrodite flowers, the ſtamina of which, by the junction of their apices, are formed into a ſingle, regular, cylindric body: of this claſs are the lettuce, ſuccory, hawkweed, &c.

The fifth of theſe claſſes (the twentieth in the general order) is of the gynandria: the word, derived from γυνὴ, a woman, or female, and ἀνὴς, male, ſignifies, with this author, a conjunction of the male and female parts of a flower at their origin; and he accordingly comprehends under this claſs thoſe plants which have hermaphrodite flowers, the ſtamina or male parts of which grow to the piſtillum, or female parts of the flower, and not to the receptacle of the ſeeds: of this claſs are the barrenwort, paſſion-flower, birthwort, &c.

Next after theſe he ranges thoſe plants which have flowers not hermaphrodite, but regularly and diſtinctly male and female, as the ſexes in animals are diſpoſed; and after theſe ſuch plants as have flowers irregularly of one, or the other, or ſometimes of both ſexes.

Of theſe he eſtabliſhes only three claſſes.

The firſt of theſe (the twenty-firſt claſs of the general order) is of the monœcia: the word, derived from the before-mentioned μόνος, and οἶκος, a habitation, ſignifies, with this author, ſuch plants as have their diſtinct flowers on the ſame individual; and he comprehends accordingly under it thoſe plants which have the male and female flowers diſtinct in themſelves, but placed on the ſame plant, or the different ſtalks from the ſame root: of this claſs are the alder, mulberry, amaranth, arrow-head, &c.

The ſecond of theſe (the twenty-ſecond claſs in the general order) is of the diœcia: the word, derived from the ſame, οἶκος and δὶς, ſignifies, with him, plants which have their male and female flowers, not on the ſame individual; and accordingly comprehends under it ſuch plants as have diſtinct male and female flowers, and different plants of the ſame ſpecies, either of which, the male and female plants, as they are hence called, might have ariſen from the ſame ſeed: of this claſs are the willow, miſletoe, hemp, and ſpinach, &c.

The third of theſe (the twenty-third in the general method) is of the polygamia: the word, derived from ϖολὺς many, and γάμος, marriage, ſignifies, with this author, plants which have a diverſity of combinations and many ways of Fructification, in the ſame ſpecies; and accordingly he comprehends under this claſs thoſe plants which have, in the ſame ſpecies, ſome flowers male, others female, each diſtinct and perfect in its kind, and others mixed or hermaphrodite, with the male and female organs of Fructification both in each: of this claſs are pellitory, of the wall, orrache, the aſh, &c.

After all theſe he places thoſe plants whoſe flowers are either abſolutely inviſible, or ſcarce diſcernable by the eye: of theſe he makes only one, his twenty-fourth and laſt claſs, the cryptogamia: the word, derived from κρύπτὸς, hidden, or concealed, and the before-mentioned γάμος, or marriage, ſignifies a ſet of plants, in which the Fructification is concealed: and under this laſt claſs he comprehends thoſe plants which either flower, as is generally ſuppoſed, within the fruit, or have the organs of their Fructification ſo mingled as to eſcape our obſervation: of this claſs are the ferns, moſſes, liverworts, and muſhrooms.

Theſe are the claſſes into which this author has regularly and certainly reduced the whole vegetable world; the characters of which are ſo expreſſive, and the parts they are founded upon ſo fixed and invariable in their nature and office, that there ſeems no reaſon hereafter to perplex the world with any new ſyſtem.

As the claſſes are here taken from the number, ſite, and diſpoſition of the male parts of the flower; ſo the orders which make their ſubdiſtinctions are, by this author, deduced from the differences of the female parts or piſtillum; and as that is ſingle, double, triple, and ſo on, they are on the ſame principles named monogynia, digynia, trigynia, &c.

It were to be wiſhed indeed that the characters of the different genera of theſe claſſes were as perfect and accurate as the claſſes themſelves: this, however, was more than the work of one man; the author has fixed the general diſtinction, and led the way; and it is eaſy now for a much leſs genius to follow him.

FRUIT (*Dict.*)—The Fruit of ſome plants are produced ſingly, as are their flowers; and ſometimes they are produced in cluſters, as in moſt fruit-trees, which are alſo fleſhy; but in many plants they are dry.

The word Fruit is alſo uſed to ſignify an aſſemblage of ſeeds in a plant; as in a pea, bean, ranunculus, &c. and, in its general ſignification, for all kinds of grain, whether naked, or incloſed in a cover, capſula, or pod, whether bony, fleſhy, ſkinny, membraneous, or the like.

Fruit is the product or reſult of the flower, or that for whoſe production, nutrition, &c. the flower is intended.

The ſtructure and parts of different Fruits are different in ſome things; but, in all the ſpecies, the eſſential parts of the fruit appear to be only continuations or expanſions of thoſe which are ſeen in the other parts of the tree.

Dr. Beale ſuggeſts ſome very good reaſons for a direct communication between the remoteſt parts of the tree and the Fruit; ſo that the ſame fibres or ſtamina, which conſtitute the root, trunk, and boughs, are extended into the very Fruit.

Thus, if you cut open an apple tranſverſely, you will find it to conſiſt chiefly of four parts: viz. 1. a ſkin or cortex; which is only a production of the ſkin or outer bark of the tree. 2. A parenchyma or pulp, which is an expanſion and intumeſcence of the ble or inner bark of the tree. 3. The fibres or ramifications of the woody part of the tree. 4. The core, which is the produce of the pith or medulla of the plant, indurated or ſtrengthened by twigs of the wood and fibres inoſculated therewith. This ſerves to furniſh a cell or lodge for the kernels, filtrates the juice of the parenchyma, and conveys it, thus prepared, to the kernel.

Of the fibres authors generally reckon fifteen branches; of which, ten penetrate the parenchyma, and incline to the baſis of the flower; the other five aſcend, more particularly from the pedicle or ſtalk, and meet with the former at the baſe of the flower; to which branches the capſulæ or coats of the kernels are faſtened.

Theſe branches, being firſt extended through the parenchyma to the flower, furniſh the neceſſary matter for the vegetation of it: but, as the Fruit increaſes, it intercepts the aliment; and thus the flower is ſtarved, and falls off.

In a pear, there are five parts to be diſtinguiſhed, viz. the ſkin, parenchyma, ramification, ſtone, and acetarium.

The three firſt parts are common to the apple. The ſtone, obſerved chiefly in choke pears, or baking pears, is a congeries of ſtrong corpuſcles, that are diſperſed throughout the whole parenchyma, but in the greateſt plenty, and cloſeſt together, about the center, or acetarium: it is formed of the ſtony or calculous part of the nutritious juice.

The acetarium is a ſubſtance of a tart acid taſte, of a globular figure, incloſed in an aſſemblage of ſeveral of the ſtony parts before-mentioned.

In a plum, cherry, &c. there are four parts, viz. a coat, parenchyma, ramification, and nucleus or ſtone. The ſtone conſiſts of two very different parts: the external or harder part, called the ſtone or ſhell, is a concretion of the ſtony or calculous parts of the nutritious juice, like the ſtone in pears, within it. The inner, called the kernel, is ſoft, tender, and light, being derived from the pith or medulla of the tree by ſeminal branches, which penetrate the baſe of the ſtone.

The nut, or acorn, conſiſts of a ſhell, cortex, and medulla; the ſhell conſiſts of a coat and parenchyma, derived from the bark and wood of a tree.

The cortex conſiſts of an inner and outer part; the firſt is a duplicature of the inner tunic of the ſhell: the ſecond is a moſſy ſubſtance, derived from the ſame ſource as the parenchyma of the ſhell. But authors are not agreed, whether the medulla or pulp of the kernel does ariſe from the pith of the tree, or the cortical part thereof.

Berries, as grapes, &c. contain, beſides three general parts, viz. coat, parenchyma, and ramification, grains of a ſtony nature, to do the office of ſeeds.

Fruits, in general, are ſerviceable in guarding, preſerving, and feeding the incloſed ſeed; in filtrating the coarſer, more earthy, and ſtrong parts of the nutritious juice of the plant, and retaining it to themſelves; ſending none but the moſt pure, elaborated, and ſpirituous parts to the ſeed, for the ſupport and growth of the tender delicate embryo, or plantule, which is therein contained.

FRUIT-*trees.* There is, in the Philoſophical Tranſactions, a method of making Fruits and flowers grow in winter inſtead of ſummer, without the common way of doing it by heat. This method is, to take up the trees with their roots in the ſpring ſeaſon, juſt as they begin to ſhoot out their buds; let them be placed upright in a cellar, and ſtand there till the end of September following; then fit veſſels to them, and place the roots in them, covering them in a proper manner with earth, and bring them up into a common ſtove; water them at times with a ſolution, of the bigneſs of a walnut, of crude ſal armoniac, in a quart of rain water, and they will make their natural progreſs, as in ſummer; and, in the months of February or March following, the Fruit will be full ripe, and as well taſted as if it had grown on them in the common way, and ripened at its natural ſeaſon. *Philoſ. Tranſ.* N°. 282.

The ſuperfluous ſhoots from theſe trees muſt be pruned off at ſuch times of the year, when the trees are full of juice, and furniſhed for a farther ſupply; and, by this means, there will be no marks of the wounds, they will cloſe up ſo perfectly.

The manner of producing pyramidal trees by ingrafting is not only applicable to Fruit-trees, but has been tried on oaks, limes, and roſes, with the ſame ſucceſs.

Laurembergius tells us of a peculiar way of managing Fruit-trees for ready ſervices and beauty, by means of which they will bear fruit the firſt year. The method is this: draw a branch of a Fruit-tree through a pot of earth, and prick it full of holes with a knife, ſo far as it is to ſtand in the pot; let it be well watered for the firſt ſeven or eight days, to make it ſhoot out a great quantity of roots: in the March following cut off the branch from the tree, and let it depend wholly on itſelf for nouriſhment; break the pot away, and place the clump of earth with the young tree in it in the place where it is intended to ſtand. The author aſſures us, it will partake ſo much of the nature of the ſtock, as to bear Fruit the firſt year. *Phil. Tranſ.* N°. 3.

FULI'GO, *ſoot.*—The learned Boerhaave has given us the following analyſis of ſoot.

Take of the blackeſt and drieſt ſoot, gathered in the chimney of an oven, where nothing but bread is baked, and nothing burnt but vegetables, and gathered on a very dry day; with this fill a large glaſs retort almoſt to the neck; apply a large glaſs receiver, after the neck of the retort has been thoroughly cleanſed, on the inſide; and lute the juncture with the common linſeed paſte; raiſe a fire of an hundred and fifty degrees, and keep it up equably: a large quantity of tranſparent water will thus come over, with conſiderable violence; ſo that, if the fire was immediately made ſtrong at firſt, the receiver would eaſily crack. Continue in this manner, ſo long as any clear water comes over, which it will long do, although the ſoot was dry. Then taking away this firſt water, and pouring it into a glaſs, apply the receiver again, and raiſe the fire a little above two hundred degrees; a white, milky, fat water, will now come over in quantity, and with conſiderable violence; proceed with a ſlowly increaſed fire, ſo long as this continues; keep it apart; apply the receiver again, and raiſe the fire briſkly; a yellow, volatile, copious ſalt will come over, and ſtick all round the ſides of the receiver; continue the fire thus briſk, ſo long as any ſalt ariſes; then with the ſtrongeſt heat, that ſand will give, and with a heat of ſuppreſſion, there ariſes a thick black oil. Let all cool, and there will be found, in the neck of the retort, a ſalt which could riſe no higher, even by ſo violent a fire; but, in the bottom of the retort, there remains a black feculent matter; the upper ſurface whereof is covered with a very thick, whitiſh, ſaline cruſt, which, both in colour, figure, concretion, and ſtriæ, reſembles the common ſal ammoniac. If the milky water be rectified, it affords a very penetrating volatile ſpirit, and ſome ſharp volatile ſalt.

Remarks.

Here we are taught what the agitation of an open fire can move, change, expel, and drive through the air by burning; firſt, in the form of ſmoke; then, of flame; laſtly, of exhalation, and how high it may carry them. For a chimney is a kind of ſtill-head, converging in an open top; and ſometimes riſes to the height of above thirty feet, and carries ſoot up to the top; and, after this, diſcharges a black ſmoke, at its upper orifice, and diſperſes it through the air, where it ſeems gradually to vaniſh. It may deſerve to be conſidered, what an immenſe quantity of ſuch matter is, by the force of fire, thrown up from the ſurface of the whole habitable globe, in the places where fire is conſtantly uſed: whence we may learn, that combuſtible vegetables, thin ſmoke, flame, and ſoot, and the black clouds diſperſed in the air, conſiſt of one and the ſame matter agitated by fire. This matter conſiſts of ſeveral parts; as, 1. a fœtid, oily, bitter, unpleaſant, nauſeous ſpirit, reſiding in the water, that firſt comes over, and is afterwards conſtantly diſperſed through all the other parts: this ſpirit ſeems to be the oily and more ſubtile part of the vegetable, acted on by the force of fire. 2. Water, which is here contained in great plenty, reſiding in this ſpirit, in the firſt limpid, and in the ſecond milky liquor, as alſo in the ſaline ſpirit, the volatile ſalt, and, in ſome meaſure, in the oil itſelf. This water can ſcarce be rendered pure by any art, being always foul with the unalterable bitterneſs, and the inſeparable diſagreeable odour of the ſpirit. 3. A ſharp, volatile, alcaline, oily ſalt, which firſt comes over, riſes into the receiver, and ſticks to the ſides thereof; for this ſalt is truly alcaline, as appears by its ſtate, ſmell, fiery virtue, the violent efferveſence it makes with acids, and by concreting therewith into a compound ſalt; and hence a volatile alcali continually impregnates the atmoſphere, in great plenty, by conflagration. 4. A ſharp, alcaline, fat ſpirit, conſiſting of the ſalt juſt now mentioned, diſſolved in water, and ſo reſembling ſpirit in fluidity, pungency, ſubtility, and volatility. 5. A fœtid, black, bitter, nauſeous, inflammable, thick, and almoſt cauſtic oil, mixed with an oily ſalt. 6. A true ſal ammoniac, ſticking in the lower part of the neck of the retort, and raiſed to the ſurface of the black earth below. For, if this ſalt be carefully collected and ſeparated from the alcaline kind, that firſt comes over, it proves a genuine ſal ammoniac. It is of a whitiſh colour ſomewhat tranſparent, makes no efferveſcence with acids, and, if mixed with fixed alkalies, preſently affords a true volatile alcaline ſalt, as ſal ammoniac does; whence the true origin of this ſalt is derived from ſoot. 7. A black fixed earth, which, being afterwards calcined in an open fire, and burnt from its oil, which tenaciouſly adheres thereto, leaves a white earthy calx behind.

This is the analyſis of ſoot; by conſidering of which, we may learn what parts of vegetables are volatile, and fly off by an open fire, and what are fixed and remain behind, and what fire throws off from vegetables into the air. Hence we ſee, that even earth, which appears ſo fixed in the moſt violent fire, after being ſeparated from the other principles, yet, when mixed with the reſt, is, either by the force of flame, or fire, thrown to the diſtance of forty feet through the air, in the form of a thin cloud; but there would be no end, if we ſhould minutely purſue the phyſical uſes of this proceſs. Pills compoſed of dry ſoot, and gilded, are recommended for the cure of cold diſtempers, and this often with ſucceſs. The volatile ſalt of ſoot is uſed with the ſame ſucceſs as that of animals. Hartman recommends the ſalt which riſes laſt, for giving relief in cancers; and, certainly, ſal ammoniac, prudently employed, is of ſervice againſt the putrefaction of running cancers. But the ſoot, produced by oak wood alone, the common Dutch tufts, or pit coal, appears different upon chymical analyſis; and that again would be very different, which ſhould be collected from the chimney of a public kitchen, which is continually filled with the fumes, not only of the fuel, but likewiſe of all kinds of boiled, roaſted, and fried meats. And thus much may help us to form a judgment of ſoot. *Boerhaave's Chymiſtry.*

FU'LLING (*Dict.*) — *Method of* FULLING *cloaths and woollen ſtuffs with ſoap.*

Let a coloured cloth of about forty-five ells be laid, in the uſual manner, in the trough of a Fulling-mill, without firſt ſoaking it in water, as commonly practiſed in moſt places.— To full this trough of cloth, fifteen pounds of ſoap are required, one half of which is to be melted in two pails of river or ſpring-water, made as hot as the hand can bear. Let this ſolution be poured, by little and little, upon the cloth, in proportion as it is laid in the trough: thus it is to be fulled for at leaſt two hours; after which, let it be taken out and ſtretched. — This done, let the cloth be immediately returned into the ſame trough, without freſh ſoap, and there fulled two hours more. Then take it out, wring it well, and expreſs all the greaſe and filth.—After the ſecond Fulling, diſſolve the remainder of the ſoap, as the former part, and throw it at four ſeveral times on the cloth, not forgetting to take it out every two hours to undo the plaits and wrinkles it got in the trough. —When it is ſufficiently fulled, and brought to the requiſite quality and thickneſs, it is ſcoured out for good in hot water, keeping it in the trough till it be thoroughly clean. — White cloths Fulling more eaſily than coloured ones, a third part of the ſoap may be ſpared.

Fulling of caps, ſtockings, &c. is performed either with the hands or feet, or a kind of wooden machine, either armed with wooden teeth, or thoſe of horſes or bullocks.—The ingredients generally uſed on this occaſion are urine, green ſoap, white ſoap, and fuller's-earth. — But a water ſoftened with chalk is far preferable.

FUMA'RIA, *fumitory*, in botany, a genus of plants whoſe characters are:

The leaves are divided as in umbelliferous plants; the calyx is ſmall, and bifoliated, in ſome lying under the ſpur of the flower, and in others wanting. The flower, if curiouſly examined, in many plants, appears tetrapetalous, the lower petal running out in the ſhape of a keel from the end of the pedicle: the upper, being bent in the figure of a ſpur, riſes upwards, in the form of an erect galea; to this latter petal grow the calyx and pedicle: the third and fourth petals are lateral, and, by their oppoſition, form the repreſentation of a very ſharp-pointed vagina, concealed between the two former petals.

The ovary, at the extremity of the pedicle, is ſhort and contracted, and furniſhed with a long tube, with a globous or diſcous head: the whole length of it ſeems carefully covered up, and concealed within the vagina before deſcribed. To the tube, for its whole length, grow two ſtamina, ſo cloſely, that, in conjunction with it, they are included in one very ſmall, thin, pellucid, vagina, in ſuch a manner, that nothing appears outwardly but the apex of the tube of the ovary, and the two teſtes. The ovary, when ripe, becomes an unicapſular pod, full of round ſeed.

If the ripe flower be cautiouſly opened, as ſoon as the two interior petals are diſcloſed, the teſtes diſcharge the ſeed by a ſudden exploſion.

This plant gives the blue paper much ſuch a red colour as aloes; ſo that, probably, it contains very near the ſame principles, ſuch as a ſalt like that which is natural in the earth, but in which the ſal ammoniac predominates over the nitre and marine ſalt: beſides, the ſalt of the fumitory is joined with a great deal of ſulphur and earth, and diſſolved in a conſiderable quantity of phlegm.

By the chymical analyſis, fumitory yields a great deal of concreted, volatile, fixed, lixivial ſalt, and very thick oil.

All theſe principles render this plant laxative, diuretic, good to cleanſe the blood, and remove obſtructions of the parts. It paſſes for a ſpecific in all diſeaſes of the ſkin, in hypochondraic melancholy, in a cachexy, and dropſy: they give the juice of fumitory from two ounces to ſix; the infuſion in whey, from ſix ounces to ten or twelve; the ſimple ſyrup, to two or three ounces, in ptiſans; the compound ſyrup, to one or two ounces, if you would have the patient purged. The water, alſo, of fumitory is deterſive, and good to dry up ulcers of the mouth. Anointment is made of the juice of this plant, mixed with equal quantities of the juice of elecampain, thickened over the fire with ſome hog's lard. Fumitory is uſed in the electuary de Pſyllis, in that which they call ſennatum, in the confection hamech, and in the compound ſyrup of ſuccory. *Martyn's Tournefort.*

FU'NDS, a term adopted by the monied men, and thoſe who ſpeak of the public revenue of nations, to ſignify the ſeveral taxes that have been laid upon merchandizes, either by way of duties of cuſtom or exciſe or in any other ſhape, to ſupply the exigencies of the ſtate, and to pay the intereſt for what ſums of money it may have occaſion to borrow. Thus we ſay, ſuch a duty, or ſuch a tax, is a good Fund to anſwer ſuch a purpoſe. The term is alſo applied to the ſtocks of great trading and monied corporations.

The Funds, or taxes if you pleaſe, of this kingdom are, to ſpeak in the language of parliament, either temporary or perpetual. Temporary ones are ſuch which are impoſed for a certain number of years, or annually; as the land and the malt-taxes; the perpetual Funds are ſuch whereon monies have been borrowed for the public ſervice, and which are appropriated for the ſecure and certain payment of the intereſt of ſuch monies, till the diſcharge of the principal ſo borrowed.

FU'NGUS (*Dict.*) — Certain tumors of the joints, generally called white ſwellings, are alſo called Fungi, by ſome authors, particularly Heiſter, who gives the following directions relative to them:

Excreſcences of the joints very nearly reſemble œdematous tumors, are attended with danger, and therefore require a peculiar examination; nothing but an ignorance of the nature and origin of them, that is, whether they proceed from the blood or ſerum, from a corrupted matter, flatus, or any other cauſe, could have tempted ſo many authors to paſs them over in ſilence, or treat of them ſo ſuperficially. A Fungus in the joints is a tumor in the articulations of the limbs, without heat or pain, ſo ſoft, that it eaſily yields to the preſſure of the fingers; but, upon the removal thereof, expands itſelf immediately, like a muſhroom, without retaining any marks. Though no joints either of the arms or legs are exempt from this diſorder, the knees, from the quantity of glands and latent fat between the ligaments and tendons, are moſt ſubject to it. There are ſeveral kinds of theſe Fungi; ſome are ſmall, others large; ſome ſoft, others hard; according as the humours, producing it by their ſtagnation and inſpiſſation, are either thin or glutinous. In ſome the noxious fluids are without ſide the articulation; theſe are properly termed Fungi: in others they ſtagnate within the very joint, as the ſerum in the ſcrotum, when there is an hydrocele, which I have both ſeen and cured: this laſt may juſtly be called a dropſy of the joint; and, by its diſtention of the intire joint, may be diſtinguiſhed from the Fungus, as that occupies rather one ſide. Theſe two diſeaſes, then, may be eaſily diſtinguiſhed from what has been ſaid.

A Fungus undoubtedly ariſes from an inſpiſſation of the viſcid, glutinous ſerum about the ligaments of the joints, which, being collected after a fall, or violent blow, immediately raiſes a tumor externally, or in the very joint, and, by debilitating the ligaments, deſtroys the natural mobility of the part. When the nerves, arteries, or veins, are affected by theſe ſwellings, the uſual conſequence is, that the ſubjected parts are deprived of their nutriment, and the joint, being preternaturally inlarged, is by degrees inſenſibly conſumed.

We have already obſerved, that, in excreſcences of the joints, the ligaments are too much extended and relaxed, and, conſequently, the natural ſtrength of the affected limb is more or leſs weakened, in proportion to the violence of the injury received: now, ſince it is very difficult to remedy this diſorder, and theſe tumors cannot eaſily be reſolved or ſuppurated, every one muſt acknowledge, that the ſurgeon lies under great difficulties, who attempts this cure; for, beſide the difficulty of bringing them to ſuppurate, there is danger in the ſuppuration, as it is often attended with a caries, or incurable fiſtula, which induce a neceſſity of amputation. Recent, ſmall, and ſoft, Fungi are often remedied by reſolvent and corroborating medicines, though they are generally irritated by emollients; whereas great and inveterate ones reſiſt all the power of medicine, and depend intirely on the knife for relief, and this does not always prove ſucceſsful: for, though by inciſion you may extract the noxious humours, the ſwelling often returns, after the wound is healed.

But the proper method for the cure ſeems to be this: rub the part affected ſeveral times in a day with warm cloths; then foment it with the beſt tartariſed ſpirit of wine, or linen dipped in the ſame; continue this, till the natural form and vigour of the limb are reſtored. Purmannus's fomentation is likewiſe a very noble remedy: take of the pickle of herrings, two pints; of the ſtrongeſt vinegar, one pint; leaves of ſage, two handfuls; Roman vitriol, an ounce and an half; and alum, ſix ounces; boil theſe together for half an hour; then apply them. When the tumor begins to be diſperſed, and the former vigour of the limb a little recovered, the reſolution is greatly promoted by fomenting with tartariſed ſpirit of wine, or fœtid oil of tartar, ſeveral times in a day; then, to keep out the cold, which is very injurious, bind it up firmly with compreſſes and bandages. Laſtly, I cannot but recommend fomentation above all others: which I have uſed myſelf, with great ſucceſs: take of litharge, half a pound; Armenian bole, an ounce; maſtic and myrrh, each half an ounce; wine vinegar, a pint: boil theſe together for a quarter of an hour. You muſt uſe this decoction warm, and every morning and evening dip compreſſes, or thick linen cloths, into it, and foment the part; obſerving to order, internally, proper purging, attenuating, and ſudorific medicines.

If none of the medicines recommended anſwer the purpoſe, Wurtzen and Purman place their ſole confidence in an inciſion into the tumefied joint, towards the lower and moſt commodious part, but with the utmoſt circumſpection, leſt any of the ligaments or tendons ſhould be injured; for, by the help of this, if the ſtagnating ſerum is collected in one cavity only, it will immediately diſcharge itſelf; if it is diſperſed into ſeveral, it will gradually flow out in a few days. This may be promoted, by applying tents dipped in ſome digeſtive, and ſprinkled with alum. But, before the inciſion, you ſhould preſs the tumor hard with your fingers, and retain it with a bandage placed above it, to prevent its giving way; for this will not only expoſe the part more commodiouſly to your ſight, but, after inciſion, promote the efflux of the ſerum, and make it burſt out, as the blood does after veneſection, or the water after an inciſion of the hydrocele. When you have done this, if any ſwelling ſtill remains, lay on a dyachilum or oxycroceum-plaiſter, or Wurtzen's red one, which, in this caſe, he ſtrongly recommends; with limewater, or ſpirit of wine, which will reſolve the remainder. Thus, when the member is reſtored to its priſtine form, the wound is healed by vulnerary balſams; carefully avoiding the uſe of fat oily medicines, as very prejudicial to the ligaments and tendons. But, if the ſerum be found too tenacious and glutinous to diſcharge itſelf voluntarily, apply ſome attenuating injection at every dreſſing. A decoction of agrimony, alchimilla, and birthwort, mixed with honey of roſes, or of celandine, is the beſt. Theſe injections will generally reſolve the tumors ſurpriſingly.

Though inciſion is the more ready way of cure, ſome prefer cauſtics; and, when the eſchar is ſeparated, they turn out the collected humors, proceeding afterwards as directed above. During this proceſs, I would adviſe anointing the affected joints with a nervous unguent, or ſome aromatic ſpirit, till it has recovered its natural ſtrength.

As it is very common for the inſpiſſated ſerum, after the formation of the cicatrix, to collect again; in order to prevent this, you muſt obſerve, not only to preſcribe internal reſolvent, purging, and ſudorific medicines, but likewiſe to keep the wound open with tents for ſome time, and cleanſe it daily with a vulnerary injection of a decoction of birthwort, agrimony, alchimilla, or the like, mixed with honey of roſes, or of celandine; for in Purman's opinion this method is the moſt expeditious, inſomuch that the ſinus of the wound is not only cleanſed, but filled up alſo with new fleſh, ſometimes in ſix days. It will, however, not be improper to inject ſome lime water into the wound, and to apply the ſame, or a digeſtive plaiſter, externally, always binding up the knee carefully, to prevent a collection of the ſerum. This will prevent a return of the Fungi, as Wurtzen, who had been very converſant in theſe cures, teſtifies.

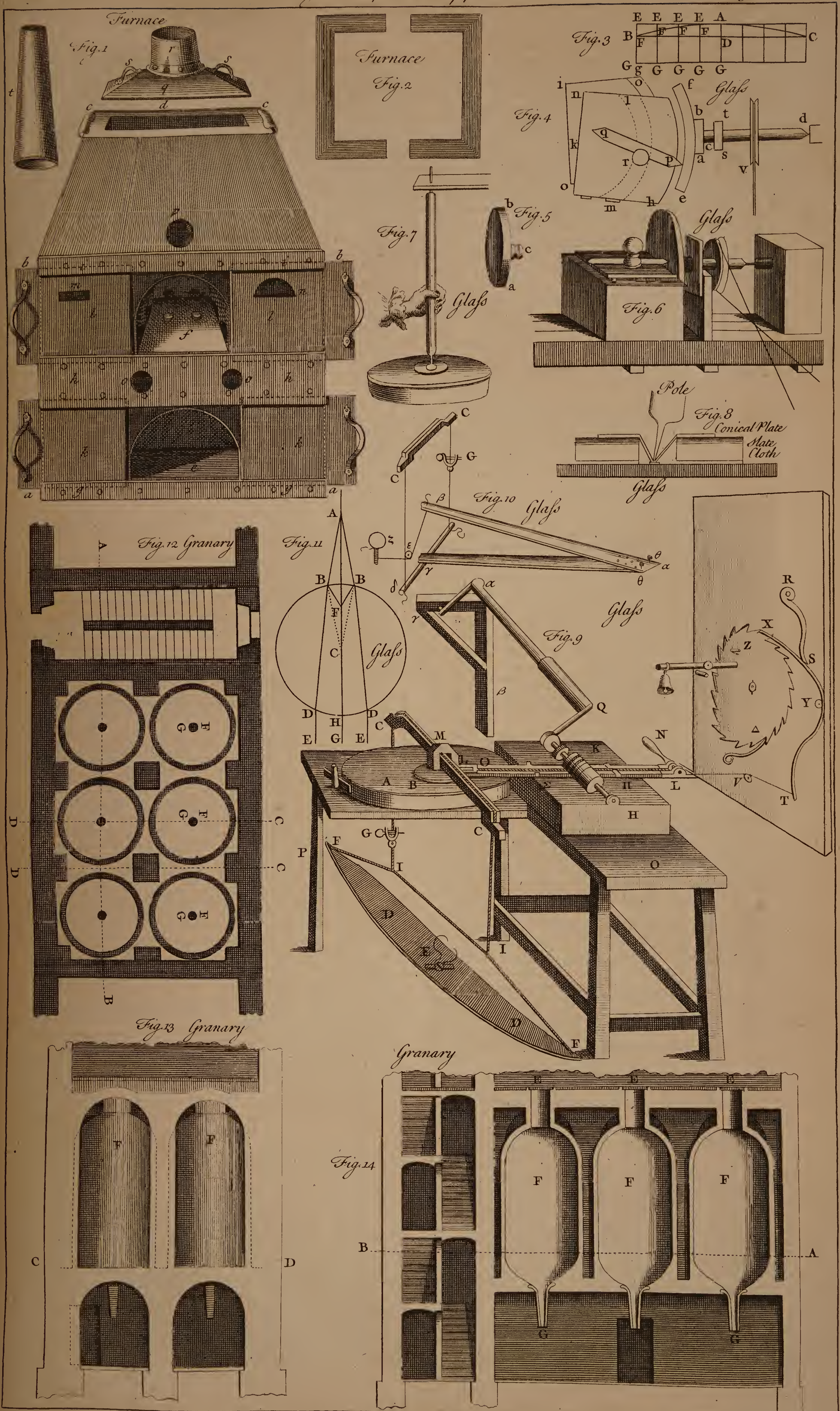
Every excreſcence of the joints is not formed, ſo as to admit of an inciſion ſafely; for, when it is inveterate, hard, or very large, or the patient is weak, you muſt forbear it, as rather more prejudicial than ſerviceable, becauſe it is frequently attended with new diſorders, as a caries, fiſtula, and gangrene, by which the man is deſtroyed, who might otherwiſe have arrived at a good old age. *Heiſter's Chururg.*

FUNGUS, in minerology, a name given by Dr. Liſter to a blackiſh bituminous ſubſtance, found in ſome of the mines of Derbyſhire. It adheres to the ſides of the fiſſures of rocks, and lies in ſeams of the ſtrata. It is of a blackiſh colour and fatty ſubſtance, which never dries in the air, but always remains as moiſt, as when taken out of the mine. Some moſſes of it are ſoft and like a jelly, others are hard and firm, and in theſe there are ſeveral lumps of bitumen in many parts. This is inflammable like reſin. It is light, but breaks finer, and ſhines like good aloes when freſh broken, but that it is a little darker-coloured, and has ſome tinge of purple in it. In ſome pieces the purple is wanting, and there is a green in the place of it. On being diſtilled, it yields firſt a limpid and inſipid, then a whitiſh water of a ſharp taſte, and finally a yellow and clear oil, much reſembling oil of amber; but the proceſs affords no volatile ſalt in the neck of the receiver, in which it differs from amber when treated in the ſame manner. *Phil. Tranſ.* N°. VI. See AMBER, in the Dictionary.

FU'RNACE (*Dict.*)—*Docimaſtical* FURNACE, a Furnace uſed in aſſaying metals, ſometimes called the aſſay-oven.

It is made in the following manner. 1. Make with iron plates an hollow quadrangular priſm, eleven inches broad, and nine inches high, *a a*, *b b* (*plate* XXI. *fig.* 1.) ending at top in a hollow quadrangular pyramid *b b*, *c c*, ſeven inches high, terminating in an aperture at top ſeven inches ſquare. But this priſm muſt be cloſed at bottom with ſuch another iron plate, which ſerves as a baſis or bottom to it *a a*. 2. Near the bottom make a door *e*, three inches high, and five inches broad, that leads to the aſh-hole. 3. Above this door, and at the height of ſix inches from the baſis, make another door *f*, of the figure of a ſegment of a circle, four inches broad at its baſis, and three inches and a half high in the middle. 4. Then faſten three iron plates on the fore-part of this Furnace: let the firſt of them *g g*, eleven inches long, and half an inch high, be clapped, its lower edge, againſt the bottom of the Furnace, with three or four rivets, in ſuch a manner, that there may be, between the upper edge of the ſaid plate and the ſide of the Furnace, a groove ſo wide, as that the ſliders of the lower door *k k* may be put into it, and freely move backwards and forwards therein: theſe muſt be made of a thicker iron plate. The ſecond iron plate *h h*, eleven inches long, three inches high, and perfectly parallel to the foregoing plate, muſt be clapped in the ſpace between the two doors, in ſuch manner, that both the upper and the lower edge of it may form a hollow groove with the ſide of the Furnace. One of theſe grooves, which

PLATE XXI. *Engraved for the Supplement.* *Facing* Furnace



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which looks downwards, ſerves to receive the upper edges of the ſliders, that ſhut the lower door. The other that looks upwards, is to receive the inferior edges of the ſliders of the ſmall door above. The third plate *i i*, which is like the firſt, muſt be riveted cloſe above the upper door, in ſuch manner, that it may form a groove looking downwards, and contiguous to the upper edge of the upper door. 5. In order to ſhut both doors, you muſt adapt to each of them two ſliders made of iron plates, that may move within the above-mentioned grooves, *k k*, *l l*. But the two ſliders, belonging to the upper door, muſt have each a hole near the top; that is, one a ſmall hole one fifth part of an inch broad, and one inch and a half long *m*; and the other a ſemi-circular aperture, one inch high and two inches broad *n*. Let beſides each ſlider have a handle, that they may be laid hold of, when they are to be moved. 6. Moreover, let five round holes, one inch broad, be bored in the Furnace: two of which muſt be made in the fore-part of the Furnace *o o*, two others in the back-part, all at the height of five inches from the bottom, but three inches and a half diſtant from each ſide of the Furnace; and, finally, a fifth hole *p*, at the height of one inch above the upper edge of the upper door *f*. 7. In ſhort, let the inſide of the Furnace be armed with iron-hooks, jetting out half an inch, and about three inches diſtant from each other, to faſten the lute with which the Furnace is to be covered over within. 8. Let then an iron, moveable, hollow, quadrangular pyramid *q*, three inches high, be adapted to the upper aperture *d* of the Furnace at the baſis ſeven inches broad, ending upwards in a hollow tube *r* three inches in diameter, two inches high, almoſt cylindrical, tho' ſomewhat convergent at top. This prominent tube ſerves to ſupport a funnel or flue, which is almoſt cylindrical, hollow, made of iron plates, and two feet high *t*, and which, when a very ſtrong fire is required, is put perpendicularly upon the ſhorter tube, in ſuch manner, that it enters cloſe into it one inch and a half, or two inches deep, and may again be taken off at pleaſure, when there is no need of ſo ſtrong a fire. But this pyramidal cover *q* muſt beſides have two handles *s s* adapted to it, that it may be laid hold of, and thus be taken away or put on again. And, that this, being put on the aperture *d* of the Furnace, may not be eaſily thrown down, let an iron plate be riveted to the right and left upper edge of the Furnace *c c*, and be turned down towards the inſide, ſo as to make a furrow open before and behind, into which the lateral edges of the cover may enter and be faſtened, and at pleaſure be moved backwards and forwards, whenever it muſt be put on, or removed. 9. Let a ſquare ledge, made of a thick iron plate *fig.* 2. be faſtened at top of the upper edge of the lower door *e*; this is deſigned to ſupport the grate and the lute. But it muſt be made of two pieces, that it may be eaſily introduced into the cavity of the Furnace. Thus you will have an aſſay Furnace, which muſt afterwards be covered over inwardly on the inſide with lute: this you are to do as follows:

That the fire may be the better confined, and the iron not be deſtroyed by growing red-hot, the whole inſide of the Furnace muſt be covered over with the lute, one finger, or one finger and a half thick. The lute, fit for this, is made with Windſor loam, or with French clay, moiſtened with three or four times as much of ox-blood diluted with water. But, before you cover the inſides of your Furnace with this lute, you muſt firſt put within the Furnace ſmall iron-bars, equal in length to the diameter of the oven, quadrangular, priſmatical, half an inch thick, having their extremities ſupported by the ledge, and three fourths of an inch diſtant from each other; and you muſt faſten them ſo, that their flat ſides may be oblique with regard to the tranſverſe ſection of the Furnace, and, that the two oppoſite angles may look one upwards and the other downwards, the bars muſt not be laid flat, but edge-ways; by which ſituation, you hinder the aſhes of the fuel of the fire from being detained too long, between the interſtices of the ſaid iron-bars, and from making an obſtruction, that would oppoſe the free draught of the air. The Furnace, being then covered over with lute, and dried up by a gentle heat, is at laſt fit for docimaſtical operations, and eſpecially for ſuch as muſt be performed in the aſſay-oven.

If then an operation is to be made in the Furnace hitherto deſcribed, you muſt let through the four lower holes above deſcribed, of the Furnace *o o*, placed before and behind, and directly oppoſite to each other, two iron bars one inch thick, and long enough, that their extremities on every ſide may jut out of the holes a ſmall matter. Theſe ſerve to ſupport the muffle, and its bottom. You then introduce the muffle thro' the upper aperture of the Furnace, and place them upon the above deſcribed iron bars, in ſuch manner that the open foreſide of it be contiguous to the inward border of the upper door *f*. The fuel of the fire is introduced through the top of the Furnace; the cover of which, on this account, muſt be moveable, and not very heavy as *q*. The beſt fuel for the fire is charcoal made of the hardeſt wood, eſpecially of beech, broken into ſmall pieces of the bigneſs of an inch, wherewith the muffle muſt be covered over ſome inches high. We then reject larger bits of coals, becauſe they cannot fall through the narrow interſtices, between the ſides of the muffle and thoſe of the Furnace, and cannot of courſe ſufficiently ſurround the circumference of the muffle: whence it happens, that there are on every ſide places void of fuel, and the fire is either not ſtrong enough, or unequal. But, if, on the contrary, you uſe coals too ſmall, then a great part fall immediately through the interſtices of the grate into the aſh-hole; and the tendereſt particles of them turn too ſoon into aſhes, and, by increaſing the heap of aſhes, obſtruct the free draught of the air, which is here greatly requiſite.

A perfect management of the fire is moſt commonly neceſſary, in the performing of operations in this Furnace: therefore, the reader muſt give attention to what follows. If the door of the aſh-hole *e* is quite open, and the ſliders of the upper door *f* drawn towards each other, ſo as to touch one another in the middle of the door; and, if beſides the cover *q*, and the funnel *t*, adapted to its tube *r*, is upon the top *d* of the Furnace, the fire will then be in the higheſt degree poſſible: though, in the mean time, it is hardly ever neceſſary to put the funnel on, except in a very cold ſeaſon. But if, after having diſpoſed the Furnace in the manner juſt deſcribed, you put red burning coals into the open upper door *f* of it, the fire is ſtill more increaſed thereby: however, this artifice is never, or very ſeldom, neceſſary. When you ſhut the upper door, with only that ſlider, that has a narrow oblong hole in it *m*, then the heat becomes a little leſs: but it diminiſhes ſtill more, when you ſhut the door with the other ſlider, that has in it the ſemi-circular hole *n*, which is larger than that of the firſt ſlider: nay, the heat again is leſs, when you take away the funnel put at top of the cover: finally, the door of the aſh-hole being either in part or totally ſhut, the heat is ſtill diminiſhed, becauſe the draught of air, ſo neceſſary to excite the fire, is thereby hindered. But if, beſides all theſe, you likewiſe open the upper door quite; then the cold air ruſhing into the muffle, cools the bodies put under it, that are to be changed to a degree never required in any operation, and ſuch as will entirely hinder the boiling of lead. If, during the operation, the fire begins to decay, or to grow unequal, it is a ſign, that there are places void of coals, between the ſides of the Furnace and thoſe of the muffle: therefore, in this caſe, you muſt ſtir your coals on every ſide, with an iron rod, which is to be introduced through the upper hole *p* of the Furnace, that they may fall together, and thus act in a proper manner, and equally.

However, you are to obſerve, concerning the regimen of the fire juſt deſcribed, that, though the apparatus is made with all the exactneſs mentioned, the effect does not always anſwer it: the cauſe of which difference has moſt commonly its origin in the various diſpoſitions of the air. For as every fire is more excited by coals, in proportion as the air more condenſed, and more quickly agitated, ſtrikes them more violently (which the effect of bellows plainly ſhews) it thence appears, that in warm and wet weathers, when the atmoſphere is light, the fire muſt be leſs efficacious in Furnaces; that likewiſe, when ſeveral Furnaces, ſituated near each other, are burning at the ſame time, the fire is in part ſuffocated; becauſe the ambient air is thereby rendered more rare and lighter. The ſame effect is produced by the ſun, eſpecially in ſummer-time, when it ſhines upon the place where the Furnace is ſituated. The atmoſphere, on the contrary, being heavier in cold dry weather, excites a very great fire.

The heat of the fire acts the ſtronger upon the bodies to be changed, as the muffle put in the Furnace is leſs; as the ſaid muffle has more and larger ſegments cut out of it; as the ſides of this muffle are thinner; in ſhort, as there are more veſſels placed in the hinder part of the muffle; and on the contrary.

In this caſe, when many of the conditions requiſite for the exciting of fire are wanting, then indeed the artificer, with all his ſkill, will hardly be able to excite the fire to a ſufficient degree, in order to perform operations well, in common aſſay-ovens, even though he uſes bellows, and puts coals into the upper door of the Furnace. For this reaſon, I have put the grate almoſt three inches below the muffle, leſt the air, ruſhing through the aſh-hole, ſhould cool the bottom of the muffle, which happens in common aſſay-ovens; and again, that the ſmaller coals, almoſt already conſumed, and the aſhes, may more eaſily fall through the interſtices of the grate, and the larger coals ſtill fit to keep up the fire, be retained. Finally, I have added the funnel *t*, that, the blowing of the fire being, by means of it, increaſed as much as poſſible, this might at laſt be carried to the requiſite degree: for the fire may always be diminiſhed, but not always increaſed at pleaſure, without the aſſiſtance of a proper apparatus.

FU'SILE *Marble*, a very common but very improper term uſed for the green or greeniſh grey marble full of ſmall ſea ſhells, of which the ſlender pillars of our Gothic buildings are made.

G.

GAD-*Bee*, in natural hiſtory, the common name for a winged inſect, called alſo the dun-fly, or ox-fly; a creature very troubleſome to cows, horſes, &c.

This creature, examined by the microſcope, has ſeveral peculiarities worthy of obſervation. It has, like the gnat, a long proboſcis, with a ſharp dart, or two darts, ſheathed within it; the uſe of theſe darts is to penetrate the fleſh of animals, for the ſucking their blood; whereas the proboſcis can only ſerve to ſuck the dews from flowers, &c.

The eggs of this fly are laid in the waters, and there produce a very remarkable ſort of maggot. It is a brown one, of a long flatted figure, with a pencil of fine downy hairs at its tail, which is ſpread into a circular form on the ſurface of the water, while its head is ſunk down in ſearch of food. When the creature would deſcend toward the bottom, theſe hairs are made to approach one another in an oval form, and in this ſtate they incloſe a bubble of air, by means of which it is able to riſe again; and, if this bubble by any accident eſcapes, the creature immediately ſqueezes another out of its own body to ſupply its place. The ſnout of this maggot has three diviſions, whence are thruſt out three little pointed bodies, like ſerpents tongues. Theſe maggots are very common on the ſurface of ditch water, and the motion of their inteſtines is very ſingular and obſervable. *Baker on the Microſcope.*

GADD'ING, among miners, the digging the ore out of the veins with an inſtrument called a gad; which is a ſmall punch of iron with a long handle of wood. One of the miners holds the gad in his hand, directing the point to the proper place, while the others drive it into the vein with a large ſledge or hammer.

GA'DWALL, in zoology, the name of a ſpecies of duck that frequents freſh waters, and is called, in ſome parts of England, the gray. It is called anas ſtrepera by authors. It is of the ſize of the widgeon, or ſomething larger; its body is of a longiſh ſhape, and its rump black; its back is brown, but the edges of the feathers are edged with white; the front of the head, and upper part of the throat, are white, ſpotted with ſmall brown ſpecks; the head is of a bluiſh black, the throat of a greyiſh white, and towards the breaſt ſomewhat reddiſh; the upper part of the breaſt and the ſhoulders are beautifully variegated with brown, white, and black; the breaſt is white, and belly browniſh, with ſmall tranſverſe ſtreaks of black; the beak is blackiſh and yellow, and the legs are whitiſh. The female is different from the male in many reſpects, particularly it wants the blackneſs of the rump; but both the male and female are diſtinguiſhed at ſight from the other ſpecies, by having marks of three different colours one above another on their wings; theſe are white, black, and a reddiſh brown. *Ray's Ornithol.*

GALE, in botany, the name of a genus of plants, whoſe characters are:

The leaves are alternate; the male flowers are produced on pedicles from the alæ of the leaves, and diſpoſed on a ſtalk, in the form of a long ſpike; theſe flowers are naked, and adorned with ſix ſtamina, which appear like branches from them. The ovary is ſeated in another place of the ſame plant, on a much ſhorter pedicle, being lodged within a tetraphyllous caducous calyx, and ſurrounded with other male flowers; it is of a globoſe figure, here and there irregular, and containing one ſeed.

It delights in heaths and uncultivated ſoils, as well as in watery and marſhy places; and is found in great plenty in the iſle of Ely, among the marſhes, in a boggy ſoil, and in many ſuch places in the north of England, and near the town of Wareham, in Dorſetſhire. The flowers appear in May and June, and the ſeed is ripe in July and Auguſt.

Its extraordinary bitterneſs demonſtrates it to be of a drying and diſcuſſive quality; but we are told, that it is principally ſerviceable in killing and expelling worms, whether it be taken inwardly, or outwardly applied. The leaves and branches are uſed in ſummer, to adorn the windows and chimneys of chambers and parlours, for the ſake of the extraordinary ſweet ſmell diffuſed by the flowers and buds; the ſame, laid in cheſts among cloaths, not only render them ſweet-ſcented, but keep away moths. Simon Pauli tells us, that the Polanders uſed to deſtroy the lice in their ſwine by this plant; which being ſtrewed in the hog-ſties, all the lice die in the ſpace of a few hours, and the nits never come to be animated. And ſerpents are never known to ſettle, or have their neſts, in thoſe marſhes where Gale grows, or ever to approach, much leſs to creep over them. Some boil the flowers, inſtead of hops, in their beer; which, for that reaſon, affects the head, and ſoon induces ebriety. In Bergen, and other places of Norway, they commonly prepare an ointment of Gale pulverized and May butter, which is found to be very efficacious in the moſt ſtubborn itch. *Raii Hiſt. Plant.*

GALE'NA, a name given by mineraliſts to a ſpecies of poor lead ore. It was alſo the original name given by Andromachus to the theriaca, from its effect in bringing on a pleaſing calm over the blood and ſpirits on taking it.

GALENA *inanis*, in minerology, a name given by authors to a glittering ſubſtance, very much reſembling ſome of the plated ores of lead, but really containing none of that metal. It is more uſually called mock-lead and blende.

GA'LEOPSIS, *hedge-nettle*, in botany, a genus of plants, whoſe characters are:

The calyx is quinquefid and funnel-ſhaped; the upper lip, or galea, is entirely hollow; the lower lip, or beard, trifid; the middle ſegment being the greateſt.

The Galeopſis ſmells of bitumen, or fœtid oil: it has an herby taſte, a little ſaltiſh, aſtringent, and does not ſtain the blue paper; which makes us conjecture, that its ſalt participates very much of the natural ſalt of the earth, which in this plant is involved in a great deal of ſulphur, and terreſtrial parts.

It is vulnerary, and very ſweetening: an oil made of it by infuſion is excellent for burns, and for wounds of the tendinous parts. In the country, they uſe ſucceſſively the infuſion of its leaves and flowers, for a nephritice cholic, ſcrophulous tumors, and the pleuriſy. An extract may be prepared of it to ſerve during the winter. *Martyn's Tournefort.*

It has the reputation of diſcuſſing hard tumors, cancers, pani, and parotides; and is recommended againſt putrefactions, gangrenes, and ſpreading ulcers. Boerhaave eſteems it excellent in hyſteric fits.

GA'LEUS *glaucus*, the blue ſhark, a very fierce and voracious fiſh of prey. It is of a fine deep blue colour on the back, and of a bright ſilver white on the belly. The ſkin is ſmoother than that of the white ſhark, and the noſe long-pointed, and ſomewhat flatted. The noſtrils are long, and placed tranſverſly to the length of the noſe. The ſockets of the eyes are of an elliptic figure, but the eyes themſelves are exactly round, and have a membrane, which, at times, the fiſh draws over them, and there are no cavities behind the eyes. The teeth are not ſo numerous as in the white ſhark, there being only two rows of them; but theſe are very large and triangular, exactly of the ſhape of the gloſſopetræ. The tail is bifid, and one portion of it much larger than the other. It is very voracious of human fleſh, and will follow cloſe under the ſhore, if there is depth enough, and a man is walking there. It is ſometimes found on the Engliſh ſhores, and has been caught on the Cornwal coaſt. *Willoughby's Hiſt. Piſc.*

GALLI'NA *Guinea*, the Guinea hen, in zoology, the name of a ſpecies of gallinaceous fowl, of the ſize of the common hen, but with a longer neck. Its body is ſloped like that of a partridge, and its colour is all over a dark grey, very beautifully ſpotted with ſmall white ſpecks; there is a black ring round the neck; its head is reddiſh, and has on its top a hard horny protuberance, of a brown colour; it is blue under the eyes, and has a red fleſhy appendage hanging down from thence. They naturally herd together in large numbers, and breed up their young in common; the females taking care of the broods of others, as well as of their own. They breed very well with us. *Ray's Ornithology.*

GA'LLING.— Good horſes are often ſubject to gall upon their backs, and the utmoſt care ought to be taken to prevent or cure it. The beſt method of prevention is, to take a hind's ſkin, well furniſhed with hair, and fit it neatly beneath the pannel of the ſaddle, ſo that the hairy ſide may be next the horſe; this does not harden by ſweat, but keeps the horſe from Galling. This is alſo a method that ſhould never be omitted with horſes that are newly cured of ſuch a hurt, as it will prevent their falling into it again. In long journeys, and in horſes that are ſubject to gall, it is always proper to take off the ſaddle, as ſoon as the horſe is brought in, and examine whether the back be at all preſſed, or pinched in any part: it will be well to re-examine it after an hour or two, to ſee what effect the ſtanding has had; for often the part hurt will not ſhew it at firſt, but will ſwell very violently afterwards. In this caſe, where the ſkin is not fretted, but a ſwelling comes on, a bag of coarſe cloth ſhould be filled with warm dung, and tied upon the ſwelling, which will not only prevent it from growing worſe, but will take it often quite down; or the ſwelling may be well rubbed with good brandy, laying on a paper ſoaked in it. If the ſkin be broken, a mixture of red wine and ſallad oil is a good remedy.

GA'LLIUM, *cheeſe-rennet*, in botany, a genus of plants whoſe characters are: it reſembles the mollugo in every thing, only its leaves are even ſofter than thoſe of that herb.

This plant, from a long ſlender ſpreading root, ſends forth many ſquare weak ſtalks, a foot or two high, beſet at the joints with ſlender narrow leaves, about an inch long, ſet in a circle; the ſtalks of a dark green colour. On the tops of the ſtalks, as well as on the ſmaller branches, which come out of the ſides, grow thick ſpikes of ſmall, yellow, monopetalous flowers, divided into four ſegments, of a pleaſant ſmell; each of which is ſucceeded by two ſmall globular black ſeeds: it grows on banks, and dry barren places, flowering in June and July. The whole herb is uſed.

The plant is drying and incraſſating, good in ſtopping all kinds of fluxes and hæmorrhages, and for the cure of wounds: ſome commend the decoction of it for the gout; and a bath made of it is refreſhing to waſh the feet of perſons tired with over walking. In the northern countries they uſe this herb for the making their cheeſes, inſtead of rennet, whence it is called cheeſe rennet; the flowers containing an acidity, which may be got by diſtillation. This is a plant but ſeldom uſed in the ſhops.

This plant is vulnerary and deterſive; it is uſed in Catalonia for the epilepſy. The ſyrup made with the juice of its flowers is very aperitive and emmenagogic. Tabernæmontanus ſays, that the decoction of it is excellent for the dry ſcab of young children, provided you bathe them often with it. *Martyn's Tournefort.*

GALLS (*Dict.*)—The Galls cauſed by different inſects have a very different internal ſtructure; ſome of them have only one large cavity within, in which a number of the animals live in community; others have ſeveral ſmall cavities with communications between each; and others have different numbers of little cellules, each ſeparate, and having no communication with the others: there are ſometimes a hundred of theſe cellules in one Gall, ſometimes only two or three; and finally, there are others, in which there is only one cavity inhabited by one inſect. The creatures of theſe two laſt kinds live in perfect ſolitude during the worm ſtate, and can have no knowledge of any other living creature beſides themſelves, till they have paſſed through the intermediate ſtate of chryſalis, and become winged animals, like thoſe to which they owed their origin, and are ready to lay eggs themſelves. The general diviſion of Galls into theſe claſſes admits of a vaſt number of ſubdiſtinctions under each, from the different figure and conſiſtence of the ſeveral ſpecies. Some of them are ſo hard, that they equal, or exceed, the hardneſs of the wood of the tree they grow upon; and, when cut, appear compoſed of fibres, much more denſely and cloſely arranged: others are ſoft and ſpongy, and reſemble ſome of the tender fruits in appearance. The firſt kind are uſually called Gall-nuts, and the latter apple Galls, or berry Galls. The common Galls, uſed in dying, are of the firſt kind, and what are called oak-apples, and oak-grapes, are of the latter. The oak produces ſeveral of this laſt ſpecies of Galls, ſome of which are oblong, and others round, reſembling grapes, gooſeberries, and other fruits; theſe are alſo uſually beautifully coloured, ſome being of a bright red, others of a bright yellow. Theſe Galls of the oak are of the auſtere taſte of the juices of that tree; but thoſe of other plants are often well taſted. There is a ſpecies of ſage, well known by the name of apple-ſage, the leaves of which afford a lodging to the worm of a peculiar ſpecies of fly, and this Gall grows to a very conſiderable ſize, ſo as to have obtained the name of an apple from its reſemblance to this fruit; theſe are eaten by the people of the eaſtern nations, and are commonly ſold in the markets of Conſtantinople, and other places. A plant very common with us, the ground-ivy, has the ſame property: its leaves are often loaded with Galls on their under ſide, which are very green and juicy, and of no diſagreeable taſte. Mr. Reaumur gives us an account of their being one year ſo plentiful in the neighbourhood of Paris, that the poor people eat them both raw and boiled as food. *Reaumur's Hiſt. Inſ.*

Box GALLS, in natural hiſtory, the name given by authors to a very ſingular kind of Galls, of a conic figure, with a conic top, or cover reſembling a wooden box, and incloſing a white worm, in the manner of the other vegetable lodgements of the ſame kind; this ſort of Gall is found only on the leaves of the lime-tree. It is common to obſerve the leaves of this tree, in the month of July, to be pierced through with ſeveral round holes of about a tenth of an inch in diameter, and as exactly circular, as if a round piece of the leaf had been taken out in each place by an inſtrument. Mr. Reaumur, to whom the world owes the diſcovery of this ſingular ſpecies of Gall, was led to the obſerving it by meeting with leaves thus pierced; and then examining others, till he found ſome which had on them the box Galls, which give origin to theſe holes.

Bramble GALLS, a ſpecies of Galls found on the branches of the common wild bramble. Theſe are often no other than tumefactions of the ſtalk, for the ſpace of an inch, or thereabout; which ſometimes form only ſo many thick cylindric pieces; at other times they are of the ſhape of an olive, and ſometimes they affect only one ſide of the branch: in all caſes, however, the tumid part, or Gall, is much harder than the other parts of the branch, which are in their natural ſtate. Theſe Galls are very common in June and July, and in the other ſummer months, and, when cut, either longitudinally or tranſverſly, they are found to be inhabited by a great number of worms of an oblong figure, and yellow colour; theſe live in the interſtices, which they make between the woody fibres, and theſe interſtices they alſo make themſelves, by eating away the ſubſtance of the wood; for, if the Galls are opened when old, they are found to have a large cavity filled with the fragments of the woody fibres, which the worms have eat to pieces; and there are uſually twenty or thirty worms in every Gall.

GALL-*inſects*, in natural hiſtory, the name of a claſs of inſects, ſo called, from their reſemblance to ſmall Galls, or vegetable protuberances of a like kind upon trees. They are indeed ſo like theſe ſubſtances, as to have been by many miſtaken for them, and thought not of the animal, but of the vegetable kingdom. Theſe inſects paſs a very great part of their lives, even many months together, faſtened againſt the leaves or ſtalks of plants, without any appearance of life or motion; and this is the time in which they acquire their ſtated growth. They are in this ſtate as immoveable as the branch they are fixed on, and ſeem to make a part of it. Their exterior form is remarkably plain and ſimple, and, the more the creature increaſes in growth, the leſs appearance of life it ſhews; and, even when it has acquired its maturity, and is in a condition to depoſit its eggs, for the propagation of its ſpecies, it then appears leaſt of all of an animal form, and more, than in any other ſtate, reſembles a Gall, or ſuch vegetable protuberance. Not only the vulgar and incurious have been deceived by this appearance, but the accurate Count Marſigli, among others, after very attentively examining the Gall-inſects of one ſpecies, remained ſeemingly convinced that they were real vegetable excreſcences.

The Gall-inſects are uſually found on the ſtalks and branches of trees, ſhrubs, and perennial plants. There are ſo far from being particular trees or plants allotted for their production, that very few are without them, and even the ſame ſpecies are found on very different ſpecies of vegetables. The figures and colours of theſe animals enable us to diſtinguiſh ſeveral diſtinct kinds of them; they are all very ſmall, even at their full growth, and ſome of them, in their perfect ſtate, reſemble little round balls, faſtened to the branches of trees, &c. by a very ſmall part of their ſurface. Of theſe round ones, ſome ſpecies never arrive at a ſize beyond that of a pepper-corn; others acquire that of a large pea; other ſpecies of them are of the figure of a ſphere, part of which has been cut off, and theſe are fixed on the trees by the part ſeemingly cut; others are of the figure of elongated ſpheres, the greater axis of which is raiſed above the branch; others are ſomewhat flatted, and more pointed at one end than at the other; others are of the figure of a kidney, and theſe are fixed by the part where the cavity is; others reſemble, in figure, the half of an oblong ſpheroide, and theſe alone furniſh a large number; theſe are divided, as it were, along their larger axis, and have ſome ſort of reſemblance to a boat turned upſide down.

GA'LLOWS *of a plough*, a name given by our common farmers to a part of the common plough, from its reſembling a gallows made for the execution of malefactors, in its form; being compoſed of three pieces of timber, one placed tranſverſely over the heads of the other two. The Gallows are a part of the plough-head; they are fixed into the box of the plough, or that part through which the axis of the wheels paſſes. They make an angle with the box inclining upwards. The upper, or tranſverſe ſpecies, is notched in ſeveral places, and ſerves to ſuſtain the wilds, a pair of irons, to which a ring and hooks are faſtened, and to theſe the chains of the harneſs, by which the whole plough is drawn along.

In ſome other parts of England they call this whole part of the plough the three pieces, being iron inſtead of timber, by the name of the wilds; and the Gallows of the plough is then the tranſverſe piece at the top of the crow-ſtaves. *Tull's Huſbandry.*

GA'LLY-*worm*, in zoology, an inſect known by moſt writers under the name of iulus. It is a land inſect, with a long body, compoſed of a great number of rings, and furniſhed with a great number of feet. It is found very frequently in gardens, and, when touched, has the power of rolling itſelf up into a ball. *Ray's Hiſt. Inſ.*

GAME-*cock*.— The beſt ſeaſon for the breeding the Game-cock is, from the beginning of February to the middle or latter end of March; the neſt for the hen is to be made of ſweet and clean ſtraw, and ſhould be placed in ſome warm corner, out of the way of diſturbance from other fowls; for this ſort of interruption provokes this quarrelſome bird in ſuch a manner, as to endanger the eggs. That ſhe may never have occaſion to leave the neſt, and cool her eggs, it will be proper to lay all ſorts of food, that ſhe is likely to approve of, before her; and to put clean water every day, not only for her to drink, but to waſh and trim herſelf in; ſome aſhes, ſand, and gravel ſhould alſo be ſifted on about the neſt. The chickens are hatched in about three weeks, and the neſt is to be carefully watched about this time, for there are always ſome of the chickens hatched before the others; theſe ſhould be taken away, as ſoon as out of the ſhell, and laid before the fire, or in ſome warm place in wool, and, as ſoon as the reſt are hatched, theſe ſhould be given back to the hen: they are not to be ſuffered to go abroad for the firſt fortnight, and the room they are kept in muſt be boarded, all other floors being too cold and too moiſt. At about a month old the chickens may be turned out into a walk of ſome freſh graſs, that they may feed at liberty, and eat worms and other inſects; but there muſt be no puddle of water in the place, for they are apt to get into ſuch, and it occaſions them a number of diſeaſes. As ſoon as the comb and wattles appear on the cocks, they muſt be cut away, and the ſore place anointed with freſh butter till it is well. The chickens may all be ſuffered to run together till they begin to peck one another, then the cocks are to be ſeparated; each muſt have his particular walk, and, the more free from diſturbance this is, the better. The place of feeding them muſt either be a boarded floor, or a very ſoft and dry piece of ground. If the place be hard, as a ſtony pavement, or a plaiſtered floor, the taking up their food will injure and blunt their beaks, ſo that they will never be able to hold faſt afterwards. Any white corn is good for the Game-cock in his walks, and ſo is a white bread toaſt ſteeped in ale; at times, this may be given him ſteeped in urine, which will ſerve to ſcour and cool him very well. There never ſhould be more than three hens allowed to one cock in his walk, for, if there are more, he will conſume his ſtrength in the treading; and, though his courage may not fail, yet he will never have the ability to go through a battle. Care is to be taken alſo of his rooſting-place, that the perch be not too ſmall in the gripe, and be ſo placed, that he may ſit on it without ſtraddling; if the perch be crooked, it is alſo very diſadvantageous, for it will accuſtom the cock to ſuch an uneven diſpoſition of his feet, that he will be no good ſtriker in the battle. The beſt method of contriving the rooſting-place is, to have a row of ſhort perches, about eight inches long, and the loweſt ten inches from the ground, that he may aſcend with more eaſe, and, when he is come to the rooſting-perch, be conſtrained to ſit with his legs cloſe together. A cock, bred in this manner, may be fought young, but the beſt method is, not to hazard a battle till he is ſomewhat more than two years old.

GA'NET, in zoology, the name uſed in Cornwal, and ſome other parts of England, for a large ſpecies of larus, or ſcalpel, called by authors cataractes. It is one of the largeſt birds of the larus kind, being larger than the common duck. Its beak is ſtronger, ſhorter, and more crooked than that of any other bird of this kind; it is web-footed, but has the ſtrongeſt and ſharpeſt claws of all the birds of that kind: its back is of a duſky, browniſh, ferrugineous grey, like that of the buzzard; its belly and breaſt are paler, but of the ſame dye, and its long wing feathers are black; its tail alſo is all black. It is a very bold and voracious bird; it follows the ſhoals of pilchards and other fiſh, and picks up vaſt numbers of them. It is very common in the weſtern coaſts of England. *Ray's Ornithology.*

GA'NGRENE (*Dict.*)— The following medicines are, by Heiſter, recommended for the ſeveral intentions of a cure in a Gangrene.

A fomentation which digeſts, ſtimulates, and reſiſts putrefaction.

Take of quick-lime-water, one pint; of camphorated ſpirit of wine, three ounces; and of the ſpirit of ſal ammoniac, half an ounce; mix all together.

Let this preparation be frequently applied warm, with proper compreſſes: the ſame intention is alſo excellently anſwered by a pint of quick-lime-water, mixed with an ounce of mercurius dulcis. Heiſter tells us, that, in the hoſpital of Amſterdam, the ſurgeons, with great ſucceſs, uſe the following fomentation againſt a Gangrene:

Take, of the ſpirit of wine, three ounces; of the powders of aloes and myrrh, each half an ounce; and of Egyptian ointment, three ounces: mix all together.

Or ſpirit of wine, gently boiled with aloes, myrrh, and ſaffron; or camphorated ſpirit of wine, mixed with Venice treacle; or the ſpiritus theriacalis, or the ſpiritus matricalis, mixed with about a ſixth part of elixir proprietatis; or, what Garengeot ſo much extols, warm wine, mixed with ſimple or camphorated ſpirit of wine, either by itſelf, or quickened with ſal ammoniac; which he recommends as a highly efficacious medicine for reviving the gangrenous parts.

Or take of leaves of ſcordium, ſouthernwood, and recent rue, each two handfuls; of chamomile flowers, one handful: boil in a ſufficient quantity of common water, ſtrain off the liquor, and, to every two pints of it, add, of the ſpiritus vini theriacalis, four ounces; of Venice ſoap, two ounces; and of ſal gemmæ, half an ounce.

Theſe fomentations are to be applied frequently every day, with linen or woollen cloths; applying over them, in order to preſerve the heat, folded cloths and heated bricks.

A penetrating, reſolvent, and digeſtive cataplaſm, for reſtoring the circulation of the blood in the affected part, may be prepared in the following manner:

Take of the herbs ſcordium, mallows, wormwood, and feverſew, each two handfuls; of mint and ſouthernwood, each one handful.

Boil theſe in a ſufficient quantity of oxycrate, in a cloſe veſſel, to the conſiſtence of a cataplaſm; to which add, of ſal ammoniac, half an ounce; of the meal of linſeed, two ounces; of the oil of rue, or chamomile, by infuſion, an ounce and an half: and, before the cataplaſm is applied, let it always be ſprinkled with camphorated ſpirit of wine, or the ſpiritus vini theriacalis, in order to render it more efficacious: or, inſtead of this, the following cataplaſm, recommended by Koenerdingius, may be uſed:

Take of the crums of wheaten bread, one pound; of the powders of wormwood, ſcordium, and rue, each one handful; of wine, a quantity ſufficient to reduce them to the conſiſtence of a cataplaſm: after gentle boiling, add four ounces of the ſpirit of wine, and apply warm.

A fomentation for ſtopping the ſpreading of a Gangrene may be prepared in the following manner:

Take of the decoction of barley, or ſcordium, one pint; of the vinegar of rue, ſix ounces; of the ſpiritus vini theriacalis, four ounces; of ſea-ſalt, one or two ounces: to be applied warm with compreſſes.

A cataplaſm for ſoftening the gangrenous cruſt, and promoting its ſeparation, may be prepared in the following manner:

Take of the flowers of ſcordium, two handfuls: and of the leaves of mallows, henbane, and marſhmallows, each one handful; and of the flowers of lavender, half a handful: boil in vinegar, or oxycrate, to the conſiſtence of a cataplaſm: to which add, of the meal of linſeed, three ounces; of the oil of linſeed, one ounce; and of ſal ammoniac, two ounces.

If, in any ſtage of the diſorder, the uſe of corroſives ſhould be indicated, the celebrated Belloſte orders the following preparation, as the moſt efficacious of all others:

Take of the ſpirit of nitre, or of aqua-fortis, two parts; and of quick-ſilver, one part: mix over a gentle heat, till the mercury is diſſolved.

With this corroſive liquor, the mortified part is to be anointed, or a little lint, or a linen cloth ſoaked in it, is to be applied to the corrupted part; for, by this means, the mortified parts will ſoon be divided from ſuch as are ſound and alive. *Heiſter's Chirurgery.*

GA'RBOARD-*ſtrake*, in a ſhip, is the firſt ſeam next to the keel.

GARBOARD-*plank*, in a ſhip, the firſt plank faſtened on the keel.

GA'RDEN (*Dict.*)— In a garden, the principal things to be conſidered, are, 1. The ſituation; 2. The ſoil, aſpect, or expoſure; 3. Water; 4. Proſpect.

1. Situation: this ought to be ſuch a one as is wholeſome, in a place that is neither too high nor too low; for, if a garden be too high, it will be expoſed to the winds, which are very prejudicial to trees; if it be too low, the dampneſs, and the vermin, and venomous creatures, that breed in ponds, add much to their inſalubrity.

A ſituation on a riſing ground, or on the ſide of an hill, is the moſt happy; eſpecially if the ground be not too ſteep; if the ſlope be eaſy, and in a manner imperceptible; if a good deal of level may be had near the houſe; and if it abounds with ſprings of water; for, being ſheltered from the fury of the winds, and the violent heat of the ſun, a temperate air will be there enjoyed; and the water that deſcends from the top of the hills, either from ſprings or rain, will not only ſupply fountains, canals, and caſcades, for ornament; but, when it has performed its office, will water the adjacent valleys, and render them fertile and wholeſome, if it be not ſuffered to ſtagnate in them.

Indeed, if the declivity of the hill be too ſteep, and if the water be too abundant, a garden on the ſide of it may often ſuffer, by having the trees torn up by the torrents and floods; and the earth above tumbling down, the walls may be demoliſhed, and the walks ſpoiled.

It cannot, however, be denied, that the ſituation on a plain, or flat, has ſeveral advantages that the higher ſituation has not: floods and rains make no ſpoil; there is a continued proſpect of champaigns, interſected by rivers, ponds, and brooks, meadows, and hills, covered with buildings or woods; and the level ſurface is leſs tireſome to walk on, and leſs chargeable, than that on the ſide of an hill; the terrace walks are not neceſſary: but the greateſt diſadvantage of flat gardens is, the want of an extenſive proſpect, which riſing grounds afford.

2. The ſecond thing to be conſidered in chuſing a plat for a garden, is a good earth or ſoil.

It is ſcarce poſſible to make a fine garden in a bad ſoil: there are indeed ways to meliorate ground, but they are very expenſive; and ſometimes, when the expence has been beſtowed of laying good earth three feet deep over the whole ſurface, a whole Garden has been ruined, notwithſtanding the expoſure has been ſoutherly and healthful, when the roots of the tree have come to reach the natural bottom.

To judge of the quality of the ſoil, obſerve whether there be any heath, thiſtles, or ſuch-like weeds, growing ſpontaneouſly in it; for they are certain ſigns, that the ground is poor. Likewiſe, if there be large trees growing thereabouts, obſerve whether they grow crooked, ill-ſhaped, and grubby, of a faded green, and full of moſs, or infeſted with vermin; if ſo, the place is to be rejected: but, on the contrary, if it be covered with good graſs fit for paſture, then you may be encouraged to try the depth of the ſoil.

To know this, dig holes in ſeveral places, ſix feet wide, and four feet deep: if you find three feet of good earth, it will do well; but leſs than two will not be ſufficient.

The quality of good ground is, neither to be ſtony, nor too hard to work; neither too dry, nor too moiſt; nor too ſandy and light; nor too ſtrong and clayey, which is the worſt of all for Gardens.

3. The third requiſite is water. The want of this is one of the greateſt inconveniencies that can attend a Garden, and will bring a certain mortality upon whatever is planted in it; eſpecially in the greater droughts that often happen in an hot and dry ſituation, in ſummer; beſides the uſefulneſs of it in fine Gardens, for making jets d'eau, canals, caſcades, &c. which are the greateſt ornaments of a Garden.

4. The fourth thing required in a good ſituation is, the view and proſpect of a fine country; and, though this is not ſo abſolutely neceſſary as water, yet it is one of the moſt agreeable beauties of a fine Garden; beſides, if a Garden be planted in a low place, that is buried, as I may ſay, and has no kind of proſpect, it will be not only diſagreeable, but unwholeſome, by being too much ſhaded and obſcured; as the trees will rather retain inſalubrious damps, than communicate the refreſhing air, that is ſo purifying to vegetable nature.

In ſhort, a Garden neceſſarily requires, beſides the care of the gardener, the ſun, a good ſoil, a full, or, at leaſt, an open proſpect, and water; the laſt, above all, and it would be egregious folly to plant a Garden where any of theſe are wanting.

In a fine Garden, the firſt thing that ſhould preſent itſelf to the ſight, ſhould be an open lawn of graſs, which, in ſize, ſhould be proportionable to the Garden: in a large Garden, it ſhould not be leſs than ſix or eight acres; but, in middling or ſmall Gardens, the width of it ſhould be conſiderably more than the front of the houſe; and, if the depth be one half more than the width, it will have a better effect. The figure of this lawn need not be regular; and if, on the ſides, there are trees planted irregularly, by way of open grove, ſome of which may be planted forwarder upon the lawn than others; whereby the regularity of the lawn will be broken; it will render it more like nature; the beauties of which ſhould always be ſtudied in the laying out and planting of Gardens; for, the nearer theſe Gardens approach to nature, the longer they will pleaſe: for what is a Garden but a natural ſpot of ground, dreſſed, and properly ornamented? There are thoſe who have erred in copying of what they call nature, as much as thoſe who have drawn a whole Garden into ſtraight lines, great alleys, ſtars, &c. by bringing the roughеſt and moſt deformed part of nature into their compoſitions of Gardens: as, for inſtance, where the ground has been naturally level, they have, at great expence, made hollows and raiſed mole-hills; ſo that the turf has been rendered not only more unpleaſant to walk upon, but much worſe to keep: and, after all the pains that have been taken to ape nature, the whole is as eaſy diſcovered to be the work of art, as the ſtiffeſt ſlopes, and the moſt finiſhed parterres.

The great art of laying out of Gardens is, to adapt the ſeveral parts to the natural poſition of the ground, ſo as to have as little earth to remove as poſſible: for this is often one of the greateſt expences in making of Gardens; and it may with truth be affirmed, that, wherever this has been practiſed, nine times in ten, it has proved for the worſe: ſo that, if inſtead of levelling hills, to form large terraces, ſtiff ſlopes, and even parterres, as has been too often practiſed; or the ſinking of hollows, and raiſing of hills, as hath by others been done; the ſurface of the ground had only been ſmoothed, and well turfed, it would have had a much better effect, and been more generally approved than the greateſt number of theſe Gardens, which have been made with an infinite expence both of time and money.

The next thing to be obſerved is, to contrive a dry walk, which ſhould lead quite round the whole garden: for, as Gardens are deſigned to promote the exerciſe of walking, the greater the extent of this dry walk, the better it will anſwer the intent; ſince in bad weather, or in dewy mornings and evenings, when the fields are unpleaſant, or unſafe to walk over, theſe dry walks in Gardens become uſeful and pleaſant: and ſuch walks, if laid either with gravel or ſand, may lead through the different plantations, gently winding about in an eaſy natural way; which will be more agreeable than thoſe long ſtraight walks, which are too frequently ſeen in Gardens.

Another thing abſolutely neceſſary is, where the boundaries of the Garden are fenced with walls or pales, they ſhould be hid by plantations of flowering ſhrubs, intermixed with laurels, and ſome other ever-greens, which will have a good effect; and at the ſame time conceal the fences, which are diſagreeable, when left naked and expoſed to the ſight.

In ſituations where there is a good ſupply of water, the deſigner has room for adding one of the greateſt beauties to the Garden, eſpecially if it will admit of a conſtant ſtream: for, in ſuch places, if the water is properly conducted through the Garden, it will afford infinite pleaſure: for, although theſe ſtreams may not be ſufficient to ſupply a large ſurface, yet, if theſe narrow rivulets are judiciouſly led about the Garden, they will have a better effect than many of the large ſtagnating ponds or canals, ſo frequently made in large Gardens: for where theſe pieces of water are large, if the boundaries can be ſeen from one point of view, they cannot be eſteemed by perſons of judgment; and frequently theſe ſtanding waters are brought ſo near the houſe, as to render the air damp and unhealthy; and many times they are ſo ſituated, as to occaſion this inconvenience, and, at the ſame time, are not ſeen to any advantage from the houſe.

Where wilderneſſes are intended, theſe ſhould not be cut into ſtars and other ridiculous figures; nor formed into mazes or labyrinths, which in a great deſign is trifling: but the walks ſhould be noble, and ſhaded with tall trees; and the ſpaces of the quarters planted with flowering ſhrubs and ever-greens; whereby they will be rendered pleaſant at all ſeaſons of the year: and, if there are hardy ſorts of flowers, which will thrive with little care, ſcattered about near the ſides of the walls, they will have a very good effect, in making a variety of natural beauties almoſt through the year.

The ſituation of theſe wilderneſſes ſhould not be too near the houſe, leſt they ſhould occaſion damps; therefore it is much better to contrive ſome open groves, through which there may be a communication, under ſhade, from the houſe to theſe wilderneſſes; which are much the beſt when they are planted at the fartheſt part of the Gardens, provided they do not obſtruct the view of fine objects.

Fountains are alſo very ornamental to a Garden, if they are magnificently built, and where a conſtant ſupply of water can be obtained: but, if they are meanly erected, or have not water to keep them conſtantly running, they ſhould never be introduced into Gardens; for nothing can be more ridiculous than to ſee a dry fountain, which, perhaps, at a great expence, may have water forced up, to ſupply it for an hour or two, and no more; and this, perhaps, not in dry ſeaſons, when there is a general ſcarcity of water.

When trees have been long growing in a Garden, nothing can be more diſagreeable than to have them deſtroyed, to alter the Garden according to the faſhion of the time; becauſe it requires much time to bring up trees to ſuch height as to afford ſhade and ſhelter: and, as time is precious, ſo, where the diſpoſition of the Garden is altered, there ſhould be great attention given to the preſervation of all the good trees, wherever they can be either uſeful or ornamental.

There is another eſſential part of Gardening, which cannot be too much conſidered by perſons who deſign Gardens; which is that of adapting the ſeveral ſorts of trees and ſhrubs to the ſituation and ſoil of the garden; as alſo to allow the trees a proper ſhare of room: but, however neceſſary this will appear, yet very few perſons have made this their ſtudy: inſomuch that, when one views many modern gardens, and ſees the great number of trees and ſhrubs, which are crouded into them, one would be induced to believe, that private intereſt has had a greater influence, than any other motive, with the deſigners. Indeed this fault may often be aſcribed to the maſter, who perhaps is too much in haſte for ſhade and ſhelter; ſo will have three or four times the number of trees and ſhrubs planted, as ſhould have been; or that can remain long without injury, where the plantations ſucceed: and to this over haſte are owing the miſerable plantations of large trees, ſo often ſeen in gardens and parks; where trees of all ſorts, and of any age, are taken out of woods, hedge-rows, &c. and removed at a great expence to ſtand and decay annually, till they become ſo many dead ſticks, than which nothing can be a more diſagreeable ſight to the owner, who, after an expectation for ſeveral years, attended with an expence of watering, digging, and cleaning, finds himſelf under a neceſſity either of replanting, or giving up the thoughts of having any. Numbers of perſons have indeed amuſed themſelves with the hopes of ſucceſs, by ſeeing theſe new planted trees put out branches for a year or two which they generally do; but in three or four years after, inſtead of making a progreſs, they decay at the top, and continue ſo to do gradually, until they quite periſh; which perhaps may not happen in eight or ten years, eſpecially if no ſevere winter, or very dry ſummer, intervenes: either of which generally proves fatal to theſe plantations; ſo that perſons may be led on with hopes, for ſo many years, in the beſt part of their lives, when there is a certainty of their falling, or at leaſt of their never increaſing in ſize. *Miller's Gard. Dict.*

GA'RNET, aboard a ſhip, is a tackle having a pendant coming from the head of the main-maſt, with a block ſtrongly fixed to the main-ſtay juſt over the hatch-way, in which block is reeved the runner, which hath an hook at one end, in which are hitched the ſlings; and at the other end is a double block, in which the fall of the runner is received; ſo that by its means any goods, or caſks, that are not over heavy, may be haled and hoiſed into, or out of the ſhip; when this Garnet is not uſed, it is faſtened along by the ſtay at the bottom of it.

Garnet *colour.* To give this colour to glaſs, the workmen take the following method: they take equal quantities of cryſtal and rochetta frit, and to every hundred weight of this mixture they add a pound of manganeſe, and an ounce of prepared zaffer; theſe are to be powdered ſeparately, then mixed and added by degrees to the frit while in the furnace: great care is to taken to mix the manganeſe and zaffer very perfectly, and, when the matter has ſtood twenty-four hours in fuſion, it may be worked. *Neri's Art of Glaſs.*

Garnet *paſte.* The making the counterfeit Garnet in paſte is done in three different proportions of the ingredients, which are theſe:

Take prepared cryſtal two ounces, common red lead ſix ounces, manganeſe ſixteen grains, zaffer three grains; mix all well together, and put them into a crucible, cover it with a lute, and ſet it in a potter's kiln for twenty-four hours.

Or take cryſtal two ounces, minium five ounces and a half, manganeſe fifteen grains, zaffer four grains; mix them well together, and leave room for their ſwelling in the pot; bake them twenty-four hours in a potter's kiln.

The laſt method is this: take cryſtal prepared two ounces, minium five ounces, mix them, and add manganeſe fifty-two grains, zaffer ſix grains; mix them well together, and let all be baked, in a pot well luted, in a potter's kiln for twenty-four hours.

The firſt of theſe makes a very handſome Garnet of the common tinge; the ſecond a deep one with ſomething of a violet tinge, as many of the natural Garnets have; but the third makes infinitely the fineſt and brighteſt. *Neri's Art of Glaſs.*

GAVO'TTA, or **Gavotte**, in the Italian muſic, is a kind of dance, the air whereof has two ſtrains, briſk and lively, and in common time; each of its ſtrains are played twice over; the firſt has uſually four or eight bars, and the ſecond contains eight, twelve, or more. The time begins with a minim, or two crotchets, or notes of equal value, and the hand riſing; and ends with the fall of the hand upon the dominant, or mediant of the mode; never upon the final, unleſs it be a rondeau. And the laſt begins with the riſe of the hand, and ends with the fall upon the final of the mode. *Breſſ. Dict. Muſ.*

Tempo di **Gavotta**, in the Italian muſic, is when only the time or movement of a Gavotta is imitated, without any regard had to the meaſure or number of bars, or ſtrains. We often find parts of ſonnatas, which have this phraſe to regulate their motion. *Breſſ. Muſ. Dict.*

GAZE'LLA, in natural hiſtory; ſee Antilope.

GE'BERRS, the name of a ſect in Perſia, who worſhip the everlaſting fire, near Baku. See *Everlaſting* Fire.

Zoroaſter, the founder of this religion, appeared about the year of the world 2860. This great philoſopher was ſtruck with the demonſtrations of that ſelf exiſtent being, who is the author of all good. Being at a loſs how to account for the introduction of evil into the world, he imagined there were two principles; one the cauſe of all good, which he repreſented by light; and the other the cauſe of all evil, which he figured to himſelf by darkneſs. He conſidered light as the moſt perfect ſymbol of true wiſdom and intellectual endowment, and darkneſs the repreſentative of things hurtful and deſtructive. From hence he was called to inculcate an abhorrence of all images, and to teach his followers to worſhip God only, under the form of fire; conſidering the brightneſs, activity, purity, and incorruptibility of that element, as bearing the moſt perfect reſemblance to the nature of the good Deity. For the ſame reaſon the Perſians ſhewed a particular veneration to the ſun, which was founded on their belief, that it is the nobleſt creature in the whole world, and that the throne of the Almighty is ſeated in it. This good principle which they acknowledge to be the omnipotent creator and preſerver of all things, they called Yezad, and alſo Ormuzd, which ſignify ſupreme. The evil principle they ſtiled Ahariman, i. e. the devil. Some have aſſerted that the antient Perſians held a co-eternity of theſe two principles; but others, who ſeem better acquainted with the true tenets of this religion, agree that Ormuzd, according to the Perſian mythology, firſt ſubſiſted alone; that by him both light and darkneſs were created; and that Ahariman was created, or rather aroſe from darkneſs. In the compoſition of this world good and evil being thus mixed together, they believed they would continue to the end of all things, when each ſhould be ſeparated and reduced to its own ſphere.

The antient Perſians erected no temples, but offered their ſacrifices in the open air, and generally on the top of a hill; for they eſteemed it injurious to the majeſty of the God of heaven, to ſhut up in walls him to whom all things are open, whom the world cannot contain, who fills immenſity by his preſence, and to whom the whole earth, with regard to man, ſhould be eſteemed as an houſe or temple.

Between the beginning of the reign of Cyrus the Great and the end of that of Darius the ſon of Hyſtaſpis, being about 600 years after the firſt Zoroaſter, another philoſopher of the ſame name aroſe. He undertook to reform ſome articles in the antient religion: he taught that there is one ſupreme, independent, and ſelf-exiſtent being. That under him there are two angels, the one of light, who is the author of all good, and the other of darkneſs who is the author of all evil. That theſe two by a mixture of light and darkneſs made all things which are. That they are in a perpetual ſtruggle with each other; where the angel of light prevails, there good reigns; and, where the angel of darkneſs, there evil predominates. That this ſtruggle ſhall laſt till the end of the world, when there will be a day of judgment, in which all ſhall receive a juſt retribution according to their works: after which the angel of darkneſs and his followers ſhall be caſt into a world of their own, where they ſhall ſuffer for their evil deeds in darkneſs, which to all eternity ſhall be ſeparated from the light. But thoſe who cheriſhed and cultivated their ſpiritual nature, and obeyed the angel of light, ſhall go with him into a world, where, amidſt everlaſting brightneſs and triumphant glory, they ſhall receive the rewards due to their good deeds. This laſt Zoroaſter, contrary to his great predeceſſor, cauſed temples to be built, in which the ſacred fires were ordered to be conſtantly preſerved.

Theſe opinions, with a few alterations, are ſtill maintained by ſome of the poſterity of the ancient Indians and Perſians, who are called Geberrs or gaurs, and are very zealous in preſerving the religion of their anceſtors, particularly in regard to their veneration for the element of fire.

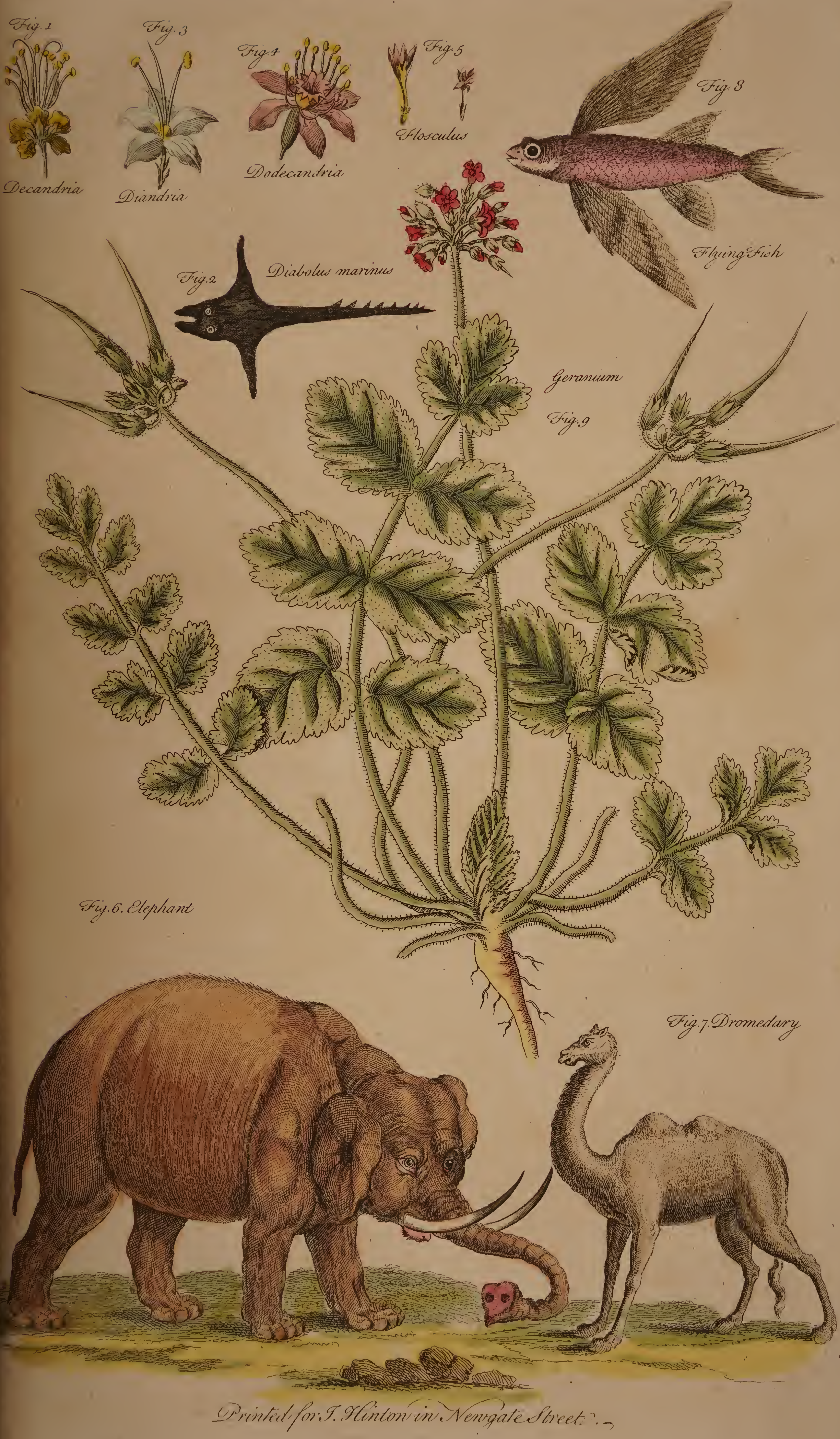
GENE'RICAL *Name*, in natural hiſtory, the word uſed to ſignify all the ſpecies of natural bodies, which agree in certain eſſential and peculiar characters, and therefore all of the ſame family or kind; ſo that the word, under the Generical name, equally expreſſes every one of them, and ſome other words expreſſive of the peculiar qualities or figures of each are added, in order to denote them ſingly, and make up what is called the ſpecific name.

Thus the word roſa, or roſe, is the Generical name of the whole ſeries of flowers of that kind, which are diſtinguiſhed by the ſpecific names of the red roſe, the white roſe, the apple roſe, &c. The ignorance of former ages in the true principles of natural hiſtory has occaſioned the bodies, which are the objects of it, to be arranged into very unnatural ſeries under the name of genera; and theſe have been called by names as improper, as the characters they were diſtinguiſhed by. Linnæus has done a great deal in the exploding the bad Generical names in botany, and Artedi has applied his rules about the formation of theſe names, with very little difference, to the ſubjects of ichthyology.

Many of the Generical names of fiſhes, till the time of this author, were ſo barbarous and obſcure, that it was not eaſy to trace them to their original, or to find whether they were truly Teutonic, Engliſh, Dutch, Swediſh, French, Italian, Spaniſh, Portugueſe, Latin or Indian. The ignorance of the writers on theſe ſubjects, or their too ſcrupulous adherence to the cuſtoms of their predeceſſors, ſeem to have been principally the cauſes of this, and often an entire negligence. Artedi's rules for Generical names for fiſhes are theſe: whatever fiſhes there are which agree in the ſame Generical characters, and are properly of the ſame genus; theſe ought all to be called by the ſame Generical name, their differences being only expreſſed by ſpecific ones. This appears ſo plain, ſo juſt, and ſo neceſſary a rule, that it is almoſt a ſhame to lay it down; yet the writers on fiſhes, till the time of this author, had very ſeldom kept up to it: but, in many different parts of their works, fiſhes of the ſame genus were found deſcribed under different Generical names, and in the other parts, on the contrary. The greateſt confuſion imaginable was brought on by the deſcribing fiſhes of really and truly diſtinct genera under the ſame Generical name. Thus the alburnus, the barbus, bubulca, brama, capito, caraſſius, carpa, erythrophthalmus, fundulus, gobius, griſlagine, leuſiſcus, mugil, naſus, orſus, phoxinus, pigus, rutilus, ſqualus, tinca, and varius, are all uſed as ſo many diſtinct Generical names; yet they are all the names of the different ſpecies of only one genus, the cyprini. In the ſame manner, the agonus, alauſa, celerinus, and chalcis, the encraſicholus, harengus, lycoſtomus, pilchardus, ſardanus, ſprattus, ſparlingus, thriſſa, &c. are a parcel of barbarous names uſed as diſtinct Generical terms; yet the fiſhes they are applied to, are all ſpecies of the ſame genus, viz. the clypeæ. Numerous other inſtances of this kind might be brought.

On the other hand, fiſhes of the moſt different genera have been confounded under the ſame Generical name: thus we have two fiſhes deſcribed under the ſame name tinca, as if of the ſame genus, but diſtinguiſhed by the ſpecific additions of their places of abode; the one called tinca lacuſtris, and the other tinca marina. The firſt of them is truly a ſpecies of cyprinus, and the other a ſpecies of as different a genus as can be well conceived.

PLATE XXII. *Engraved for the Supplement.* *Facing* Geranium.



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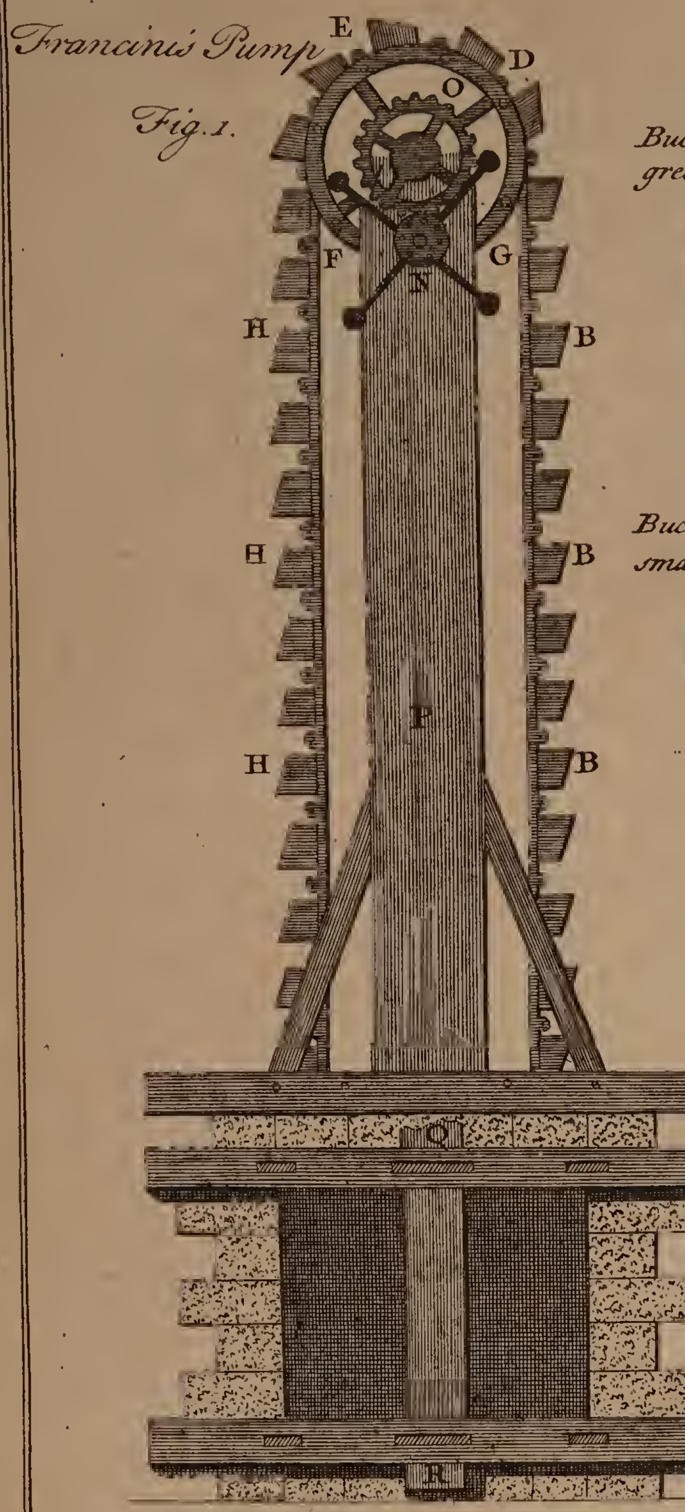
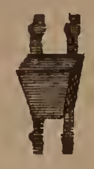
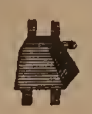
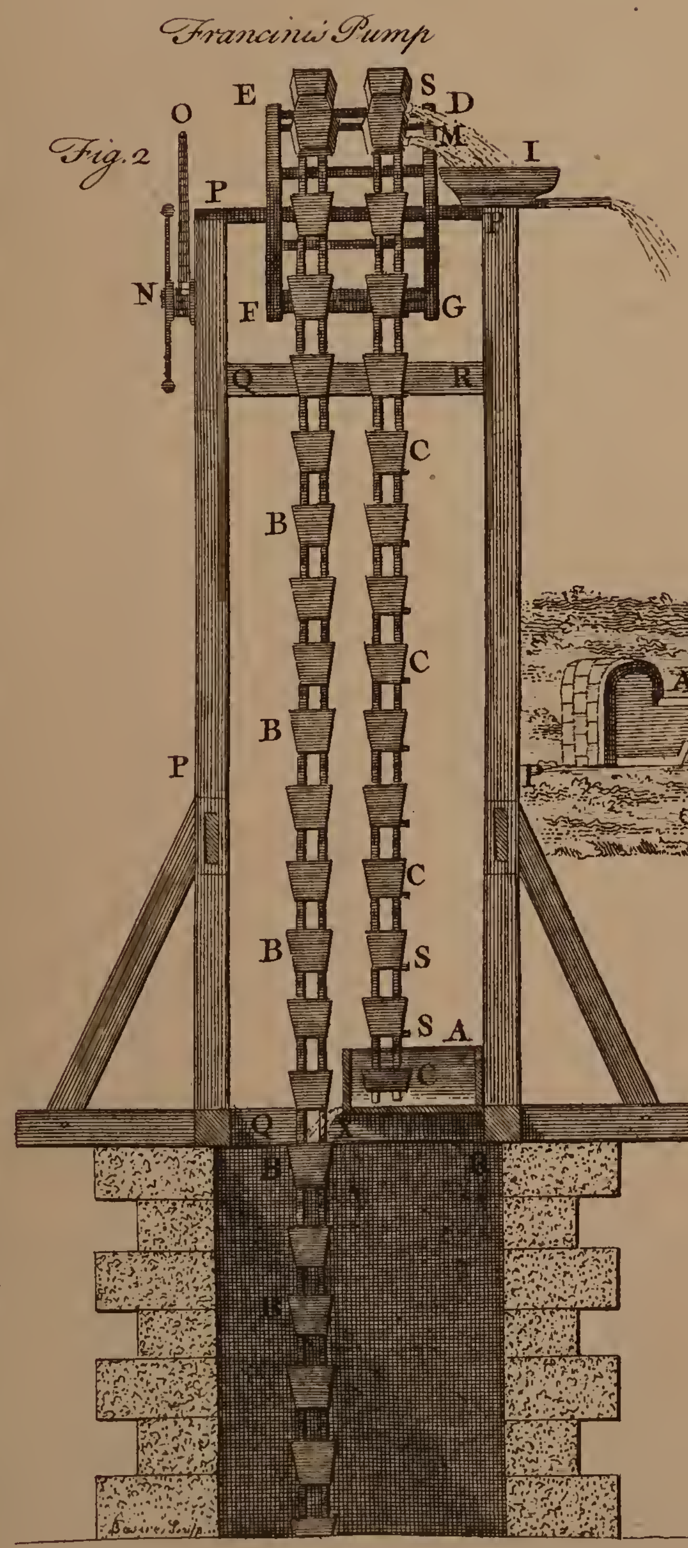
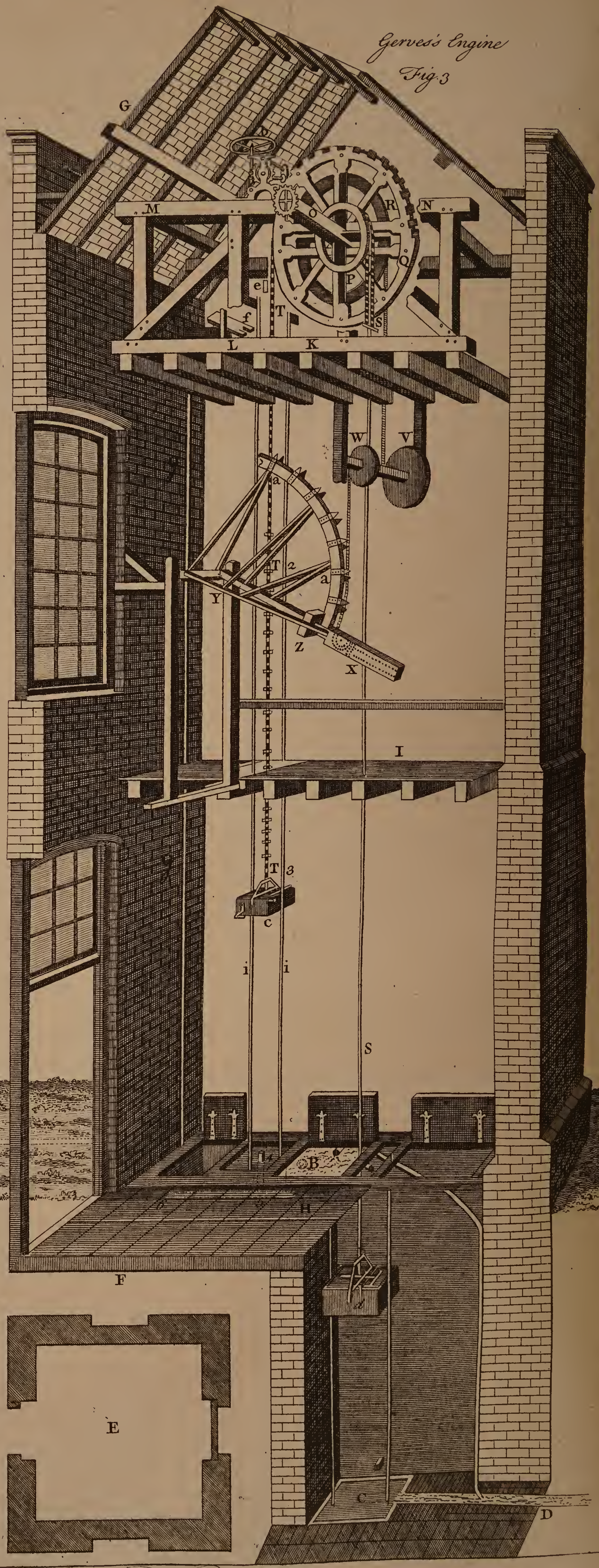



Bucket of the great Pump


Bucket of the smaller Pump





Printed for J. Hinton in Newgate Street.

Another barbariſm and impropriety, in the Generical names of fiſhes among the old authors, is the uſing the ſame words to expreſs them, which are alſo the names of other animals, quadrupeds, birds, and reptiles. Theſe are ſubject to great objections; becauſe, when they are uſed, it is not eaſy to ſee, in ſome caſes, whether the author is ſpeaking of a bird, a beaſt, or a fiſh. It is therefore one of the general rules of Artedi, that all theſe names are to be aboliſhed, as alſo all thoſe which are common to fiſhes, and to plants, minerals, and to the tools of huſbandry, or other ſervices. *Artedi, Ichthyology.*

GENE'VA. There never was ſo great a quantity of the liquor vulgarly called by this name made as at preſent; but it is wholly different from what the liquor ſo called was at firſt. The beſt Geneva we now have, is made from an ordinary ſpirit, diſtilled a ſecond time with an addition of ſome juniper berries; but the original liquor of this kind was prepared in a very different manner. It was a cuſtom, in the diſtilling of ſpirits from wort, or other fermented liquors, to add, in the working, ſome aromatic ingredient; ſuch as ginger, cortex Winteranus, or grains of paradiſe, to take off the bad flavour, and to give a pungent taſte to the ſpirit. Among other things uſed with this intent, ſome tried the juniper berries, and, finding that they gave not only an agreeable flavour, but very valuable virtues alſo to the ſpirit, they brought it to a general cuſtom, and the liquor ſold under this name. The method of adding the berries was to the malt in the grinding: a proper proportion was allowed, and the whole was reduced to meal together, and worked in the common way. The ſpirit thus obtained was flavoured ab origine with the berries, and exceeded all that could be made by any other method. Our common diſtillers leave out the juniper berries intirely from the liquor they now make and ſell under that name. Our raſcally chemiſts have let them into the ſecret, that the oil of juniper berries, and that of turpentine, are very much alike in flavour, though not in price; and the common method of making what is called Geneva in London, is with common malt ſpirit and a proper quantity of oil of turpentine diſtilled together. *Shaw's Eſſay on Diſtill.*

GERA'NIUM, *Crane's-bill*, in botany, a genus of plants whoſe characters are:

The leaves are, for the moſt part, conjugated, the calyx pentaphylloidal, and expanded in form of a ſtar. The flower here, in Europe, is pentapetalous, and roſaceous; but in Africa ſometimes tetrapetalous, and in a manner galeated and labiated, and furniſhed with ten ſtamina, which cloſely ſurround the baſe of the ovary. The fruit is pentangious, or quinquevaſcular, beaked, containing, at the baſe, five capſules, including each a tailed ſeed, and producing a long ſlender tube; which five tubes, uniting cloſe, repreſenting with the ovary, the head of a ſtork, or crane. See *plate* XXII. *fig.* 9.

This plant has an emollient virtue like the acetoſa: as it is eſculent, its tuberous roots are eaten in Africa, as we eat turneps. An infuſion, or decoction, of the herb, or its juice, are effectual in reſolving the coagulated blood in wounds; it has ſomething of aſtringency, and is recommended by the antients for the cure of foul ulcers; they uſed it alſo in ulcers of the pudenda. A bath prepared of the decoction of this herb has a good effect in fevers; and a decoction of the ſeeds is in uſe for the healing of wounds, and as a demulcent of aſperities in the body; it is highly comforting and refreſhing to the breaſts labouring under a cancer, being reckoned among thoſe plants which preſerve from corruption: the leaves boiled in wine diſcuſs an inflammation, and are commended for an eryſipelas. The juice of the root cures diſeaſes in the ears, and is good in a fomentation for pains of the joints; for which purpoſe it is uſed by ſome ſurgeons, as alſo for fiſſures in the breaſts, and diſcuſſion of the milk.

Boerhaave mentions ſeveral other ſpecies of the African Geranium; all which, he ſays, are poſſeſſed of an emollient quality.

GERMA'NDER *Galls*, in natural hiſtory, a term uſed by thoſe who have treated on the ſubject of galls, to expreſs a peculiar vitiated ſtate of a part of this plant. The ſtalks and leaves of other plants, and the bark and branches of trees, are the parts which furniſh theſe ſorts of excreſcences, and, being vitiated by the biting and ſucking of ſome inſects, ſwell out in the parts where ſo injured into a protuberance; but in this plant it is the flower that becomes then vitiated, and forms what is properly enough called a flower-gall. Mr. Bernard Juſſieu was the firſt who obſerved this fact. He obſerved, that many of the flowers of this plant never opened like the reſt, and yet grew much larger, and that theſe always contained an inſect. Other galls owe their origin to the worms of ſeveral kinds of flies, or to the little pucerons; but this is produced by an inſect not known before to have any ſuch power. A ſmall and very beautiful kind of bug of a grey colour, with ſpots of white and brown, depoſits its eggs in the calyx, or cups of this flower.

Theſe ſoon hatch into ſo many ſmall worms, which, feeding on the juices of the bud of the flower, eat their way into its cavity; when lodged there, they remain perfectly at eaſe, and, continuing to feed on the petal, the flower grows like all other parts of vegetables, injured in the ſame manner, to a much larger ſize than it otherwiſe would have done, but never opens into a flower.

While all the reſt of the flowers are open, thoſe thus injured, which are uſually ſeveral on each plant, form ſo many red tubercles, which, being opened, are always found to contain either the worm of the bug, or its chryſalis, or, at the utmoſt, the remains of that ſtate from which the creature has eſcaped in its perfect ſtate. *Reaumur, Hiſt. Inſect.*

GE'RVES'S *Engine*, a curious engine for raiſing water to ſupply a gentleman's ſeat, &c.

If there be a ſpring affording but a ſmall quantity of water, and having but a ſmall fall, ſuppoſe 10 feet, it is poſſible by the loſs of ſome of the water to raiſe the reſt to ſupply a gentleman's ſeat, or any place where it is wanted; but in a leſs quantity, by a little, than what runs waſte, if the place to which the water is to be raiſed is higher than the fall of the ſpring is low. For example, the fall of one hogſhead 10 feet will raiſe very near a hogſhead 10 feet: one hogſhead, falling 10 feet, will raiſe very near $\frac{1}{4}$ of a hogſhead 40 feet. This has been thought of by Schottus a great many years ago, and he gave a draught of it; but I do not find that it was ever put in execution (at leaſt to any good purpoſe) till the late George Gerves, carpenter, erected an engine for this purpoſe, for Sir John Cheſter, Bart. at his ſeat at Chicheſter, in Buckinghamſhire. This engine has not been out of order ſince it was firſt ſet up, about 15 years ago.

Explanation of *Plate* XXIII. *fig.* 3. repreſenting Gerves's engine.

A. Is a ſmall ſpring of water, running four gallons per minute, conveyed 72 yards into B.

B. A ciſtern holding about 12 gallons, with a fall from B to C.

C. A ciſtern 10 feet below B, where the waſte is conveyed off along D.

D. A drain, or ſewer.

E. A plan of the building by a ſcale of 8 feet in an inch.

F G. A ſection of the houſe built over the well or ciſtern, drawn by a ſcale of 4 feet in an inch; with

H I K. Three floors, for the conveniency of fixing and ordering the engine; on the uppermoſt is

L M N. A frame of timber, on which the moving part is ſupported (part broken off in the figure, to ſhew the work;) acroſs this frame lies O,

O. An horizontal axis, three feet and an half long, moving on two gudgeons in braſſes. Upon this axis are framed three wheels.

(1) P. A wheel 2 feet diameter ſhrouded, whoſe ſole is 5 inches broad, and ſhod with iron.

(2) Q. The largeſt wheel 6 feet diameter, lying cloſe by the other, 1 inch and an half broad on the ſole, and ſhrouded; this is ſpiraled 2 inches, both in ſole and ſhrouds.

(3) R. A wheel 3 feet 10 inches diameter, fixed on the ſides of the ſpokes of the wheel Q. and ſhrouded; this is ſpiraled $\frac{3}{4}$ of an inch.

P. Upon the wheel P, is fixed a chain, made flat and very flexible, which, after it has wrapped once round, is made double to ſtride on each ſide the ſingle part, to prevent its fretting and galling, and to keep exactly the perpendicular.

S S. To this chain is hung S S, a long rod of iron, at the bottom of which the greater bucket *d* is fixed.

Q. Upon the wheel Q, is fixed a ſmaller chain made flat as the other; and, when this wheel has made one revolution from left to right, the ſpiral ſole takes up as much of the chain, as is between T and T 2. The lower part of the chain from T 2 to T 3 has croſs bars, which fall upon the edge of the ſhroud in notches plated with iron; which, by the help of the ſpiral, not only prevent this part of the chain from riding upon the other, but help to equiponderate the increaſe of weight of the other chain S S.

R. Upon the wheel R, is faſtened a rope, one end of which goes about V.

V. A wheel of 2 feet diameter, to which that end is fixed; and on the ſame axis is fixed W.

W. Another wheel one foot diameter, to which is faſtened a rope, which goes over a pulley to a ſliding weight in a box at X.

X. Being the ſtilyard end of Y *a a*.

Y *a a*. A quadrant wheel moving on the axis Y; the rope falling upon pullies, running betwixt iron plates, upon the circumference.

Z. Is a lead weight, fixed to counter-balance the weight of the chains, keeping exactly an æquilibrium in every poſition they move in.

O. Upon one end of the axis O, is a ſtrong iron wheel, giving motion to a fly *b* which regulates the motion of the engine.

T T. Upon one end of the chain T T, is a copper bucket *c*; whoſe capacity is about 5 gallons, having a valve in the bottom on the left hand, and a waſte pipe near the top on the right: upon the lower end of the rod S S, is hung *d*.

d. A copper bucket containing about 15 gallons; in the bottom of this is a valve opened by a trigger falling upon a ſtud at the bottom of the well.

ii. Are iron-rods, for the guiding of the buckets, whoſe ears have braſs rolls in them, and incloſe three ſides of each rod, which is ſquare.

The operation.

When the leſſer bucket deſcends, it falls upon a trigger at 4, which is jointed to a treddle at 5. expreſſed with pointed lines, moving on an axis at 6, which by a rod at 7 opens a valve in the bottom of the ciſtern B; whence the water, by a braſs cock and branch-pipe, is conveyed underneath into both buckets, *c* and *d*.

When the leſſer bucket has received about four gallons and an half, it runs out at the pipe or ſpout into a leaden trough, which conveys the water underneath the ciſtern into the great bucket, till it overpoiſes the leſſer; which deſcending, and raiſing the leſſer bucket, the valve ſhuts, and the water that is left in the trough and branch-pipe runs into the greater bucket *d*, accelerating the motion, which falling 10 feet, the leſſer bucket riſes 30 feet; which taking up the trough *f*, and its trigger ſtriking upon a ſtud at *e*, its valve is opened, and its water runs out into a ſmall ciſtern at *f*, and down a pipe *g g*, and ſo is conveyed to the place deſigned: at the ſame time a ſtud opens the valve of the greater bucket, the water running along D the drain or ſewer.

When both buckets are empty, the leſſer overpoiſes the greater, and deſcends down to the ciſtern, bringing up the greater, where they fill as before.

To regulate the weight of the chains in every poſition, as they act in winding on and off the wheels P and Q, the ſpiraling of the wheels helps in ſome meaſure; but the quadrant wheel and ſtilyard X, with the weight Z, compleat the equilibrium, by acting with the greateſt force in the horizontal poſition, when the chain T is all down, and acts with its whole weight upon the wheel Q. Then, as that chain is drawn up, its acting weight being thereby diminiſhed, the ſtilyard X is moving down towards its perpendicular, where the weight Z ceaſes to influence the motion of the wheel R; at which time the ſliding weight runs down to keep the rope tight.

At the firſt moving down of the leſſer bucket, the weight X ſlides up to a ſhoulder, before any motion is given to the ſtilyard; but, whilſt the chain T evolves from its wheel Q, its acting weight increaſing; and, at the ſame time, the chain S wrapping itſelf upon the wheel P, its acting weight decreaſing. The ſtilyard, by riſing higher, brings the line of direction of the weight Z farther from the center of the quadrant, and ſo lays a greater force or obſtruction to retard the wheel R, and continually keeps a counter-balance.

The fly *b* regulates the motion of the engine to an equal velocity; and, by its running forwards, after the buckets are quite up or down, holds them ſteady till they begin to fill or empty, and prevents their recoiling back.

This engine, at a ſlow motion, carries up one bucket full in five minutes; but, if the ſpring run double the quantity, it would go up twice in the ſame time; and an engine, in this kind, may be made to raiſe one hogſhead per minute, or more, if required; the waſte water not being the hundredth part of what is ſpent by a water-wheel, to raiſe an equal quantity of water to the ſame height.

GI'BBOUS, *crooked or hump-backed.* Gibboſity is a preternatural incurvation of the ſpina dorſi, either backward, or on one ſide. Infants are more ſubject to this diſorder than adults, and it oftener proceeds from external, than from internal cauſes. A fall, blow, or the like violence, frequently thus diſtorts the tender bones of infants. When it proceeds from an internal cauſe, it is generally from a relaxation of the ligaments that ſuſtain the ſpine, or a caries of its vertebræ; though the ſpine may be inflected forward, and the back thrown out, by a too ſtrong and repeated action of the abdominal muſcles; and this, if not timely redreſſed, uſually grows up and fixes as the bones harden, till in adults it is totally irretrievable: but when the diſorder is recent, and the perſon young, there are ſome hopes of a cure. The common method is by a machine of paſteboard, wood, or ſteel, which is made to preſs principally upon the Gibbous part, and this by long wearing may ſet all right. The ſurgeons have however a different inſtrument which they call a croſs, much more efficacious, though not quite ſo convenient in the wearing; by the uſe of this, the parts are always prevented from growing any worſe, and are often cured. During the application of theſe aſſiſtances, the parts ſhould be at times rubbed with Hungary water, ſpirit of lavender, and the like, and defended with a ſtrengthening plaiſter of oxycroceum, opodeldoc, or the like. *Heiſter's Surgery.*

GIBBOUS *fiſh, gibboſus piſcis,* in zoology, a name given by Mr. Ray to the fiſh called by the Dutch kromruph. It is a ſmooth fiſh without ſcales; its belly is white, its fins and tail black. It grows to a conſiderable ſize, ſometimes to four feet. It is caught all over the Eaſt-Indies, near the ſea-ſhores, and is very firm, and much eſteemed at table. It has its name from the remarkable riſing of its back, which is like that of a perch, but much higher. *Ray's Ichthyolog. Append.*

GI'LDING *on China ware.* The gold is very much valued on China ware, and would be much more ſo, were it not that it is very liable to loſe its luſtre, and to rub off. The Chineſe at preſent have a method of preventing both theſe accidents in a great meaſure, by means of a ſort of poliſhing, which they give it, after it is laid on. They prepare for this purpoſe a fine piece of agate, which they poliſh on one ſurface in as perfect a manner as poſſible. With this, they rub over the gold as it lies on the porcelain ſeveral times, when it firſt comes from the baking.

This gives the gold a luſtre which it would not otherwiſe have, and fixes it down to the ware in ſuch a manner, that it cannot eaſily be got off. The principal miſchief that gold thus laid on is ſubject to, is, the tarniſhing, or growing dull; this is remedied by the ſame ſort of means. They wet the veſſel upon which they would revive the luſtre of the gold, in common clean water, and, while it is wet, they rub it with the ſame poliſhed agate, adding a little fair water at times to keep it moiſt. If the gold has not been laid on well at firſt, this may poſſibly raiſe it or take it off in ſome places; but if it was originally put on with the help of this ſtone, as all the gold on porcelain now is, the rubbing it with it a ſecond time never gives it any ſcratches, but recovers its priſtine luſtre and beauty. It muſt be obſerved, that the rubbing with this ſtone muſt be all done one way, both in the firſt laying on the gold, and in the brightening it up afterwards. This may ſerve as a method for us, as well as the Chineſe, not only to recover the beauty of our tarniſhed gilt China ware, but alſo to lay gold upon ſome of our home manufactures of this kind. *Obſer. ſur les Coutumes de l'Aſie.*

GILLS *of fiſhes,* the parts which ſerve to their taking and throwing out again proper quantities of water, impregnated with its due and natural portion of air. The branchiæ, or Gills of fiſh, therefore, are the organs which correſpond to the lungs in quadrupeds and birds, as alſo of frogs, ſerpents, and lizards, creatures too much confounded with fiſh by the old authors; all fiſhes therefore have theſe branchiæ, except the cetaceous and the petromyzum. The Gills in all fiſh are eight in number, four being placed on each ſide the throat. The loweſt Gill is always much ſmaller than either of the others; the other three on each ſide are gradually larger to the top one, which is in all fiſh the largeſt. Every one of theſe Gills is compoſed of a bony ſubſtance formed into a ſemicircle, in moſt kinds, or bent into the ſhape of a bow; in the convex ſide of which there is formed a ſort of plume, or the reſemblance of a leaf.

Each leaf, to uſe that word, is compoſed of a double row of bony lamellæ, formed like ſo many ſickles; and each of theſe lamellæ is fixed to the convex part of the bow, by means of the membrane with which that bow is covered. Theſe lamellæ have one part convex, and the other concave. The convex ſide is covered with numerous hairs in all parts, and theſe are longeſt near the baſe, and ſhorteſt toward the apex. They are leſs hairy on the concave ſide; the hairs there being ſhorter, and continued only to the middle of the lamellæ, not running all the way along it. Theſe hairs are all the way connected to the Gill by a very tender membraneous ſubſtance, which covers the lamellæ; but they are each ſingle at the baſe. *Artedi, Ichthyolog.*

GLASS.— Under this article in the Dictionary we have given the method of blowing and caſting large plates glaſs as performed in England; we ſhall here deſcribe a famous manufacture of that kind at St. Gobin in France.

The building at St. Gobin in France, where the Glaſſes are run, is called the hall, which may be eleven fathoms long, and about ten and a half broad in the clear. The furnace is in the center, and is three fathoms long, and two and a half wide. It is built of very good brick.

There are two doors three feet high on each of the ſides, of two fathoms and a half; and a door three feet and a half high on the longer ſide. The two former ſerve to throw wood continually into the furnace, and the laſt to get the pots and pans in and out; by means of a crane fixed before it for that purpoſe.

This furnace is upon ſolid foundations, and paved with ſquare tiles of a well-baked earth, of the ſame quality with that of the pots into which the matter is put to be melted. It is arched within to the height of ten feet. The tube for the venting of the ſmoke is in the center.

On one of the ſides of the length of the furnace and at the height of three feet and a half, there is the great arched aperture, ten feet wide and three feet high, and ſhaped like the mouth of an oven. Through this aperture they put in the ſolder and ſand to be melted in the pots, and through it they take out the melted matter, which is carried into the pan, when they are ready to run it.

Round the furnace are the walls of the hall well built with free-ſtone: there are in theſe walls, within, apertures like the mouth of a common oven. The hearth of theſe apertures, which are about four fathoms and a half deep, is two feet and a half from the ground-floor. Theſe ſmall furnaces are called carquaiſſes, and ſerve to neal the Glaſſes after they have been run. Theſe furnaces make ſo many ſmall buildings round the hall, and much lower than the under part of the roof that covers it. There are without a like number of apertures of the ſame ſhape right over-againſt thoſe that are within the hall, which makes a parallel arch, three feet high. There are by the ſides of theſe apertures ſmall arched niches, with pipes to give vent to the ſmoke. They light the fire in them to heat the carquaiſſes. A large gallery terminates theſe ſmall buildings, and helps the outward ſervice of the carquaiſſes.

The manufacture is compoſed of many of theſe halls, and of a multitude of large rooms, the upper part of which ſerves to lodge the workmen. It has fine buildings to lodge the maſters, a very pretty chapel and wide yards, many of which are full of ſtacks of wood of ſeveral kinds. The compaſs of the furnace is very large, and incloſed with good ſtrong walls. The whole is ſituated at the top of a ſmall hill, cloſe to the village of St. Gobin, near la Fere and Chauny, two towns of Picardy. The foreſt of St. Gobin, which is of conſiderable extent, gave birth to the eſtabliſhment of this manufacture. There are fine ſprings in the foreſt, that ſupply, on the declivities of the hill, all the water neceſſary for the work. Stone is very good and very common there: and now and then they draw ſome out of the incloſure of the manufacture.

The matter of which the Glaſſes are made, is a compoſition of ſolder, and of a very white ſand, which is fetched from the neighbourhood of Creil, eleven leagues diſtant from Paris. There are above 200 people employed round tables in the halls, about cleaning and picking the ſolder and ſand, to take out all heterogeneous bodies out of them. After this, the whole is waſhed ſeveral times, and dried ſo as to be pulveriſed in a mill, conſiſting of many peſtles, which are moved by horſes that turn round blindfold. This done, the ſand is ſifted through ſilk ſieves, and then carried to be dried in narrow places, contrived in the corners of the furnace, four feet and a half from the ground-floor, whence it is put into the pots, to be melted.

The largeſt Glaſſes are run: the middle-ſized and ſmall ones are blown.

The aboveſaid furnace is not ſufficiently heated before it has conſumed 50 cords of wood, which is 100 cart-loads. After that, it melts the ſolder and ſand. It keeps the ſame degree of heat by means of a continual ſupply of wood: which is done by two men in their ſhirts, who are relieved every ſix hours. The furnace is never extinguiſhed but at ſix months end, in order to be rebuilt. During this time, they rebuild that which was extinguiſhed before the furnace actually made uſe of was employed, and they make the neceſſary repairs in both the hall and the carquaiſſes.

The furnace contains ſeveral pots formed like crucibles, three feet high, and about as much in diameter, of a well-baked earth of a whitiſh colour, inclining to that of tripoly. Theſe pots may hold the quantity of a hogſhead of wine, and are very coſtly. Few of them will hold out the full ſix months of the furnaces being hot. It happens ſometimes that the pots break, when full of matter, which is a conſiderable loſs to the manufacture.

Theſe pots being in the oven, the ſolder and ſand are put into them by the men that run the Glaſſes, who have in their hands an iron ſhovel in the form of a ſcoop to take water out of a boat, and which is full either of ſand or ſolder: they paſs one after another before the maſter workman, who puts a ſmall quantity on each ſhovel-ful to facilitate the melting of it, by repeating the ſame mixture till the pots are quite full. The ſolder and ſand remain in the pots for ſix and thirty hours together, after which the matter is fit to be run.

All hands are now ready for the running of the Glaſſes. They begin by emptying with a large iron-ladle the matter out of one of the pots into a pan, which is put into the furnace for that purpoſe. This pan is of the ſame earth as that of the pots, and may be ſix and thirty inches long, eighteen inches wide, and as many deep. There are ſome thirty inches long, with the ſame depth and width as the reſt. There are in the length of theſe pans notches three inches wide, to ſtop them on the ſides of the ſledge, which is all iron, and very low: the tail of this ſledge forms a ſquare kind of pincers, which, when ſhut into the pan, takes off the notches. The two ſides of theſe pincers, ſtretched out in form of an X, make the ſhaft of the ſledge. The motion of theſe pincers is made upon the axle-tree of the ſledge, where there is a large iron peg that croſſes it, and is ſtopped with a pin. They fix the pan upon the ſledge, with an iron chain on the ſide of the ſhaft.

Several workmen carry the ſledge over-againſt one of the heated carquaiſſes, where the Glaſs is to be run upon a table of caſt iron, which is horizontal and level with the hearth of that carquaiſſe. This table is ten feet long, and five feet wide, and ſtands ſolid upon a timber-ſupport.

They put, in a parallel direction upon this table, a couple of flat iron bars or rulers, of the thickneſs intended in the glaſs, and which ſerve alſo to fix the width of it by their diſtance from each other. They put on the right ſide of the table an engine in form of a crane, which is faſtened to the wall at top, and ends at bottom in a pivot, to make it turn, as occaſion requires. This machine is full three fathoms high, its croſs-piece a fathom in length, and its upright beam eight or ten inches thick. This engine is moveable, and they carry it to all the carquaiſſes. It ſerves to lift the tub above the table, by means of a couple of iron bars nine feet long, and forged ſo as to clip the whole tub, that it may be eaſily inclined, and the matter run out of it upon the table. There are four iron chains to ſupport the pincers, which unite at a big rope that runs through a couple of pulleys in the croſs-beam of the crane. The whole is lifted up or lowered with a cric, which is a kind of dented machine that wheel-wrights and coach-makers uſe to lift up the wheel from the ground, to make it turn freely on its axle-tree, when any thing is to be mended in it, and to ſupport the coach on the ſide: it has ſeveral iron teeth which move up and down with a turning handle.

There is, at the foot of the table, a roller of caſt iron five feet long, and a foot in diameter, reſting upon a couple of timber treſſels. This roller being laid upon the rulers or bars on the table, that raiſe above the ſaid table the pan full of matter, led by two men, who holding the two ſides of the bars, they graſp it like pincers, cauſe the pan to ſwing in the manner of a ſweep, and pour down the matter before the roller, which is held by a couple of workmen. Theſe people make it roll ſwiftly, and in a parallel ſituation over the matter towards the carquaiſſe, and roll it back the ſame way to bring it to its place again. They have the upper half of their body and their face wrapped up in a thick cloth, to preſerve themſelves from the dartings of the fire.

There are on the three other ſides of the table ſmall wooden troughs full of water, to receive the overplus of the matter juſt run. The men that run the Glaſſes are twenty in number at leaſt, and act ſo perfectly in concert, that the work is done quickly, and without confuſion, every one having his peculiar province.

The running of the Glaſſes is performed in preſence of the head of the Glaſs-houſe, attended by the overſeer and the ſecretary. When the Glaſs is run, theſe gentlemen examine it, whether there are any bubbles in it: theſe are ſmall places ſhining like ſtars, when the Glaſs is hot. If any be perceived, the Glaſs is cut directly in that place: if it be at the third or fourth of the Glaſs, the parts cut off ſerve to make ſmall Glaſſes: when they are but ſheards, they are thrown among the waſte.

When the Glaſs has cooled and been declared good, or free from bubbles, by the approbation of the inſpectors; they puſh it off the table into the carquaiſſe level to it. This is done with an iron raker as wide as the table, that has a handle two fathoms long.

On the other ſide of the carquaiſſe, without, there are workmen who pull the Glaſs to them with iron hooks, and range it in the carquaiſſe, which holds ſix large Glaſſes. When it is full, they ſtop up its apertures with the doors which are of baked earth, and every chink of them with cement, that the Glaſſes may be ſmothered and better heated. They remain in that condition for a fortnight, and then are drawn out with all imaginable caution, to be put in boxes, and ſent by water to Paris, where they are poliſhed.

It may be obſerved that the oven full, or the quantity of matter commonly prepared, ſupplies the running of eighteen Glaſſes, which is performed in eighteen hours, being an hour for each Glaſs. The workmen work but ſix hours, and are relieved by others, who perform the ſame operations, tranſporting both the crane and the table near another carquaiſſe.

The manufacture would make vaſt profits, if the eighteen Glaſſes did all ſucceed, and were all of their intended meaſure. But there are ſometimes runnings in which not one of the Glaſſes will be able to preſerve the fineſt ſize, which is an hundred inches in length and fifty in width. However, I have ſeen many of them ſucceed with theſe dimenſions.

When the laſt Glaſs is run, they ſcour the pots before they put into the furnace the matter of another running, which is to begin ſix and thirty hours after the foregoing: ſo that they put the matter into the furnace and begin to run it every fifty-four hours. The men who run the Glaſs have nothing to do, whilſt the matter is melting, except thoſe who are appointed to watch the fire.

Let us now ſee the particulars of the blowing of Glaſſes. The hall of the blown Glaſſes is ſmaller than that of the running: it is made in the ſame manner, with this difference, that there are no carquaiſſes round it. But there is over-againſt the furnace a large covered gallery twelve feet wide, in the middle of a building which is above twelve fathoms long: there are all along, and both to the right and left of this gallery, carquaiſſes, the hearth of which is raiſed four inches above the ground-floor: they are fifteen feet deep, and their arches three feet high, like thoſe of the run Glaſſes. The furnace here, as well as in the running, is not heated above ſix months together; ſo that there is a ſecond hall to perform the blowing, whilſt they are making all proper repairs in that at reſt. The pots are of the ſame earth as thoſe of the run glaſſes. They are ſcoured, and the matter put in the furnace in the ſame manner. The matter is melting the ſame ſpace of time, to be fit for the blowing of the Glaſſes, which are all of them leſs than forty or fifty inches.

The workman who blows the Glaſſes, when the matter is melted, takes an iron rod ſix feet long and two inches in diameter, bored hollow quite through, ſharpened at the end, which is put in the mouth, and widened at the other, that the matter may adhere to it. He dips this rod into one of the pots through the mouth of the furnace, and by that means takes up a ſmall ball of matter four inches in diameter; which ſticks to that end of the rod by conſtantly turning it. Then he takes it out and blows a little into the cane, that the air may ſwell this ball of matter. Next to this he carries his rod over a large round bucket full of water, and reſting upon a three-footed ſupport, at the height of four feet; then with his hand he takes water and ſprinkles the end of the rod to which the ball of matter ſticks, ſtill turning the rod, that, by this cooling, the matter may coaleſce, and make but one body with the rod, ſo as that it may ſuſtain a greater weight.

This operation being over, he again dips the rod into the ſame pot, to take a greater quantity of matter, ſtill turning the cane as before: he takes it out, and cools it in the abovementioned manner.

He, for the third and laſt time, take in the ſame pot a quantity of matter ſufficient to make his glaſs. He takes the rod out of the pot, loaded with matter, and being of the ſhape of a large pear, which may be ten inches in diameter, and a foot long; he goes to the bucket and cools it at the tail: this cooling is performed more quickly than the other two, not to loſe the opportunity of the heat of this maſs of matter. He at the ſame time blows into his rod, and, with the aſſiſtance of one of the labourers, gives his rod a balancing motion, that cauſes the matter to lengthen; which, by being thus blown and lengthened ſeveral times over, aſſumes the form of a cylinder ending like a ball at bottom, and in a point at top, which ſticks to the rod only by means of the ſeveral coolings already mentioned.

When the workman has blown ſufficiently, and lengthened his matter ſo as to make it become of an even thickneſs, he deſires his aſſiſtant to mount upon a ſtool three feet and a half high, on which there are two ſmall upright pieces of timber with a croſs beam of the ſame, to ſupport the weight of the Glaſs and rod, which are kept ſomewhat obliquely by the aſſiſtant, that the maſter may, with a puncheon ſet in a wooden handle, and with a mallet, make a hole into the maſs. This hole is drilled at the center of the ball that terminates the cylinder: it is an inch in diameter at moſt.

When the Glaſs is pierced, if there be any defects in it, they are perceived after this operation: if it have too many, they break it directly, and throw the matter among the waſte: if there be none or very few about the extremities, the workman goes and lays his rod horizontally on a little iron treſſel placed on the ſupport of the aperture of the furnace. He expoſes the Glaſs to the heat of it for about half a quarter of an hour, and then takes it away. In the mean time the aſſiſtant mounts the foot-ſtool again in the former ſituation, whilſt the maſter, with a pair of long and broad ſheers extremely ſharp at the end, widens the Glaſs by inſinuating the ſheers into the hole already made with the puncheon, and by thruſting them more and more into it, as it grows wider. Whilſt the aſſiſtant turns the maſs of Glaſs, the maſter goes on with opening of it, till the opening is ſo large at laſt as to make a perfect cylinder at bottom.

Next to this the workman lays his Glaſs upon the treſſel at the mouth of the furnace to heat it: then he takes it and gives it to his aſſiſtant on the foot-ſtool, and with large ſheers cuts the maſs of matter up to half its height. If there be any defects in the Glaſs, it muſt be cut in that place, as this ſection makes the extremities of it.

There is at the mouth of the furnace an iron tool called pointil, which is now heating, that it may unite and coaleſce with the Glaſs juſt cut, and do the office which the rod did before it was ſeparated from the Glaſs. This pointil is a piece of iron ſix feet long, and much of the form of a rod: there is at the end of it a ſmall iron bar a foot long, laid equally upon the long one, and making with it a T. This little bar is full of the matter of the Glaſs about four inches thick.

This red-hot pointil is preſented to the diameter of the Glaſs, which coaleſces directly with the matter round the pointil, ſo as to be able to ſupport the Glaſs for the following operations. This done, they ſeparate the rod from the Glaſs, by ſtriking a few blows with a chiſſel upon the end of the ſaid rod which has been cooled; ſo that the Glaſs breaks directly, and makes this ſeparation, the rod being unloaded of the Glaſs now carried by the pointil.

This done, they preſent to the furnace the pointil with the Glaſs, laying it on the treſſel to heat; and redden the end of that Glaſs, that the workman may open it with his ſheers, as he has already opened one end of it to complete the cylinder, the aſſiſtant holding it on his foot-ſtool as before.

They then again, and for the laſt time, put the pointil on the treſſel, that the Glaſs may grow red-hot, and the workman cuts it quite open with his ſheers right over-againſt the foregoing cut. This he does as before, taking care that the two cuts make but one and the ſame line.

In the mean time, the man who looks after the carquaiſſes, comes to receive the Glaſs upon an iron ſhovel two feet and a half long without the handle, and two feet wide, with a ſmall border of an inch and a half to the right and left, and towards the handle of the ſhovel. They lay the Glaſs upon it, flattening it a little with a ſmall ſtick a foot and a half long; ſo that the cut of the Glaſs is turned upwards. They ſeparate the Glaſs from the pointil, by ſtriking a few gentle blows between the two with a chiſſel. This done, they carry the Glaſs on the ſhovel to the mouth of the hot carquaiſſe, where the Glaſſes are to be nealed. They take away the ſhovel: the Glaſs grows red-hot gradually, by the vaſt heat which is at the mouth of the carquaiſſe: the workman belonging to it takes an iron tool ſix feet long, and widened at the end in form of a club at cards, four inches long and two inches wide on each ſide, very flat, and not half an inch thick. With this tool he gradually lifts up the cut part of the Glaſs to unfold it out of its form of a flattened cylinder, and render it ſmooth by turning it down upon the hearth of the carquaiſſe. The ſaid club, being inſinuated within the cylinder, performs this operation, by being puſhed hard againſt all the parts of the Glaſs.

This done, and the Glaſs being quite ſmooth, the workman puſhes it to the bottom of the carquaiſſe with a ſmall iron-raker. He ranges it with a little iron hook. When the carquaiſſe is full, they ſtop and cement it as they do the carquaiſſes of the run Glaſſes; and the Glaſſes remain there alſo for a fortnight to be nealed. When this time is over, they take them out to poliſh them.

A workman can make but one Glaſs in an hour, and he works but ſix together, after which he reſts ſix hours, to begin the ſame operation a-new: being never at reſt, but when the matter is melting in the pots.

Glass *for teleſcopes.* The following curious method of grinding and poliſhing Glaſs for teleſcopes, is that practiſed by the ingenious Mr. Molyneaux and Mr. Huygens.

Of making and poliſhing the tools. — It is eaſier to make an object Glaſs of equal convexities than of any other figure, becauſe the ſame tools will ſerve for forming both its ſurfaces. And a Glaſs of this figure will make as perfect an image in its focus as any other, becauſe the aberrations of the rays cauſed by the ſphericalneſs of the figures of the ſurfaces, whatever be the proportion of their ſemidiameters, are inconſiderable in long teleſcopes, in compariſon to the aberrations cauſed by the different refrangibility of the rays; and theſe latter aberrations are the ſame, whether the ſemidiameters of the ſurfaces be equal or unequal, ſuppoſing the aperture and focal diſtance to be the ſame. If it be propoſed then to make a Glaſs of equal convexities, that ſhall have a given focal diſtance, the radius of the ſpherical ſurface will be found by taking it in proportion to the given focal diſtance as twelve to eleven, putting the ſine of incidence to the ſine of refraction out of air into Glaſs, as ſeventeen to eleven, as Sir Iſaac Newton has accurately determined it.

The focal diſtance of the Glaſs being found, and becauſe its figure cannot be formed exactly true to the very edges, the breadth of the Glaſs may be taken about half an inch more than the diameter of its aperture, or even three quarters or a whole inch more, if its focal diſtance be between fifty and 200 feet.

Mr. Huygens directs in general to make the breadth of the concave tool, or plate, or diſh, or form, in which an object Glaſs muſt be ground, almoſt three times the breadth of the Glaſs. Though, in another place, he ſpeaks of grinding a glaſs whoſe focal diſtance was 200 feet, and breadth eight inches three quarters, in a plate only fifteen inches broad. But, for eye Glaſſes and others of leſſer ſpheres, the tool muſt be broader in proportion to the breadth of theſe Glaſſes, to afford room enough for the motion of the hand in poliſhing. Mr. Huygens made his tools of copper or caſt braſs; which, for fear they ſhould change their figure by bending, can hardly be caſt too thick; nevertheleſs, he found by experience that a tool fourteen inches broad, and half an inch thick, was ſtrong enough for forming Glaſſes to a ſphere of thirty-ſix feet diameter, when the tool was ſtrongly cemented upon a cylindrical ſtone an inch thick, with hard cement made of pitch and aſhes.

In order to make moulds for caſting ſuch tools as are pretty much concave, he directs that wooden patterns ſhould be turned in a lathe, a little thicker and broader than the tools themſelves. But, for tools that belong to ſpheres above twenty or thirty feet diameter, he ſays it is ſufficient to make uſe of flat boards turned circular to the breadth and thickneſs required. When the plates are caſt, they muſt be turned in a lathe, exactly to the concavity required. And for this purpoſe it is requiſite to make a couple of braſs gages in the manner following:

Take a wooden pole a little longer than the radius of the ſpherical ſurface of the Glaſs to be formed, and through the ends of it ſtrike two ſmall ſteel points, at a diſtance from each other, equal to the radius of the ſphere intended; and by one of the points hang up the pole againſt a wall, ſo that this upper point may have a circular motion in a hole or ſocket made of braſs or iron fixed firmly to the wall. Then take two equal plates of braſs or copper, well hammered and ſmoothed, whoſe length is ſomewhat more than the breadth of the tool of caſt braſs, and whoſe thickneſs may be about a tenth or twelfth of an inch, and whoſe breadth may be two or three inches. Then, having faſtened theſe plates flat againſt the wall in an horizontal poſition, with the moveable point in the pole, ſtrike a true arch upon each of them. Then file away the braſs on one ſide exactly to the arch ſtruck, ſo as to make one of the braſs edges convex and the other concave; and, to make the arches correſpond more exactly, fix one of the plates flat upon a table, and grind the other againſt it with emery. Theſe are the gages to be made uſe of in turning the braſs tools exactly to the ſphere required.

But, if the radius of the ſphere be very great, the gages muſt be made in this manner: I imagine the line A E (*plate* XXI. *fig.* 3.) drawn upon the braſs plate to be the tangent of the required arch A F B, whoſe radius, for example, is thirty-ſix feet, and diameter ſeventy-two. From A ſet off the parts A E, E E, &c. ſeverally equal to an inch, and let them be continued a little beyond half the breadth of the tool required. Then, as ſeventy-two feet, or 864 inches, are to one inch, ſo let one inch be to a fourth number; this will be the number of decimal parts of an inch in the firſt line E F, reckoning from A. Multiply this fourth number ſucceſſively by the numbers 4, 9, 16, 25, &c. the ſquares of 2, 3, 4, 5, &c. and the ſeveral products will be the number of parts contained in the 2d, 3d, 4th, 5th, E F reſpectively. But, becauſe theſe numbers of parts are too ſmall to be taken from a ſcale by a pair of compaſſes, ſubtract them ſeverally from one inch, repreſented by the lines E G, and the remainders, being taken from a ſcale of an inch divided into decimal parts, and transferred by the compaſſes from G to F, will determine the points F, F, of the arch required. And, the ſame being done on the other ſide of the line A D, the braſs plate muſt be filed away exactly to the points of this arch, and poliſhed as before.

To apply the braſs tool to a turning lathe, in order to turn the concave ſurface of it exactly ſpherical, let figure 4 repreſent a view of ſome part of the lathe taken from a point directly over it; and here let (*fig.* 4, 5, 6,) repreſent a ſtrong flat diſk of braſs, half an inch thick at leaſt, having a ſtrong iron ſkrew-pin fixed firmly in the center of it, and ſtanding out exactly perpendicular to one ſide of it; by which it may be ſkrewed into the end *c*, of the mandrel or axis of the lathe repreſented by *c d*. This diſk is repreſented ſeparately in figure 5, and muſt be well ſoldered to the back ſide of the tool *e f*, which therefore in the middle of it muſt be made plane, and exactly parallel to the circumference of its oppoſite ſurface, to the intent that the circumference may be carried round the axis of the lathe in a plane perpendicular to it. The mandrel or axis *c d* turns upon a point *d* in the puppet-head of the lathe, and in an iron collar repreſented by *s t*, as uſual.

Let *g h i k* repreſent a board nailed faſt upon the other puppet-head; and let the concave gage *g h* be laid upon this board, with its concave arch parallel to the concavity of the tool *e f*, and be ſkrewed down to the board with flat-headed ſkrews ſunk into the braſs. Let *l m n o* repreſent ſuch another board lying upon the former, with the convex gage *l m* ſkrewed to the underſide of it, ſo that by moving this upper board the arch of the convex gage may be brought to touch the concave one and ſlide againſt it. The turning tool *p q* is laid upon this moveable board, and is held faſt to it by a broad-headed ſcrew at *r*, to be turned or unturned by the hand upon occaſion. To know whether the concave gage be exactly parallel to the concavity of the tool *e k* ſkrewed faſt to the mandrel, direct the point *p* of the turning tool *p q* to touch any point of the tool *e f* near its circumference; then, having fixed the turning tool *p q* by the ſkrew *r*, turn the braſs tool *e f* half round, and move the upper board till the point *p* of the turning tool be brought over-againſt the ſame mark upon the tool *e f*; and, if it juſt touches it as before when the gages coincide, all is right. If not, the poſition of the head of the lathe may be altered a little by ſtriking it with a mallet. But the beſt way is to make this examination of the ſituation of the concave gage, when only one end of it is fixed to the head of the lathe by a ſingle tack or ſcrew, about which it may eaſily be moved into its true poſition. And, while the tool or plate *e f* is turning, the ſame examination of its paralleliſm to the gage muſt be frequently repeated; otherwiſe its ſurface will take a falſe figure. It is convenient that the upper board *l m n o* ſhould project over both the gages; and, to keep its ſurfaces parallel to that of the under board, two round-headed nails, or a plate of braſs, as the gages, muſt be fixed to its under ſurface, towards the oppoſite ſide *n o*. Care muſt be taken to drill the holes in the gages, through which they are ſcrewed to the boards, not too near the poliſhed arches, for fear of altering their figure, by the yielding of the braſs. The tool and all the parts of the lathe muſt be fixed very firm; becauſe any trembling motion will cauſe the graving tool *p q* to indent the braſs. After the tool is well turned, it muſt be ſeparated from the back *a b*, by melting the ſolder with live coals laid upon it.

It is eaſy to underſtand, that, by tranſpoſing the gages, a convex tool may be turned in the ſame manner.

Mr. Huygens would have his plates or tools firſt formed in a turning lathe, and then ground together with emery; that is to ſay, the concave and convex tool of the ſame ſphere together. But the tools of very large ſpheres he would have ground at firſt quite plane by a ſtone-cutter; and then ground hollow, with a round, flat ſtone and emery, to the deſired gage. And he preſcribes to uſe for this grinding firſt a ſtone half as broad as the tool, and after that another ſtone very nearly as broad as the tool; and, in this way of forming the tools, it is convenient to tie a *little frame* of thick paper, or rather of thin paſteboard, about an inch high round about the tool to keep in the emery; and, in grinding, the whole muſt be made extreamly firm and ſtable. And, when the tool is to be poliſhed, it muſt ſtill remain upon the ſtone pedeſtal; otherwiſe it will be in danger of bending a little in the operation.

For poliſhing theſe tools thus ground, Mr. Huygens takes ſome ſoap, and daubs the concave tool therewith; then he takes the laſt mentioned round ſtone, ſomewhat leſs than the tool (or the convex tool itſelf) and heats it, and then he pours upon it ſome hot melted cement (made of pitch and fine powdered and ſifted aſhes as much as he can mix with it) and then he turns over the ſtone and cement upon the concave tool, into which alſo he had poured a good quantity of the ſame cement, having firſt laid three little pieces of braſs of equal thickneſs on the circumference thereof, in order to preſs and keep this cruſt of cement of an exact equal thickneſs in all its parts; and thus he lets them cool together: then, taking the ſtone from the tool and turning it up, he ſifts, upon the cement that ſticks to it, a cruſt of very fine emery, and with a flat iron ſpatula about one third of an inch thick, gently warmed, he preſſes lightly the emery, to ſtick to and incruſtate upon the cement; then he again gently warms the whole ſtone (or convex tool) cement and emery, and he again replaces it upon the concave tool, and leaves it again to cool; ſo that he has by this means a cruſt of emery exactly of the figure of his tool; with this he poliſhes the tool dry, without the addition of any wet, preſſing it down hard on the ſurface of the tool. And, to preſs it the harder, he places upon it a long pole, a little bent to make it ſpring; whoſe upper end is fixed to the cieling of the room, or elſe is preſſed downward by a ſtrong iron ſpring; and he ſays it will be neceſſary to have two perſons to rub the ſtone upon the tool. And here it is to be noted, that great care muſt be taken, in this and all caſes where this way of grinding by a pole is made uſe of, to fix the point of preſſure exactly and truly in the middle, as ſhall be more particularly explained hereafter, when the Glaſs comes to be ground in this tool.

For the method of making the cement, ſee CEMENT.

To bring the concave tool ſtill to greater perfection, and ſtill to preſerve its true form, take equal pieces, about an inch ſquare, of blue hone, ſuch as engravers poliſh their copper withal, and place as many of them, laying the grain ſome one way, and ſome another, as you can, upon the ſurface of the tool to be poliſhed; ſticking and ſteadying the ſame, as cloſe as you can to one another, with ſoap or common white ſtarch; then fill up all the interſtices between the ſaid pieces of hone with clean dry ſand, to about two thirds of the thickneſs of the ſaid hones; then, having a border of paper or paſte-board put round the tool as before, ſhake the tool gently, that the ſand may every-where equally ſubſide, and blow it to an equal depth with a pair of bellows. Then take ſome hard cement extreamly hot, and pour it all over the hones, and having cleaned the ſtone (or the convex tool) which before was incruſtated with pitch and emery, place this ſtone (or convex tool) warmed on the top of this cement, and let all cool together. Then, rubbing the tool with this poliſher made with hones, by applying your pole to the top of the ſtone as before, you ſhall know when the tool is brought to perfection, if, wiping off the dirt and filths you ſine, by looking obliquely upon it againſt the light, that it ſhines equally bright and ſtrong in all parts. If you would uſe this poliſher again, it muſt be kept in a cool cellar, leaving the hones uppermoſt; otherwiſe in warm weather they will change their ſituation in the cement, even with their own weight.

And here is to be obſerved that this method of grinding theſe tools by an incruſtation of emery on hard cement, formed to a convexity by the very tool itſelf, and alſo the method of poliſhing the ſame by the blue hones fixed in hard cement, may probably as well be uſed and applied to the grinding and poliſhing of a reflecting metal for a teleſcope. But in that caſe I believe it is beſt not to uſe a ſpringing pole, but one that ſhall turn upon a point above, being nearly equal in length to the radius of the ſphere intended.

Of chuſing Glass.—The beſt ſort of Glaſs has generally a yellowiſh, reddiſh, or a greeniſh colour, when we look through it againſt the ſky-light, or lay it upon a ſheet of white paper. That which is perfectly white, though it tranſmits the moſt light, is generally fuller of veins, and is often ſubject to grow moiſt in the air, which in time deſtroys its poliſh. In theſe parts there is no better Glaſs to be had, than pieces of broken looking Glaſſes. But after ſome time I found pretty good Glaſs at a Glaſs-houſe; and made uſe of the ſame matter with which they make drinking-Glaſſes, which I found was always the beſt after the matter had reſted for two or three days, when the workmen kept holydays. I ordered pieces of Glaſs to be made for my own uſe in the ſame manner as they make looking Glaſſes, that is, by cutting off the top and bottom of the round globe they blow up, and by ſlitting the ſide of it, and then by flatting it upon the hearth of the furnace. Theſe pieces, which were about half an inch or three quarters thick, I ordered to be ground to an equal thickneſs by a ſtone-cutter, in the machine they poliſh marble with.

To diſcover the veins in Glaſs one ſhould look very obliquely againſt a ſmall light in a room, otherwiſe dark. Thus one may examine the pieces of a poliſhed looking-Glaſs. But, becauſe they are ſeldom thick enough for object Glaſſes, it is neceſſary to take ſome pieces of the ſame ſort of Glaſs before it is poliſhed, and to get it round to an equal thickneſs, and poliſhed a little by the common Glaſs-grinders, in order to judge what pieces are fit for uſe. Sometimes little veins will appear like fine hairs or threads, which ſcarce do any harm. I have ſeveral very good Glaſſes of this ſort. Sometimes their imperfections cannot be diſcovered by the former way of trial, and yet, after the Glaſs is well formed and poliſhed, they will appear by reflection in this manner: in a dark room, place the Glaſs upright upon a table, turning that ſurface from you which is ſuſpected to be faulty; then holding a lighted candle in your hand, ſo that the middle of the broad light reflected from the firſt ſurface may fall upon your eye, recede from the Glaſs till the rays reflected from the back ſurface ſhall juſt begin to invert the candle; then the whole Glaſs will appear all over bright, and then you will diſcover its defects, and the imperfections of the poliſh. When the glaſs is a portion of a large ſphere, we uſe a ſmall perſpective, three or four inches long, to magnify the defects.

Of preparing the Glasses *before they can be ground and poliſhed.*—The pieces of Glaſs above-mentioned, which we directed to be planed to an equal thickneſs and poliſhed a little by a Glaſs-grinder, ſhould be much broader than the intended object Glaſs, and there may be room enough for chuſing the beſt part of them. For planing and ſmoothing thoſe large pieces of Glaſs, I ordered the workmen to make uſe of plates of caſt iron, ſuch as are ſold at the ironmongers ſhops, after they had been ground and planed in a ſtone-cutter's engine. Upon the plate of Glaſs, with a diamond-pointed compaſs, ſtrike a circle repreſenting the circumference of the object Glaſs; and alſo another concentric circle, with a radius about a tenth or twelfth part of an inch bigger. And alſo two other ſuch circles, on the other ſide of the Glaſs directly oppoſite to the former: which may be done by means of a circular Glaſs to be deſcribed by and by. The larger parts of the Glaſs may be ſeparated from the outward circle by a red-hot iron, or by a ſtrong broad vice, opened exactly to the thickneſs of the Glaſs. The remaining inequalities may be taken off by a grind-ſtone, beginning with the largeſt firſt, and taking care they do not ſplinter. Then, having warmed the Glaſs, cement a wooden handle to it, and in a common deep tool for eye Glaſſes, making uſe of white clear ſand and water, grind the circumference of the Glaſs exactly true to the innermoſt circle on each ſide of it. Then having made a great many ſmall cavities with a punch upon one ſide of a round copper-plate, and having fixed the other ſide of it upon the middle of the round Glaſs, by cement made with two parts of roſin or hard pitch, and one part of wax, place the ſteel-point of the ſpringing pole, being fourteen or fifteen feet long, into that cavity of the copper-plate, which lies neareſt to the thickeſt part of the Glaſs. Then work the Glaſs by the pole with ſand and water, upon a flat plate of caſt iron, of a round figure, the plate having been planed with ſand and water by a ſtone-cutter. Then having examined the thickneſs of the Glaſs in ſeveral places, by a hand-vice, which is better than a pair of callippers, by repeating the ſame operation it will be reduced to an equal thickneſs in all its parts.

Towards the end of this operation it is convenient to make uſe of ſifted emery, becauſe the ſand will ſcratch too deep; and then it will alſo be neceſſary to place the ſteel point of the pole exactly over the center of the under ſurface of the Glaſs; otherwiſe that ſurface will take a cylindrical or ſort of a convex figure inſtead of a plane one, even though it was exactly plane before you began to grind it. The reaſon of which is well worth obſerving. And, when convex Glaſſes are to be poliſhed, it is alſo abſolutely neceſſary to place the point of preſſure exactly over the center of the under ſurface of the Glaſs. Therefore, to bring one of the little cavities in the copper-plate exactly over that center, we make uſe of a circular Glaſs formed from a broken looking-Glaſs, the quickſilver being rubbed off; having deſcribed upon it, with a diamond-pointed compaſs, eight or ten concentric circles at the diſtance of about a quarter of an inch from each other, ſo that the large circles may be ſomewhat bigger than the circumference of the Glaſs to be poliſhed. Lay this circular Glaſs upon the ſurface of the Glaſs to be poliſhed, and move it to and fro, till you perceive the circumference of the Glaſs to be poliſhed is exactly parallel to the neareſt circle upon the circular Glaſs; then, having inverted both the Glaſſes, lay the circular Glaſs upon a table, and, having laid a ſmall live coal upon the copper-plate to make it moveable upon the cement, place one point of a pair of compaſſes in one of the little cavities, and move the copper till a circumference deſcribed with the other point coincides exactly with any one circle upon a circular Glaſs, and the buſineſs is done. With ſtarch it is convenient to paſte three ſlender ſhreds of fine linen, directly towards the center of the circular Glaſs, that the other Glaſſes may not ſlide too eaſily upon it, and that they may not ſcratch one another.

The cavities punched in the copper-plate, and alſo the point of the pole, ſhould be triangular, to hinder the rotation of the Glaſs; which is ſtill more neceſſary in perfecting the poliſh of the Glaſs. And here it muſt be obſerved again whether the circumference of the Glaſs remains exactly circular on both ſides of it, which muſt be tried with a pair of compaſſes; and, if it be not, it muſt be corrected again by grinding it exactly circular in a common tool for making eye Glaſſes; which will contribute very much to its taking an exact ſpherical ſurface, when it comes to be ground in its proper tool. For, if any part of the circumference be protuberant, it will hinder the adjoining parts of the ſurface from wearing ſo much as they ſhould do; and, by conſequence, will ſpoil the ſpherical figure of the ſurface.

Of grinding the Glasses.—The Glaſs being planed and rounded as above, take away the plate with ſeveral cavities, and with ſome of the ſame cement fixed on a ſmaller round piece of braſs or rather ſteel, truly flat and turned about the bigneſs of a farthing, but thicker, having firſt made in the center thereof, with a triangular ſteel punch, a hole about the bigneſs of a gooſe quill, and about the depth of one twelfth of an inch; and, at the very bottom of this triangular hole, a little ſmall round hole muſt be punched ſomewhat deeper with a very fine ſmall ſteel punch. A ſmall ſteel point, of about an inch long, muſt be truly ſhaped and fitted to this triangular hole, and, at the very apex, to the ſmall, round, deeper impreſſion. Nevertheleſs, it muſt not be fitted ſo exactly to the ſame, but that it may have ſome liberty to move a little to and fro; the apex always continuing to touch and preſs upon the ſurface of the round hole below. This ſteel triangular point muſt be fixed to the end of a pole (*plate* XXI. *fig.* 7.) to the other end of which another round iron point muſt be fixed, of about five or ſix inches long, to play freely up and down in a round hole in a piece of braſs let into a board, fixed againſt the ceiling for that purpoſe, perpendicularly over the bench, and over the center of the tool, which muſt be ſtrongly and truly fixed horizontally thereon.

Now, here is to be noted that Mr. Huygens preſcribes to fix his braſs-plate to the Glaſs by the means of a cement, and takes no notice of any other method whatever; though a very ſmall experience in theſe affairs will convince any body that it is hardly poſſible, in this or any other caſe, to bring the cement to a fluidity ſufficient to fix two plane ſurfaces exactly parallel one to the other, without heating the Glaſs and the braſs alſo to a great degree, and ſo as to endanger the figure of the Glaſs conſiderably.

To avoid this in fixing Glaſſes to braſs or wood, or the like, ſome have done it with plaiſter of Paris: Mr. Scarlet does it by cementing another intermediate Glaſs to the braſs (or wood) and then fixing the Glaſs, to be ground, to the outward ſurface of the cemented Glaſs with common glew. Without all this trouble I have done it only with common icthyocolla or fiſh glew, which will run very fluid, and will fix the Glaſs and the braſs itſelf ſtrongly together; and, round the edges of the braſs, I ſtick on ſome common ſoft red-wax, ſuch as is uſed for the privy ſeal, to keep the wet from getting to the glew.

For grinding Glaſſes truly plane, upon a plane tool, by this method, Mr. Huygens preſcribes this pole to be about fifteen feet long; but, in grinding upon a concave plate, the pole had beſt be made equal to the radius of the ſphere of the tool; though I believe it would not be material, if made conſiderably ſhorter, according as the height of the room will allow.

It is neceſſary to have lying by one an ordinary piece of coarſe Glaſs, ground in the ſame tool, called a bruiſer; whereby, when any new emery is neceſſary to be laid on the tool in grinding your Glaſs, the ſaid emery is to be conſtantly firſt run over and ſmoothed, for fear any little coarſe grains ſhould remain and ſcratch the Glaſs to be ground.

Having theſe things prepared together with ſome pots of emery of various fineneſs, take of your rougheſt ſort a ſmall half pugil, wetting the ſame, and daubing it pretty equally on the tool; then lay on your Glaſs and fix up your pole, and continue to grind for a quarter of an hour, not preſſing upon the pole, but barely carrying the Glaſs round thereby; then take the like quantity of ſome finer emery, and work another quarter of an hour therewith; then take the like quantity of emery ſtill finer, and work for the ſame time; laſt of all, take a leſs quantity of ſome of the very fineſt you have, which will be ſufficient for a Glaſs of five inches diameter, and work therewith for an hour and half, taking away, by little and little, ſome of the emery with a wet ſponge. Do not keep it too wet nor too dry, but about the conſiſtence of pap; for much depends on this. If it is too dry, your emery will clog, and ſtick, and incorporate, ſo as for the moſt part to cut little or not at all, unleſs here and there where its body chances to be broke, and there it will ſcratch and cut your Glaſs irregularly; and, if it is too wet, and too much diluted, it will form the irregular ſeparation of its parts cut in ſome places more than others, juſt as in the other caſe.

But Mr. Huygens tells us this method of uſing various ſorts of freſh emery is not good, finding by experience that the ſurfaces of large Glaſſes are often ſcratched. And, therefore, he ſays it is beſt to take a large quantity of the firſt or ſecond ſort of emery, and ſo work with the ſame from the firſt to the laſt; taking away, by little and little, every half hour, or quarter of an hour, more and more of the emery with a wet ſponge; by which means he could bring the Glaſs extremely ſmooth and fine, ſo as to ſee pretty diſtinctly a candle or the ſaſh-windows well defined through it; which is a mark when it is ground enough to be ready to receive a poliſh. But, if the Glaſs has not acquired this degree of tranſparency, it is certain, ſays Mr. Huygens, that too much emery remains; and therefore it muſt ſtill be diminiſhed, and the operation continued. He found it beſt to make uſe of common well-water in this grinding; and he took care to move the Glaſs in circles, taking in an inch beyond the center of the tool, and ſomewhat beyond the outſide of the tool; and he found in a Glaſs of two-hundred feet whoſe diameter was eight inches three-fourths, which he ground in a tool of fifteen inches diameter, that the figure of the tool in grinding would alter conſiderably, unleſs he carried the Glaſs round an inch beyond the center of the tool one way, and three inches one-fourth beyond the ſkirts of it another way; but, if he carried it no more than a ſtraw's breadth beyond the ſkirts of the tool, and accordingly farther beyond the center, the Glaſs would always grind falſly, too much being taken off on the outſides, ſo that he could never after bring the outſides of the Glaſs to a true and fine poliſh.

When you firſt begin to grind, and the emery begins to be ſmooth, the Glaſs will ſtick a little to the tool and run ſtiff; then freſh emery is to be added. When it afterwards comes to be poliſhed, it will, if large, require a conſiderable ſtrength to move it, but this inconvenience will happen leſs in grinding by the pole than in grinding by hand. For the warmth of the hand makes the ſubſtance of the Glaſs ſwell, and not only increaſes the ſticking of the Glaſs, but in ſome meaſure may alſo ſpoil the figure of it, and alſo of the tool. When it is ground with the pole, it never ſticks very ſtrongly, unleſs when you take the Glaſs off from the tool, and keep it from it for ſome time, and then apply it to the tool again; and this in large Glaſſes; for, by this means, ſays Mr. Huygens, the Glaſs gets from the air a greater warmth than it had on the tool; and, being again applied to the tool, its lower ſurface is ſuddenly contracted by the coldneſs of the tool, and ſo ſticks to it. Wherefore, ſaith he, you muſt, in that caſe, wait till the Glaſs and the tool come to be of one temper. The like effect is obſerveable in grinding large Glaſſes when there is a fire in the room. Perhaps, the cauſe of thoſe effects may be more truly deduced from the attractive qualities of warm Glaſs. But, whatever is the cauſe, we may from hence perceive the great nicety of grinding large Glaſſes, and the neceſſity there is of grinding them ſlowly, and with the greateſt caution, in the moſt minute circumſtances.

The method hitherto deſcribed of grinding with emery is what is recommended by Mr. Huygens. Le Pere Cherubin preſcribes another material, and it is the grit of a hard grindſtone well beaten into a fine powder and ſifted pretty fine. And here in England the ſame thing was uſed to be performed by Mr. Cox with common clean fine white ſand, taking away, by little and little, the ſaid grit and ſand, as it ground finer and finer. Nay, Mr. Cox was uſed to continue his grinding till the matter of the ſand came to be ſo fine, and ſo little of it to remain in the tool, that he could, and frequently did uſe to poliſh off his Glaſſes therein, without the uſe of any other material whatſoever; and I myſelf have been preſent, while Mr. Scarlet ground and poliſhed, or dried off, a Glaſs of ſixteen feet in this manner. They call this way drying off on ſand, becauſe, as the matter grows finer and finer, they wet it leſs and leſs, till for the laſt quarter of an hour (the whole work laſting near two hours) they only wet it by breathing upon it, and, at the very laſt, not at all.

It ſeems this method is now quite diſuſed; perhaps the violent labour requiſite at the laſt may be the reaſon of it. A better reaſon may be the great improbability of grinding or poliſhing true by this method, by the uncertain and unequal force of the hand; and, if this be the true reaſon of its diſuſe, I cannot well ſee but that this method of grinding and poliſhing out and out in the ſame tool, and with the ſame material, viz. white ſand, might be perhaps again reſtored, and greatly improved by adding, to the old way, Mr. Huygens's method of grinding and poliſhing with a pole and ſpring to preſs down the pole, or ſome analogous contrivance. And, in relation to grinding by all or any of the methods above deſcribed, this one general remark muſt be made, that the artiſt muſt allow time and patience to bring his Glaſs by grinding to the ſmootheſt and fineſt ſurface, that he poſſibly can, before he attempts to poliſh. For this, and this only, makes his Glaſs poliſh truly ſmooth, well and eaſily; and, the ſmoother you bring it in grinding, the leſs labour you will have in poliſhing; in which conſiſts not only the greateſt difficulty but the greateſt danger too of ſpoiling all you have done before.

Of giving GLASSES *the laſt and fineſt poliſh.*—Having removed the little braſs plate from the Glaſs (See *fig.* 8.) take, ſays Mr. Huygens, a very thick ſlate, or rather a block of blue or grey ſtone; let it be half an inch thick, and let it be ground true and round at the ſtone-cutter's; its diameter being ſomewhat ſmaller than the diameter of your Glaſs, leaving a hole, quite through, in the center, of about an inch diameter. Then make ſome cement two parts roſin, or hard pitch, and one part wax; and, taking a piece of thick kerſey cloth, truly and equally wrought, cut this cloth round, and leave a like hole, one inch diameter, in the middle. Then warming the ſtone, and alſo warming the Glaſs, and ſpreading thinly and equally upon them ſome of this cement, lay on the cloth, and thereupon lay on alſo the Glaſs, having left in the middle a ſpace the breadth of a ſhilling uncemented and blacked with a candle. Then provide an hollow conical plate of iron or ſteel (ſhaped like an high-crowned hat) having the baſis of the cone one inch diameter, and having round the baſis a flat border about two inches one half diameter, and having the depth or altitude of the cone exactly of the thickneſs of the ſlate, cloth, and cement, to which the Glaſs is fixed. The vertex of this cone muſt go down through the ſlate and cloth, ſo that, being cemented on the ſlate, the ſaid vertex may approach to the Glaſs within a hair's breadth, and lie perpendicularly over the center of the lower ſurface of the Glaſs: and this muſt be adjuſted by the circular Glaſs deſcribed above. Within the vertex of this hollow cone, the lower point of the pole is to be applied in poliſhing; but it may be firſt proper to be obſerved, that, perhaps, fiſh-glew and a braſs plate, in lieu, and of the dimenſions of the above-ſaid ſlate, may perhaps be better. Mr. Huygens obſerves alſo, that the angle of the cone ſhould be eighty or ninety degrees, and that the hollow vertex of it ſhould be ſolid enough to receive a ſmall impreſſion from a round ſteel punch, to put the point of the pole into, which might otherwiſe have too much liberty and ſlip from the vertex. The deſign of the black ſpot, in the middle of the Glaſs, is to diſcover, by the light of a candle, obliquely reflected from your Glaſs, after it has been poliſhed ſome time, whether it be perfectly clear, and free from the appearance of any bluiſh colour like that of aſhes.

Before the work of poliſhing is begun, it is proper to ſtretch an even well wrought piece of linen over the tool, duſting thereupon ſome very fine tripoly. Then, taking the Glaſs in your hand, run it round forty or fifty times thereupon; and this will chiefly take off the roughneſs of the Glaſs about the border of it, which otherwiſe might too much wear away the lower parts of the tool, in which the Glaſs is chiefly to obtain its laſt poliſh. If I underſtand Mr. Huygens right, this cloth is then to be removed, and the Glaſs to be begun to be poliſhed upon the very naked tool itſelf. But, firſt, there is to be prepared ſome very fine tripoly, and alſo ſome blue vitriol, otherwiſe called cyprion, Engliſh and Hungarian vitriol finely powdered; mix four parts of tripoly with one of vitriol: ſix or eight grains of this mixture (which is about the quantity of two large peaſe) is ſufficient for a Glaſs five inches broad. This compound powder muſt be wetted with about eight or ten drops of clear vinegar in the middle of the tool; and it muſt be mixed and ſoftened thoroughly with a very fine ſmall mullet. Then with a coarſe painting bruſh take great care to ſpread it thinly and equally upon the tool, or at leaſt upon a much larger ſpace in the middle of it, than the Glaſs ſhall run ever in the poliſhing. This coat muſt be laid on very thin (but not too thin neither) otherwiſe it will waſte away too much in the poliſhing, and the tool will be apt to be furrowed thereby, and to have its figure impaired; inſomuch that ſometimes a new daubing thereof muſt be laid on, which it is not eaſy to do ſo equably as at firſt. This daubing muſt be perfectly dried by holding over it a hot clean frying-pan, or a thin pan of iron, with lighted charcoal therein for that purpoſe; then leave all till the tool is perfectly cold. Then having ſome other very fine tripoly very well waſhed and ground with a mullet, and afterwards dried and finely powdered; take ſome of the ſame, and ſtrow it thinly and equably on the tool ſo prepared: then take your coarſe Glaſs which lay by you, and ſmooth all the ſaid tripoly, very equably and finely: then, take your Glaſs to be poliſhed, and wipe it thoroughly clean from all cement, greaſe, or other filth which may ſtick to it, with a clean cloth dipped in water, a little tinged with tripoly and vitriol; then taking your Glaſs in your hand, apply it on the tool, and move it gently twice or thrice, in a ſtraight line backwards and forwards; then take it off, and obſerve whether the marks of the tripoly, ſticking to the Glaſs, ſeem to be equably ſpread over the whole ſurface thereof; if not, it is a ſign that either the tool or the Glaſs is too warm; then you muſt wait a little, and try again, till you find the Glaſs take the tripoly every-where alike. Then you may begin boldly to poliſh, and there will be no great danger of ſpoiling of the figure of the Glaſs; which in the other caſe would infallibly happen. If the tool be warmer than the Glaſs, it will touch the Glaſs harder in the middle than towards its circumference; becauſe the upper ſurface of the tool, being ſwelled by heat, will become too flat. On the contrary, if the Glaſs be warmer than the tool, it will bear harder towards its circumference than at the center; becauſe the inferior ſurface of the Glaſs is contracted by the coldneſs of the plate more than the ſuperior.

Mr. Huygens ſays, that, if the work of poliſhing were to be performed by ſtrength of hand only, it would be a work of very great labour, and even could not be performed in Glaſs of five or ſix feet focal diſtance: and he ſeems to think it abſolutely neceſſary that an extraordinary great force or preſſure ſhould be applied upon the Glaſs. For this purpoſe, he has therefore contrived and deſcribed two methods for ſufficiently increaſing the preſſure; for the explanation of which, recourſe muſt be had to the book itſelf and his figures; it may ſuffice here to ſay that they chiefly conſiſt in applying the force of a ſtrong ſpring to preſs down the center of the Glaſs upon the poliſher.

This operation of poliſhing, as it is one of the moſt difficult and nice points of the whole, hath been very variouſly attempted and deſcribed by various authors. Sir Iſaac Newton, Pere Cherubin, Mr. Huygens, and the common Glaſs-grinders have taken different methods in this matter. Sir Iſaac is the only perſon who ſeems not to inſiſt on the neceſſity of a very violent and ſtrong preſſure. In the Engliſh octavo edition of his Optics, page 95, he hath theſe words: ‘ An object Glaſs of fourteen feet, made by an artificer at London, I once mended conſiderably, by grinding it on pitch with putty, and leaning very eaſily on it in the grinding, leſt the putty ſhould ſcratch it. Whether this may not do well enough for poliſhing theſe reflecting Glaſſes, I have not yet tried. But he that ſhall try either this or any other way of poliſhing which he may think better, may do well to make his Glaſſes ready for poliſhing, by grinding them without that violence, wherewith our London workmen preſs their Glaſſes in grinding. For by ſuch violent preſſure Glaſſes are apt to bend a little in the grinding, and ſuch bending will certainly ſpoil their figure.’

As to his own method of poliſhing Glaſs, I do not know that he any where expreſly deſcribes it; but his method of poliſhing reflecting metals he doth, and it was thus in his own words, page 92. ‘ The poliſh I uſed was in this manner: I had two round copper-plates, each ſix inches in diameter, the one convex, the other concave, ground very true to one another. On the convex, I ground the object-metal or concave, which was to be poliſhed, till it had taken the figure of the convex and was ready for a poliſh. Then I pitched over the convex, very thinly, by dropping melted pitch upon it, and warming it to keep the pitch ſoft, whilſt I ground it with the concave copper wetted to make it ſpread evenly all over the convex. Thus, by working it well, I made it as thin as a groat, and, after the convex was cold, I ground it again, to give it as true a figure as I could. Then I took putty which I had made very fine by waſhing it from all its groſſer particles, and, laying a little of this upon the pitch, I ground it upon the pitch with the concave copper, till it had done making a noiſe, and then upon the pitch I ground the object-metal with a briſk motion for about two or three minutes of time, leaning hard upon it. Then I put freſh putty upon the pitch and ground it again, till it had done making a noiſe, and afterwards ground the object-metal upon it as before. And this work I repeated till the metal was poliſhed, grinding it the laſt time with all my ſtrength for a good while together, and frequently breathing upon the pitch to keep it moiſt, without laying on any more freſh putty. The object-metal was two inches broad, and about one third part of an inch thick to keep it from bending. I had two of theſe metals, and, when I had poliſhed them both, I tried which was beſt, and, ground the other again, to ſee if I could make it better than that which I kept. And thus, by many trials, I learned the way of poliſhing, till I made thoſe two reflecting perſpectives I ſpake of above. For this art of poliſhing will be better learned by repeated practice than by my deſcription. Before I ground the object-metal on the pitch, I always ground the putty on it with the concave copper till it had done making a noiſe, becauſe, if the particles of the putty were not by this means made to ſtick faſt in the pitch, they would, by rolling up and down, grate and fret the object-metal, and fill it full of little holes’. It ſeems not improbable but that the Glaſs may alſo be poliſhed with proper care by the ſame method.

The method of poliſhing, deſcribed by Pere Cherubin, ſeems to be chiefly thus: he poliſhes with tripoly or putty, or firſt with tripoly, and afterwards with putty. But what he ſeems moſt to approve of is putty alone. He poliſhes in the ſame tool he grinds in, and he very verboſely deſcribes various ways of doing it. He preſcribes to ſtretch, very tight, a very fine thin leather, or fine Engliſh fuſtian, or fine holland, or any fine linen, or fine ſilk taffety, or ſattin, all of an equable thickneſs as near as may be, upon the tool; then he daubs thinly on this ſurface, thus ſtretched, a ſtreak of putty, ſufficiently wetted to the conſiſtence of thick ſyrup, about as broad as the Glaſs or a little more, paſſing through the center of the tool directly from him; then ſmoothing the putty by running his bruiſer, and preſſing it backwards and forwards to him and from him, he at length lays on the Glaſs cemented to its handle; and giving it always the ſame motion, ſtrongly preſſing to him, and from him along the ſtreak of putty, and by ſuch preſſure forcing the ſurface of the ſilk, already ſomewhat ſtretched, cloſe to the ſurface of the tool, to which the figure of the Glaſs was exactly adapted, he ſays that he could by that means obtain an excellent fine poliſh on any of the above-mentioned ſubſtances. Before the ſtroke he turned the Glaſs a little on its axis, and its handle was on this occaſion conſiderably heavier than uſual in grinding, which he commends as very uſeful in this buſineſs; and, if new putty was wanting, he made no difficulty of laying it on, as often as neceſſary; always carefully ſmoothing it thereon with the bruiſer, before the Glaſs was applied.

This method I am of opinion might be improved by moving the Glaſs not by hand but by the pole, and ſpring, ſomewhat after the method of Mr. Huygens, eſpecially if the pole were contrived not to move looſe in a round braſs hole above, but on a ſtrong point preſſed down by ſome ſpring; the length of the pole being equal to the radius of the tool, and the point where the ſpring preſſes the upper end of the pole, being truly perpendicular over the center of the tool, and exactly in the center of its ſphere.

Another method which the ſame author preſcribes for poliſhing in the tool is thus: he takes a ſheet of very fine paper, and, examining it very carefully by looking upon it and through it, he takes off with a fine penknife all the little lumps, hard parts, roughneſſes and inequalities that he can find; then he ſoaks it in clean water, then he takes it and dries it between two clean linen cloths, though not ſo much as to make it quite dry, but to leave it dampiſh; then with ſome very thin ſtarch or paſte he daubs equally all over the ſurface of his tool as thin as poſſible, but ſome every-where; then he lays on his paper very gently and ſlowly, letting it touch and ſtick firſt at one ſide, and by degrees more and more towards the middle, and by degrees to cover the whole; and he does this ſlowly to let all the air get out; then with the palm of his hand he preſſes the center and every-where round about it towards the circumference to make the paper ſtick every-where; and this he does three or four times, while it is drying, to get out all the air; he lets it dry of itſelf, then he reviſes it again with his knife as before; then he hath a very coarſe bruiſer of glaſs whoſe circumference is ſharply ground round and at right angles to its ſurface, which he had coarſely ground before in the ſame tool; with this and a very heavy handle he ſmooths and poliſhes and rubs off all the remaining inequalities of the paper, and, when this is done, he lays on a ſtreak of tripoly and poliſhes as in his other method.

At C C (*Plate* XXI. *fig.* 9.) is repreſented a ſquare beam of wood a little longer than the diameter of the tool, and about 1 , inch thick; the two extremities of it at C and C are bent downwards, and then are again directed parallel to the whole length, and ſerve for handles for the workman to lay hold upon. In the middle of this beam there is fixed an iron ſpike, ſo long that, when the lower ſurfaces of the handles C, C, are placed upon a plane, the point of the ſpike ſhall juſt touch the plane. This point preſſes upon the apex of the hollow cone, which deſcends through the hole in the ſlate, which by the interpoſition of a cloth was cemented to the glaſs B lying upon the tool A. To increaſe this preſſure a ſort of bow D E D is ſhaped out of a deal board, half an inch thick and 5 feet long, being 7 inches broad in the middle, and tapered narrower towards its extremities, ſo as to end almoſt in a ſharp point. The middle of the bow is fixed to the floor by an iron ſtaple at E driven croſs it, and is bent into an arch by a rope F I I F; to which two other ropes are tied at I and I; the interval I I being equal to the length of the beam C C. One of theſe ropes I C C G goes over the back of the beam C C, paſſing through a hole in each handle at C and C, and then is lapped round a cylindrical peg at G, that paſſes through two wooden chaps, to the bottom of which the other rope is tied that comes from the other I. So that by turning the peg G, to lap the rope about it, the bow D D may be bent as much as you pleaſe. The tool A is placed upon a ſtrong ſquare board fixed to the table O on one ſide, and ſupported on the other ſide by the poſt P. Then the workman ſits down, and, taking hold of the handles C C, he draws the glaſs to him and from him over the tool A, with a moderate motion. And after every 20 or 24 ſtrokes he turns the Glaſs a little about its axis. This way of poliſhing took up two or three hours, and was very laborious as well as tedious, becauſe the glaſs, being ſo much preſſed downwards, was moved very ſlowly.

Inſtead of the bow D D (*fig.* 10.) afterwards I invented another ſpring, by ſloping the flat ends of a couple of deal boards α β, α γ, and by nailing the flat ſlopes together very firmly, that the boards might make an acute angle β α γ, One of theſe boards ſo joined was laid upon the floor under the poliſhing table, the end β γ being under the middle of the tool A, ſo that they lay quite out of the way of the workman, who before was a little incommoded by the ends of the bow.

D D. The boards at the end α were 8 or 10 inches broad, and from thence went tapering almoſt to point at β and γ. The board α γ, lying upon the floor, the end β of the upper board was pulled downwards by a rope β ε ζ that paſſed under a pulley ε, fixed to the floor, and then was lapped round a ſtrong peg ζ that turned ſtiff in a hole in the floor. Under the end γ the middle of a ſtrong ſtick δ γ δ was fixed at right angles to the board α γ, and cords were tied to each end of this ſtick at δ, δ, which went over the poliſhing beam C, C, as in the former machine. This ſtick was lifted up but very little from the floor at the time of poliſhing; and by conſequence the ropes, δ C, δ C, were long enough to give liberty of motion to the poliſhing beam C C. Two iron pins θ, θ, paſſing through the ends of the boards α, were ſkrewed into the floor; but the heads of the pins ſtood up above the boards, to give them liberty to riſe up, when the rope β ε ζ was ſtretched.

To facilitate the labour of moving the glaſs backwards and forwards in the tool, I made this addition to the former machine. At M (*fig.* 9.) is repreſented a ſtrong hand made of wood or iron, having a ſquare cavity cut through the bottom of it, for the poliſhing beam C C to paſs through, not tight, but with ſome liberty. To one ſide of this hand M a long board L L is annexed, ſome way or other, by means of an iron bolt. The breadth of the lower ſurface of this board L L is equal to the breadth of the hand M, being 2 inches and a half; its thickneſs is half an inch, and its length is equal to three ſemidiameters of the tool. The board L L muſt be drawn lengthways backward and forward over a block H fixed firmly to a table O; the thickneſs of the block being ſuch that the boar L L may lie an inch higher than the ſurface of the tool A. The wooden hooks at π and the pins at Σ keep the motion of the board in the ſame direction, by hindering it from ſlipping either ſideways or upwards. Over this board, at right angles to it, and over the middle of the block H, there lies a wooden roller, having a ſtrong iron axis which turns in the holes of two iron plates fixed to the ends of the block. The thickneſs of the roller is about an inch and a half. Through two holes bored through this roller and made wider at one end of them, two ſtrong cords are made to paſs with knots at one end of them, to be drawn into the wider parts of the holes, that they may neither ſlip through nor ſtand out from the roller. Then each cord is lapped round the cylinder ſeveral times, and one end of each is pegged firmly into the board L L at the end towards M, and the other ends of them are lapped round a peg at N; which, being turned round will ſtretch the cords as much as you pleaſe. At one end of the axis of this roller there is a handle Q, which being turned round, backwards and forwards alternately, the board L L, with the glaſs annexed to it, is moved to and fro, ſo far, that about a third part of its diameter ſhoots both ways over the margin of the tool. The ſpike in the middle of the beam C C preſſes the Glaſs a little obliquely, becauſe the hand M holds the beam C C, not tight but ſomewhat looſely, to the end that the Glaſs may paſs over the tool without trembling. Nevertheleſs this inclination of the ſpike muſt be but very ſmall, and may eaſily be increaſed or diminiſhed ſeveral ways. Two pins or ſtops muſt be fixed to the under ſurface of the board L L, to determine the length of the ſtroke. The tool A, or rather the ſtone to which it is cemented, is ſqueezed faſt between the block H and a ſtrong ſtop on the oppoſite ſide of the ſtone, by the interpoſition of a wedge. The workman ſits upon a round ſtool, and, when one hand is tired with turning the roller, he applies the other; and therefore is not tried ſo ſoon as with the other machine, which required both hands, and alſo a reciprocating motion of his whole body. Some time after, I cauſed a longer handle Q *a* to be made that turned at both ends, for the convenience of uſing both hands at once.

After every 20 or 24 ſtrokes it is neceſſary to give the glaſs a ſmall turn about its axis; which is eaſily done by laying hold of the ſlate fixed to it, with one hand, while the other hand goes on with the poliſhing motion. The tool muſt alſo be moved a little after every 25 or 50 ſtrokes, by drawing it half a ſtraw's breadth towards that part of it which the Glaſs has left, and by drawing it back again after as many more ſtrokes. At the beginning of the work the tripoly will be gathered into little lumps in ſome places of the tool, but will be diſperſed again, in a little time; and then the area of the tool will become perfectly ſmooth.

If the tripoly does not appear to ſtick equally to the glaſs in all parts, and to be diffuſed over it in ſlender ſtraight ſtreaks, the frying-pan, with coals in it, muſt be held over the tool again; till you perceive the area or coat of tripoly is not quite ſo cold as the other parts of the tool. Then let tripoly be rubbed upon the tool again, and let the Glaſs be preſſed over it with your hand, to try whether it ſticks equally to the Glaſs in every place. When it does, you may proceed to the work of poliſhing. But, after I began to make uſe of vitriol inſtead of verdigreaſe, all that I have ſaid about warming the tool may be omitted. Becauſe theſe coats always touch the Glaſs as they ſhould do, and ſtick better than before. Alſo let the tool be rubbed with tripoly over the coat without warming the tool, that the coat may be preſerved more entire, and that the Glaſs may touch it better; which muſt always be repeated after 200 or 400 ſtrokes in poliſhing. The Glaſs ſhould alſo be taken from the tool after 200 ſtrokes, by withdrawing the bolt L which connects the hand M to the board L L, and by removing the beam C C. Then rub your finger upon the glaſs, or a clean rag or a bit of leather, to examine how much it is poliſhed.

To ſave the trouble of counting the ſtrokes, there is a wooden wheel Δ X, 7 or 8 inches broad, placed flat againſt a board, fixed to the ſide of a wall. It turns eaſily about an axis, and has 24 teeth, like thoſe of a ſaw, which are puſhed round by a bended wire T Y X, in this manner: the wire turns about a center Y, and while one end of it is pulled by the ſtring T V, tied to the end of the board L L, the oppoſite end Y X puſhes back a long ſtring R S fixed to the board at R; which by preſſing upon the wire at S cauſes the part Y X to bend a little, and ſo the point X, in returning to the wheel (the ſtring being relaxed) falls a little lower, into the next tooth, and puſhes it forward into the poſition repreſented in the figure. There is a ſpringing catch at Δ which ſtays the wheel after every ſtroke at X. Laſtly, there is a pin fixed in the circumference of the wheel at Z, which, by preſſing the tail of a hammer and letting it go again, cauſes a bell to ſound after every revolution of the wheel, and gives notice that the Glaſs muſt be turned a little about its center. It is eaſy to underſtand that another piece of wheel-work, having three or four indexes, whoſe revolutions are in decimal progreſſion, may be fixed to the block H and impelled by the ſtrokes of the board L L; by which means, without any trouble of counting, one may be informed how many ſtrokes go to poliſh a Glaſs.

A glaſs 5 or 6 inches broad requires about 3000 ſtrokes upon each ſurface, to bring it to perfection: and you muſt carefully examine the middle of the Glaſs oppoſite to the blacking, whether any place appears darkiſh or of an aſh-colour, or whether any ſmall ſpots appear by an oblique reflection of the light of a candle or of a ſmall beam of light let into a dark room. For the other parts of the Glaſs will appear perfectly fine much ſooner than the middle.

After the glaſs has been ſufficiently poliſhed, let the ſtone, the cloth, and the cement be warmed over a pan of charcoal, till the cement grows ſo ſoft that the Glaſs may be ſeparated from it by a ſide motion. Then whatever cement remains upon the Glaſs muſt be wiped off with a hot cloth dipped in oil or tallow, and laſt of all with cleaner cloths. Then if it does not appear perfectly poliſhed (for we are often deceived in this point) the work muſt be repeated again, by glewing the Glaſs to the ſlate as before; then it muſt be wiped very clean and be made a little rough, as we ſaid before. We may alſo lay a new fund or coat upon the tool, if the old one be ſpoiled, provided no other Glaſs has been poliſhed in the tool in the mean time. The old fund may be waſhed off from the tool with a little vinegar. Laſtly, take care always to chuſe the thickeſt and the cleareſt pieces of Glaſs, to avoid a great many difficulties that ariſe from the unequal preſſure in poliſhing. *Smith's Optics.*

GLASS-*chalcedony*. A mixture of ſeveral ingredients, with the common matter of Glaſs, will make it repreſent the ſemi-opake gems, the jaſpers, agates, chalcedonies, &c.

The way of making theſe ſeems to be the ſame thing with the method of making marbled paper, by ſeveral colours diſſolved in ſeveral liquors, which are ſuch as will not readily mix with one another, when put into water, before they are caſt upon the paper which is to be coloured. There are ſeveral ways of making theſe variouſly coloured Glaſſes, but the beſt is this: diſſolve four ounces of fine leaf ſilver in a Glaſs veſſel in ſtrong aqua fortis, ſtop up the veſſel, and ſet it aſide.

In another veſſel diſſolve four ounces of quick-ſilver in a pound of aqua fortis, and ſet this aſide.

In another Glaſs veſſel diſſolve in a pound of aqua fortis three ounces of fine ſilver, calcined in this manner: amalgamate the ſilver with mercury, mix the amalgama with twice its weight of common ſalt well purified; put the mixture in an open fire in a crucible, that the mercury may fly off, and the ſilver be left in the form of powder. Mix this powder with an equal quantity of common ſalt well purified, and calcine this for ſix hours in a ſtrong fire; when cold, waſh off the ſalt by repeated boilings in common water, and then put the ſilver into the aqua fortis. Set this ſolution alſo aſide.

In another veſſel diſſolve in a pound of aqua fortis three ounces of ſal armoniac, pour off the ſolution, and diſſolve it in a quarter of an ounce of gold. Set this alſo aſide.

In another veſſel diſſolve three ounces of ſal armoniac in a pound of aqua fortis, then put into the ſolution cinnabar, crocus martis, ultramarine, and ſevretto of Spain, of each half an ounce. Set this alſo aſide.

In another veſſel diſſolve in a pound of aqua fortis three ounces of ſal armoniac, then put into it crocus martis made with vinegar, calcined tin, zaffer, and cinnabar, of each half an ounce; let each of theſe be powdered very fine, and put gently into the aqua fortis. Set this alſo aſide.

In another veſſel diſſolve three ounces of ſal armoniac in a pound of aqua fortis, and add to it braſs calcined with brimſtone, braſs thrice calcined, mangneſe, and ſcales of iron which fall from the ſmith's anvil, of each half an ounce; let each be well powdered, and put gently into the veſſel. Then ſet this alſo aſide.

In another veſſel diſſolve two ounces of ſal armoniac in a pound of aqua fortis, and put to it verdigreaſe an ounce, red lead, crude antimony, and the caput mortuum of vitriol, of each half an ounce; put theſe well powdered leiſurely into the veſſel, and ſet this alſo aſide.

In another veſſel diſſolve two ounces of ſal armoniac in a pound of aqua fortis, and add orpiment, white arſenic, painter's lake, of each half an ounce: keep theſe nine veſſels in a moderate heat for fifteen days, ſhaking them well at times. After this pour all the matters from theſe veſſels into one large veſſel, well luted at its bottom; let this ſtand ſix days, ſhaking it at times, and then ſet it in a very gentle heat, and evaporate all the liquor, and there will remain a powder of a purpliſh green.

When this is to be wrought, put into a pot very clear metal, made of broken cryſtalline and white glaſs, that has been uſed; for with the virgin frit, or ſuch as has never been wrought, the chalcedony can never be made, as the colours do not ſtick to it, but are conſumed by the frit. To every pot of twenty pounds of this metal put two or three ounces of this powder at three ſeveral times; incorporate the powder well with the Glaſs, and let it remain an hour between each time of putting in the powder. After all is in, let it ſtand twenty-four hours; then let the Glaſs be well mixed, and take an eſſay of it, which will be found of a yellowiſh blue; return this many times into the furnace; when it begins to grow cold, it will ſhew many waves of different colours very beautifully. Then take tartar eight ounces, ſoot of the chimney two ounces, crocus martis made with brimſtone half an ounce; let theſe be well powdered and mixed, and put them, by degrees, into the Glaſs at ſix times, waiting a little while between each putting in; when the whole is put in, let the glaſs boil and ſettle for twenty-four hours, then make a little Glaſs body of it, which put in the furnace many times, and ſee if the Glaſs be enough, and whether it have on the outſide veins of blue, green, red, yellow, and other colours, and have, beſides theſe veins, waves like thoſe of the chalcedonies, jaſpers, and oriental agates, and if the body kept within looks as red as fire.

When it is found to anſwer thus, it is perfect, and may be worked into toys and veſſels, which will always be beautifully variegated; theſe muſt be well annealed, which adds much to the beauty of their veins. Maſſes of this may be poliſhed at the lapidary's wheel as natural ſtones, and appear very beautiful. If in the working the matter grow tranſparent, the work muſt be ſtopped, and more tartar, ſoot, and crocus martis, muſt be put to it, which will give it again the neceſſary body and opacity, without which it does not ſhew the colours well. *Neri's Art of Glaſs.*

Glass *of lead*, a Glaſs made with the addition of a large quantity of lead, of great uſe in the art of making counterfeit gems. The method of making is this: put a large quantity of lead into a potter's kiln, and keep it in a ſtate of fuſion with a moderate fire till it is calcined to a grey looſe powder; then ſpread it in the kiln, and give it a greater heat, continually ſtirring it, to keep it from running into lumps; continue this ſeveral hours, till the powder becomes of a fair yellow, then take it out and ſift it fine; this is called calcined lead.

Take of this calcined lead fifteen pounds, and cryſtalline, or other frit, twelve pounds; mix theſe as well as poſſible together, put them into a pot, and ſet them in the furnace for ten hours; then caſt the whole, which will be now perfectly melted, into water; ſeparate the looſe lead from it, and return the metal, into the pot, and, after ſtanding in fuſion twelve hours more, it will be fit to work. It is very tender and brittle, and muſt be worked with great care, taking it ſlowly out of the pot, and continually wetting the marble it is wrought upon.

Glaſs of lead is capable of all the colours of the gems in very great perfection. The methods of giving are theſe: for green, take polverine frit, twenty pounds; lead calcined, fixteen pounds; ſift both the powders very fine, then melt them into a Glaſs, ſeparating the unmixed lead, by plunging the maſs in water; after this return it into the pot, and add braſs thrice calcined, ſix ounces; and one penny-weight of crocus martis made with vinegar; put this in at ſix different times, always carefully mixing it together; let it finally ſettle an hour, then mix it together and take a proof of it; when the colour is right, let it ſtand eight hours, and then work it. If inſtead of the calcined braſs, the ſame quantity of caput mortuum of the vitriolum veneris be uſed, the green is yet much finer.

For topaz colour, take cryſtal frit, fifteen pounds; calcined lead, twelve pounds; mix them well together by ſifting the powders through a fine ſieve, then ſet them in a furnace not too hot, and ſeparate the ſuperfluous unmixed lead, by caſting the whole into water; repeat this twice, then add half gold yellow Glaſs, and let them incorporate and purify, and they will be of the true and exact colour of the oriental topazes.

For ſea-green, take cryſtal frit, ſixteen pounds; calcined lead, ten pounds; mix and ſift them together, and ſet them in a pot in a furnace, and in twelve hours the whole will be melted; then caſt it into water, and ſeparate it from the looſe lead; put them into the furnace again for eight hours, then ſeparate the looſe lead by waſhing a ſecond time, and return it to the pot for eight hours more. *Neri's Art of Glaſs.*

Glass-*balls*, a term uſed to expreſs circular or otherwiſe ſhaped hollow veſſels of Glaſs, coloured within, ſo as to imitate the ſemipellucid gems. The method of doing it is this: make a ſtrong ſolution of ichthyocolla or iſinglaſs in common water by boiling; pour a quantity of this while warm into the hollow of a white Glaſs veſſel, ſhake it thoroughly about, that all the ſides may be wetted, and then pour off the reſt of the moiſture. Immediately after this, throw in red-lead; ſhake it and turn it about, throw it into many places with a tube, and the moiſture will make it ſtick and run in waves and pretty figures. Then throw in ſome of the painter's blue ſmalt, and make it run in waves in the ball as the red-lead; then do the ſame with verdigreaſe, next with orpiment, then with red-lake, all well ground; always caſting in the colours in different places, and turning the Glaſs, that the moiſture within may run them into the waves. Then take fine plaiſter of Paris, and put a quantity of it into the ball, ſhake it alſo nimbly about; this will every-where ſtick firmly to the Glaſs, and give it a ſtrong inner coat, keeping all the colours on very fairly and ſtrongly. Theſe are ſet on frames of carved wood, and much eſteemed as ornaments in many places. *Neri's Art of Glaſs.*

Glass *globules for teleſcopes.*— Mr. Butterfield tells us, he had tried ſeveral ways of making Glaſs globules of the bigneſs of great pins heads, and leſs, as in the flame of a candle, made of tallow or wax; but, that the beſt ſort of flame for making them clear and without ſpecks was, that of a lamp, made with rectified ſpirits of wine. Where, inſtead of a cotton wick, he made uſe of fine ſilver wire doubled up and down like a ſkein of thread. Then, having prepared ſome fine Glaſs, beaten to powder and waſhed very clean, he took a little of it upon the ſharp point of a ſilver needle wetted with ſpittle, and held it in the flame, turning it about till it melted and became quite round, but no longer, for fear of burning it. The art lies in giving the globule an exact roundneſs, which can only be learned by experience. When a great many globules are thus formed, he rubs them clean with a ſoft leather. Then having ſeveral ſmall pieces of thin braſs-plates, twice as long as they are broad, he doubles them up into the form of a ſquare, and punches a fine hole through the middle of them: and having rubbed off the bur about the holes with a whetſtone, and blacked the inſides of the plates with the ſmoke of a candle, he places a globule between the two holes, and tacks the plates together with two or three rivets. Then he tries how they magnify ſmall objects, and keeps the beſt of them for uſe.

Dr. Hook uſed to take a very clear piece of Glaſs, and to draw it out into long threads in a lamp; then he held theſe threads in the flame, till they ran into round globules, hanging to the end of the threads. Then having fixed the globules with ſealing-wax to the end of a ſtick, ſo that the threads ſtood upwards, he ground off the ends of the threads upon a whetſtone, and poliſhed them upon a ſmooth metal plate with a little putty.

Mr. Stephen Gray tells us, that, for want of a ſpirit lamp, he laid a ſmall particle of Glaſs, about the bigneſs of the intended globule, upon the end of a piece of charcoal; and, by the help of a blaſt-pipe, with the flame of a candle he ſoon melted it into a globule. By this means he made them indifferently clear, and the ſmalleſt very round; but the larger, by reſting upon the coal, were a little flatted, and received a roughneſs on that ſide. Therefore he was wont to grind and poliſh them upon a braſs plate, till he reduced them to hemiſpheres. But he found that the ſmall globules, beſides that they magnified more, ſhewed objects more diſtinct than the hemiſpheres.

Theſe experiments led him to another which is very curious. Having obſerved, ſays he, ſome irregular particles within the Glaſs globules, and finding they appeared diſtinct and prodigiouſly magnified, when held cloſe to my eye; I concluded that if I conveyed a ſmall globule of water cloſe to my eye, in which there were any opacous or leſs tranſparent particles than the water, I might ſee them diſtinctly. I therefore took on a pin a ſmall portion of water which I knew to have in it ſome minute animals, and laid it on the end of a ſmall piece of braſs wire, that then lay by me, about one tenth of an inch in diameter, till there was formed ſomewhat more than an hemiſphere of water. Then, keeping the wire erect, I applied it to my eye, and ſtanding at a proper diſtance from the light, I ſaw them and ſome irregular particles as I had predicted, but moſt enormouſly magnified. For, whereas they were ſcarce diſcernable by my Glaſs microſcope, they appeared within the globule not much different in form, nor leſs in magnitude than ordinary peaſe. They cannot well be ſeen by day-light, unleſs the room be darkened, after the manner of the famous dioptrical experiment, but moſt diſtinctly by candle-light. They may alſo be ſeen very well by the full-moon light.

Mr. Gray explains the reaſon of this appearance as follows: Let the circle D B B D (*Plate* XXI. *fig.* 11.) repreſent a ſphere of water, A, an object placed in its focus, ſending forth a cone of rays, two of which are A B, A B; which, coming into the water at B and B, will be refracted from their direct courſe, and become B D, B D; and, at D D, they will, at their paſſing into air, again be refracted into D E, D E; and ſo run parallel to one another, and to the axis of the ſphere A F C G. Now, it is a known principle in optics, that the angle of reflexion is equal to the angle of incidence: wherefore let the rays B D, B D, be imagined to have come from ſome point F of an object placed within the ſphere of water, by being reflected from the interior ſurface of the ſphere at B B. But C B D is the angle of reflexion, to which making C B F equal, the point F will be the place, from whence, if an object ſends forth a cone of rays, two of them as F B, F B, will be reflected into the lines B D, B D; and then, coming to the other ſide of the globule at D D, they will be refracted into D E, D E, as before: and, conſequently, will be fit for diſtinct viſion, whether the object be placed in F within, or in A without the ſphere, if its interior ſurface be conſidered as a concave ſpeculum.

Glass *porcelain*, the name given by many to a modern invention of imitating the China ware with Glaſs. The method given by Mr. Reaumur, who was the firſt that carried the attempt to any degree of perfection, is delivered by that gentleman in the Memoirs of the Academy of Sciences of Paris, to this effect.

The mixing of Glaſs reduced to powder, with other leſs eaſily vitrifiable ſubſtances for the forming a paſte to be afterwards made into a ſort of porcelain, has been a contrivance long practiſed, but it is very troubleſome, and the reſult ſubject to many faults; but this new ware is made of Glaſs alone, and that with much leſs trouble, and without the reducing it to powder. By this art, veſſels of Glaſs are changed into veſſels of a ſort of porcelain, without altering their form, and the meaneſt Glaſs ſerves as well as the beſt for that purpoſe; our common coarſe green quart bottles, or the great bell Glaſſes with which gardeners cover their melons, &c. being by this means changeable into a beautiful white ſort of porcelain ware; and this is to be done in ſo eaſy a manner, and with ſo ſmall an expence, that it requires no more trouble or charge, than that of baking a common veſſel of our coarſe earthen ware, and, for this reaſon, the veſſels of this ſort of ware may be afforded extremely cheap.

It is very certain, that all porcelain ware is a ſubſtance in the ſtate of a ſemivitrification; and, in order to bring Glaſs, which is a wholly vitrified ſubſtance, into the condition of porcelain, there requires no more than to reduce it to a leſs perfectly vitrified ſtate.

The queſtion which would naturally be ſtarted on this occaſion, is, whether it be poſſible to reduce Glaſs into a leſs vitrified ſtate, it having already undergone what is eſteemed the laſt change by fire? But when we conſider that the Glaſs of antimony, the vitrifications of many of the metals, as the Glaſs of lead, and the counterfeit gems coloured by the metals, are more or leſs eaſily reduced again by chemiſtry to metals, &c. the reducing ſand, flints, &c. after they are vitrified, at leaſt a little way back toward their native or priſtine ſtate, may appear not wholly impracticable; and the attempts which Mr. Reaumur made on this occaſion, were what gave him the firſt hints of the Glaſs porcelain.

The method of making it is this: the Glaſs veſſels to be converted into porcelain, are to be put into a large earthen veſſel, ſuch as the common fine earthen diſhes are baked in, or into ſufficiently large crucibles; the veſſels are to be filled with a mixture of fine white ſand, and of fine gypſum or plaiſter-ſtone burnt into what is called plaiſter of Paris; and all the interſtices are to be filled up with the ſame powder, ſo that the Glaſs veſſels may no where touch either one another, or the ſide of the veſſel they are baked in. The veſſel is to be then covered down and luted, and the fire does the reſt of the work; for this is only to be put into a common potter's furnace, and, when it has ſtood there the uſual time of the baking the other veſſels, it is to be taken out, and the whole contents will be found no longer Glaſs, but converted into a white opake ſubſtance, which is a very elegant porcelain, and has almoſt the properties of that of China. *Mem. Acad. Scien. Par.* 1739.

Glass *pots*, the veſſels in the Glaſs trade uſed for melting the Glaſs. Thoſe for the white Glaſs works are made of a tobacco-pipe clay, brought from the iſle of Wight, which is firſt well waſhed, then calcined, and afterwards ground to a fine powder in a mill; which, being mixed with water, is then trod with the bare feet, till it is of a proper conſiſtence, to mould with the hands into the proper ſhape of the veſſels. When theſe are thus made, they are afterwards annealed over the furnace. Thoſe for the green Glaſs work are made of the none-ſuch, and another ſort of clay from Staffordſhire; they make theſe ſo large as to hold three or four hundred weight of metal. And, beſides theſe, they have a ſmall ſort called piling pots, which they ſet upon the larger, and which contain a finer and more nice metal fit for the niceſt works. *Neri's Art of Glaſs.*

GLA'ZING, in pottery, a compoſition applied to veſſels of earth, &c. to render them more beautiful, and prevent fluids from penetrating them.

Black Glazing, is made of lead-aſhes, eighteen meaſures; iron-filings, three; copper-aſhes, three; and zaffer, two meaſures. This, when melted, will make a brown black; and, if you want it blacker, add more zaffer to it.

Blue Glazing is thus prepared: take lead-aſhes, one pound; clear ſand or pebble, two pounds; ſalt, two pounds; white calcined tartar, one pound; Venice, or other glaſs, ſixteen pounds; and zaffer, half a pound; mix them well together, and melt them for ſeveral times, quenching them always in cold water. If you would have it fine and good, it will be proper to put the mixture into a glaſs furnace for a day or two.

Brown Glazing, is made of common glaſs and mangaueſe, or brown ſtone, of each one part; and lead of glaſs twelve parts.

Fleſh colour Glazing, is made of twelve parts of lead-aſhes, and one of white glaſs.

Gold-coloured Glazing. To make gold-coloured Glazing, take of litharge three parts; of ſand or calcined flint, one part; pound and mix theſe very well together, then run them into a yellow glaſs with a ſtrong fire. Pound this glaſs and grind it into a ſubtile powder, which moiſten with a well ſaturated ſolution of ſilver, and make it into a paſte; which put into a crucible, and cover it with a cover. Give at firſt a gentle degree of fire, then increaſe it, and continue it till you have a glaſs, which will be green. Pound this glaſs again, and grind it to a fine powder; moiſten this powder with ſome beer, ſo that, by means of a hair pencil, you may apply it upon the veſſels, or any piece of earthen ware. The veſſels that are painted or covered over with this Glazing, muſt be firſt well heated, then put under a muffle, and, as ſoon as the glaſs runs, you muſt ſmoak them, and take out the veſſels. Mr. Heinſius of Peterſburgh, who ſent this receipt to the Royal Society, uſes the words afflare debes fumum, which is rendered ſmoak them, in the Tranſactions. *Phil. Tranſ.* N°. 466.

Green Glazing may be prepared of eight parts of litharge, eight parts of Venice glaſs, four parts of braſs duſt; or of ten parts of litharge, twelve of flint or pebble, and one of æs uſtum, or copper aſhes.

Iron-colour Glazing is prepared of fifteen parts of lead aſhes, fourteen of white ſand, five of copper aſhes, one of mangaueſe, one of zaffer, and one of iron filings.

Liver-coloured Glazing is prepared of twelve parts of litharge, eight of ſalt, ſix of pebble or flint, and one of manganeſe.

Purple-brown Glazing conſiſts of lead aſhes, fifteen parts; clear ſand, eighteen parts; manganeſe, one part; white glaſs, fifteen meaſures; and one meaſure of zaffer.

Red Glazing is made of antimony, two pounds; litharge, three; and ruſt of iron calcined, one; grind them to a fine powder.

Sea-green Glazing is made of five pounds of lead aſhes, one pound of tin aſhes, three pounds of flint, three quarters of a pound of ſalt, half a pound of tartar, and half a pound of copper duſt.

White Glazing. A fine white Glazing for earthen ware is thus prepared: take two pounds of lead, and one of tin; calcine them to aſhes: of this take two parts, calcined flint or pebble, one part; and ſalt, one part; mix them well together, and melt them into a cake for uſe.

The white Glazing for common ware is made of forty pounds of clear ſand, ſeventy-five pounds of litharge or lead aſhes, 26 pounds of pot-aſhes, and ten pounds of ſalt: theſe are three times melted into a cake, quenching it each time in clear cold water. Or it may be made of fifty pounds of clean ſand, ſeventy of lead aſhes, thirty of wood aſhes, and twelve of ſalt.

Yellow Glazing is prepared of red-lead, three pints; antimony and tin, of each two pounds. Theſe muſt be melted into a cake, then ground fine; and this operation repeated ſeveral times. Or it may be made of fifteen parts of lead ore, three parts of litharge of ſilver, and fifteen parts of ſand.

Citron-yellow Glazing is made of ſix parts of red-lead, ſeven parts of fine red brick-duſt, and two parts of antimony. *Vid. Smith's Laboratory.*

GLAU'CIUM, *yellow horned poppy*, in botany, a genus of plants whoſe characters are:

The end of the pedicle is expanded into an orbicular placentula, terminated by a hollow ſpherical ſubſtance, to which it grows. The calyx conſiſts of two leaves, and is caducous: the flower is tetrapetalous, expanding in form of a roſe or poppy, and furniſhed with very numerous ſtamina, which, for the moſt part, fall off, after the opening of the flower. The ovary ariſes from the bottom of the placentula, with a hairy bifid apex; and ripens into a long, ſmooth, bivalve pod, the valves adhering to the intermediate partition, in ſuch a manner as to leave the whole capacity unicapſular, and full of roundiſh ſeeds.

Dioſcorides ſays, this plant is diuretic; and Galen looks upon it to be vulnerary and deterſive; but he conſiders not, that it muſt be uſed only to eat away the proud fleſh of ulcers. Nevertheleſs, in Portugal, they give the infuſion of half a handful of it, in white wine, to thoſe who are ſubject to the ſtone. In Provence, they uſe the ſame leaves, bruiſed, for ulcers; and, above all, for the wounds of horſes. *Martyn's Tournefort.*

GLAUX, in botany, the name of a plant, alſo called the milkwort of Dioſcorides.

It grows in hilly and chalky fields, and the herb is in uſe; which, boiled in barley water, is effectual, as Dioſcorides ſays, for renewing milk in women's breaſts, where it is loſt.

There is a diſpute among the botaniſts, about the Glaux of Dioſcorides. Anguillarius, Parkinſon, and Alpinus, will have it to be the lotus; Geſner, the onobrychis; Turner, the Glaux vulgaris (liquorice vetch) Dodonæus, Cordus, and C. Bauhine, a ſpecies of a certain ſmall marine plant; Lobel, Gerard, and Cluſius, the plant deſcribed by Dioſcorides, as follows: ‘ The Glaux has leaves like thoſe of the cytiſus or lentil, green on the upper ſide, and whitiſh underneath. The root ſends forth five or ſix ſlender ſtalks, a ſpan high; the flowers are of a purple colour, and reſemble thoſe of the leucoium (ſtock gilliflower) only ſmaller. *Dale.*

GLOBULA'RIA, *French daiſy*, in botany, a genus of plants whoſe characters are:

The floſcules are unilabiated, multifid, connected each to its proper calyculus, and collected very many together into one globoſe flowery head, ſurrounded with one common calyx.

The calyculus, or little flower cup, of the floſcule becomes a capſule, which contains the ſeed, and is affixed to the common placenta.

It is to be found in the gardens of the curious, and flowers in ſummer. The plant is a vulnerary. *Dale.*

GLOW-*worm, cantharis,* in zoology, a claſs of inſects, the antennæ of which are cetaceous, the exterior wings flexile, the thorax ſomewhat flatted, and the ſides of the abdomen plicated and papilloſe.

The common Glow-worm is frequently met with under our hedges, and, if carefully taken up, may be kept alive many days on freſh turfs of graſs; all which time it will continue to ſhine in the dark.

The light of this little inſect is ſo ſtrong, that it will ſhew itſelf through ſeveral ſubſtances, in which the creature may be put up; a thin pill-box eaſily ſnews it through, and even though lined with paper, the light is not impeded in its paſſage by both. The creature is ſluggiſh, and appears dead in the day-time; and its light is not diſtinguiſhable, even if carried into a darkened room, unleſs the creature be turned upon its back, and diſturbed, ſo as to be put in motion; and then it is but very faint: after ſun-ſet the light begins to return, and with it the life and motion of the animal. The motion and light of this creature ſeem, in ſome meaſure, to depend upon one another: it never ſhines but when it is in ſome ſort of motion; and, when it ſhines moſt, the body is extended to one third more than its length in the day-time. In the time of brighteſt ſhining, it will ſometimes, of a ſudden, turn its body about, and the light will not be larger than the head of a pin; and, on being touched, ſhe will then immediately extend herſelf, and the light will become as large and as bright as ever. *Phil. Tranſ.* N°. 71.

Flying GLOW-*worm, cicindela volans.* In the warmer months of the year, this creature is ſometimes caught in our houſes flying to the flame of a candle; and, when examined in the dark, it is found luminous at theſe times, though perhaps leſs, or not at all ſo, at others; which may be a reaſon of its not being known, though caught in the fields; and to this it may be owing, that many who have deſcribed it, have thought it not a native of England.

Without wings it is frequently enough found in form of the common Glow-worm, and then always ſhines.

The male and female, in this winged ſtate, both ſhine in hot weather, and their light is ſo vivid as to be eaſily ſeen, even while there is a candle in the room; the vibrations of it are irregular, and its colour greeniſh. The luminous parts are two ſmall ſpecks under the tail at the end, and the light continues in theſe ſome time after the tail is cut off, but then gradually goes out.

The parts of inſects continue alive in ſome degree, for a conſiderable time after they are cut off; and probably the light in the tail of this animal continues juſt as long as that ſort of life remains in it. *Moffett.*

The uſe of this light ſeems to be to direct the animal in its courſe, and in the taking of its prey, and to this purpoſe it is admirably placed. The tail is eaſily bent under the belly, and then throws the light full upon any object about, or under the head of the animal; and the eyes are placed, not on the upper part, but on the under-ſide of the head; ſo that they have all the advantages of it, while the light in this part is not offenſive to the eyes, as it naturally would have been, if carried before the head. The creature can upon occaſion cover this light ſo as not to be known, or purſued by it, by its enemies. *Thomas Barthol. de Luce Anim.*

GNATS, in natural hiſtory.—All the Gnats have a long cylindric body compoſed of eight rings; their corſlet is ſhort, but large in proportion to the ſize of the fly, and to this are fixed the legs, the wings, and the balancers; four ſtigmata are alſo found here, as is the caſe in other flies. The two firſt of theſe are placed near the head, and have been miſtaken for ears.

When the Gnat is in a ſtate of reſt, it holds one wing ſomewhat croſſed over the other, in ſuch a manner, as that they cover the body. It has a multitude of little oblong ſcales on its wings, and not only there, but on its corſlet and body; and they are ſo thick laid on the body, that one cannot touch it without rubbing them off, and leaving the part naked. Beſides theſe, they have alſo very long and extremely fine hairs, and ſome of the ſpecies have ranges of theſe on each ſide of the body appearing like fringes. The antennæ of the Gnats are extremely worth obſervation, and differ much from one another. Some of them are elegantly feathered; theſe belong to the males of certain ſpecies, for the antennæ of the females are not ſo beautiful.

Theſe feathered antennæ of the male Gnats, examined by the microſcope, ſhew, at every junction of two of the rings, a ſmall cluſter of hairs in form of a pencil on each ſide; the hairs of which they are compoſed ſeparate, and ſpread toward their extremities; theſe cluſters of them grow ſhorter, as they approach the upper part of the antennæ; and, towards the extremity of each, there is a vacant ſpace where they are wholly wanting; this part, however, is covered with ſingle ſhort hairs.

The antennæ both of the males and females of ſome ſpecies have alſo thin ſtalks covered with ſingle hairs, and at certain diſtances; or at every articulation theſe have four hairs longer than the reſt, and eaſily diſtinguiſhable by the naked eye.

The Gnats have no ſmall or gloſſy eyes, as moſt other flies have, but, in recompence for the want of theſe, they have reticular eyes, ſo large as to ſurround, and, in a manner, cover the whole head. Thoſe of many ſpecies are extremely beautiful, of a fine changeable green in ſome lights, and of a bright red in others.

Many of the ſpecies of Gnats have before their heads two ſmall oblong cylindric bodies, ſomething reſembling the antennæ of the ſhort-bodied flies; theſe we may not improperly call the beards of the Gnats, for immediately below them is placed the trunk, and they ſeem to have ſome analogy with the beards of the butterfly claſs, which are placed in the ſame manner. *Reaumur's Hiſt. Inſ.* For the trunk and wings of the Gnat, ſee the articles TRUNK and WINGS.

GNAT-*worm,* in natural hiſtory, a ſmall water inſect, produced of the egg of a Gnat, and which is, after its ſeveral changes, transformed into a Gnat again.

GOAT, *capra,* in zoology, a genus of animals, the characters of which, according to Mr. Ray, are theſe: that it is covered with hairs, not with wool; that its horns are leſs crooked than thoſe of the ſheep, and that it has a beard hanging down from its chin, and is of a ſtrong ſmell.

It is very ſingular, that this genus of animals are all able to run and climb about the rugged parts of mountains without falling, though their feet ſeem by no means contrived by nature for any ſuch purpoſes.

Goats may be of great advantage to the farmers in ſome parts of the kingdom, as they will live in rocky barren countries, where nothing elſe can get a ſupport for life. They will climb the ſteepeſt rocks, and there browſe upon briars, heath, and ſhrubs of various kinds, which other creatures will not taſte of. They will feed on graſs in paſtures, but, as they love browſing on trees much better, great care muſt be taken to keep them from valuable plantations.

The greateſt advantage of theſe creatures is their milk, which they yield in large quantities; and which is accounted the beſt milk of all animals. They mix this and cows milk together in many parts of the kingdom, and a very valuable kind of cheeſe is made of it. Beſide this, the kids or young Goats are very fine food, and the beſt kinds bring forth theſe two or three at a time, and that twice a year.

Goats hair alſo is of value; it may be ſheared as the wool from the ſheep, and is excellent for making ropes that are to be uſed in the water, as they will laſt a great while longer than thoſe made the common way. A ſort of ſtuff is alſo made of it in ſome places. The beſt kind of Goats for keeping to advantage ſhould be choſen in this manner: the male ſhould have a large body, his hair ſhould be long, and his legs ſtraight and ſtiff; the neck ſhould be plain and ſhort, the head ſmall and ſlender, the horns large, the eyes prominent, and the beard long. The female ſhould have a large udder, with large teats, and no horns, or very ſmall ones. They ſhould be kept in flocks, that they may not ſtraggle; and they ſhould have good ſhelter both in ſummer and in winter, the heat and cold being both prejudicial to them. They ſhould be coupled in December. They ſhould have no litter in winter, but only a paved floor kept clean. The kids are to be brought up for the table in the ſame manner as our lambs are. They are recommended to lie among horſes, their ſmell, as is ſuppoſed, preventing many diſtempers in thoſe cattle. *Mortimer's Huſbandry.*

GOAT-*ſucker,* in zoology, a name by which the caprimulgus is called in ſome parts of England, but its more uſual name with us is the churn owl. It is a very beautiful bird, ſeeming rather to approach to the cuckow than the owl kind, and has had its common Latin name, and this Engliſh one, from an opinion, there ſeems to be no foundation for, of its ſucking the Goats dugs in the night-time. *Ray's Ornithology.*

GOATS-*rue,* has many tall, hollow, ſtriated branches, a yard or more in height, with long pinnated leaves growing alternately on the joints, conſiſting of ſix or eight pair of long oval pinnæ, ſmooth, and not indented about the edges, which are ſubject to be folded together. The flowers grow in long ſpikes, hanging downwards in the ſhape of peaſe bloſſoms, but leſs; of a pale, whitiſh, blue colour: the ſeed grows in long erect pods: the root is thick, ſpreading on the earth, and abiding long: it grows in ſeveral parts of Italy, by river-ſides; but, with us, only in gardens; and flowers in June and July.

Goats-rue is accounted cordial, ſudorific, and alexipharmic, and good againſt peſtilential diſtempers, expelling the venom through the pores of the ſkin; and is of uſe in all kinds of fevers, the ſmall-pox and meaſles; it likewiſe kills worms, and cures the bites of all kinds of venomous creatures. *Miller's Bot. Off.*

GOLD (*Dict.*)—It is the received opinion, that, whatever has been done to this metal, the common way of purifying it by the copel reſtores it eaſily to itſelf again; but this is not always ſo certain, or ſo eaſy, as is generally imagined. Mr. Homberg put into the copel an ounce of gold, which he had uſed in ſeveral chemical experiments, in order to reſtore it to its original ſtate; but, after four times copelling it, he found, that, whatever quantity of lead he uſed, ſtill the metal, though of the right and beautiful colour, was brittle, and not at all in the ductile ſtate of pure gold. Finding therefore that lead would not anſwer his purpoſe, he incorporated the gold with four times its quantity of ſilver, and, having performed the operation of the depart in the common manner, he fuſed it with borax; but after all this the Gold was as brittle as before, though ſtill of the ſame beautiful colour. He then melted it again without any addition, but ſtill it remained in the ſame brittle ſtate. His next trial was by antimony, not doubting but that the particles, whatever they were, that ſtood the operation of the depart, and of lead, would be abſorbed by this powerful ſemi-metal, and the Gold left in its natural malleable ſtate: he melted it twice to this purpoſe, with eight ounces of antimony; but, after ſeparating the antimony, and then melting the Gold ſeveral times with ſalt-petre, and many times without any mixture, it was found of the moſt perfect and beautiful colour imaginable; but ſtill brittle, and not in the leaſt malleable. Surprized to ſee all the common methods fail, he melted it again with ſix ounces of antimony, and afterwards melted this regulus with three times its own weight of lead, and ſet the whole in a copel in a proper degree of fire, to evaporate both the antimony and the lead. But, when the fire was out, he was ſurpriſed to ſee the Gold covered with a browniſh ſubſtance, reſembling a muſhroom, which fell to powder on being touched by the fingers. The Gold itſelf was become of a grey colour, and was full of wrinkles on the upper ſurface, from whence this fungous matter had been thrown out; but on the under ſurface, where it ſtuck to the copel, it was ſtill of a fine and beautiful Gold colour. He then melted ſeveral times the Gold and the fungous ſubſtance together, and every time there appeared the ſame ſort of fungous cruſt at the top. At laſt he gathered this fungous ſubſtance carefully off from the Gold, and then, melting the metal by itſelf, there was no more any fungous matter thrown out upon it, but only a thin layer of a powder of the ſame nature and colour with the former. Three times it was melted, and at every time threw off a quantity of this powder; and, after this, being fuſed with borax, it at length became perfect malleable Gold.

He then fuſed together the fungous matter, and all the quantities of powder which he had ſaved; there appeared a new fungus on the matter, and that for ſeveral times melting; but at laſt this diſappeared, and there was found a ſmall lump of pure Gold in the copel. It is not eaſy to gueſs at the cauſe of this obſtinate brittleneſs of the Gold, becauſe it had paſſed ſeveral experiments, and been mixed with ſeveral ſalts and ſeveral metals, particularly at laſt with iron and with emery. The emery ſeemed moſt to be ſuſpected as the cauſe, but this brittleneſs cannot be given to Gold by emery alone, and muſt have been owing to the mixed effect of ſome of the ſalts and emery together; as, by means of the ſalts, the particles of emery are thrown farther, and more intimately mixed with thoſe of the Gold, than they could otherwiſe be. We have been told of the degradation of Gold. This Gold would have been declared degraded, and robbed of one of its greateſt qualities, its malleability, had it fallen into any hands but thoſe of ſo great a chemiſt; and it is much to be doubted, whether Mr. Homberg would not have been able to reduce the degraded Gold of any other chemiſt, and reſtore it to its natural ſtate and purity, though the common methods of operating on it ſhould all have failed, as they did in this caſe. *Mem. Acad. Par.* 1693.

It is generally underſtood, that ſilver is the peculiar wealth of Peru; and the Spaniards have alſo Gold mines there.— There are alſo two waſhing-places for Gold in the ſouth part of Peru, near the frontiers of Chili. About the year 1709 there were two ſurpriſing large lumps of virgin Gold found in one of theſe places, one of which weighed 32 pounds complete, and was purchaſed by the Count de Montcloa, then viceroy of Peru, and preſented to the king of Spain: the other was ſhaped ſomewhat like an ox's heart; it weighed 22 pounds and a half, and was bought by the corrigidor of Arica.

To find theſe lavadores or waſhing-places, they dig in the corners of a little brook, where, by certain tokens, they judge the grains of Gold to lie. To aſſiſt in carrying away the mud, they let a freſh ſtream into it, and keep turning it up, that the current may ſend it along.— When they are come to the golden ſand, they turn off the ſtream another way, and dig with their mattocks; and this earth they carry on mules to certain baſons, joined together by ſmall channels: into theſe they let a ſmart ſtream of water, to looſen the earth, and carry all the groſs part away. The Indians ſtanding in the baſons, and throwing out all the ſtones; the Gold at bottom is ſtill mixed with a black ſand, and hardly to be ſeen, till it be farther ſeparated.

In theſe waſhing-places are found Gold grains, as big as bird-ſhot; and in one, belonging to the prieſts near Valparaiſo, ſome are found from two or three ounces to a pound and an half weight.— This way of getting Gold is much better than from the mines; here is no need of iron crows, mills, or quickſilver; ſo that both the trouble and expence are much leſs.

The moſt conſiderable port in Chili is that of Valparaiſo; which is eſteemed one of the beſt harbours in the ſouth-ſeas: It lies upon a river, fifteen leagues below St. Jago, the capital of Chili. To this port, all the riches of the Gold mines behind it, and on every ſide, are brought; particularly from thoſe of Tiltil, which are immenſely rich, and lie between this port and the city of St. Jago.

The Gold here is found in a very hard ſtone, ſome of which ſparkles, and betrays the incloſed treaſure to the eye; but moſt of it has not the leaſt ſign of Gold, but appears to be an hard harſh kind of ſtone, of very different colours, ſome white, ſome red, and ſome black. This ore, broken to pieces, is ground in a mill, by the help of water, into a groſs powder; with which quickſilver is afterwards mixed: to this paſte they let in a ſharp ſtream of water, which having reduced it to a kind of mud, the earthy particles are carried off by the current, and the Gold and quickſilver precipitated, by their own weight, to the bottom.— When this mud has ſettled a little, into a ſort of paſte, they put it into a linen bag, and ſtrain it very hard, by which operation the mercury is driven out, or, at leaſt, the greateſt part of it, and the remainder they evaporate by the help of fire; ſo that they have all the Gold together in a little wedge, like a pine-apple; whence it derives its name of pinha.— In order to clear the Gold from the ſilver it is firſt impregnated with, the lump muſt be run, and then the exact weight is known, and the true fineneſs; it is not done otherwiſe there.—The weightineſs of the Gold, and the facility of its amalgamation with mercury, makes the droſs eaſily ſeparate from it: this is an advantage the Gold-miners have over thoſe of ſilver; they every day know what they get, which is not the caſe of the ſilver-miners.

According to the nature of the mines, and the richneſs of the veins, every caxon, or 50 quintals, or 100 hundred weight, yields four, five, or ſix ounces.—When it yields but two, the miner does not make good his expence, which frequently happens; but he has ſometimes good amends made him, when he meets with rich veins; for the Gold mines are, of all mines, thoſe which produce metals the moſt unequally.—They follow a vein, which grows wider, then narrower, and ſometimes ſeems to be loſt in a ſmall ſpace of ground. This ſport of nature makes the miners live in hopes of finding what they call the purſe, being the ends of veins, ſo rich, that they have ſometimes made a man wealthy at once: and this inequality ſometimes ruins them; which is the reaſon that it is more rare to ſee a Gold-miner rich than a ſilver-miner, or of any other metal, though there be leſs expence in extracting it from the mineral. For this reaſon, alſo, the miners have peculiar privileges; for they cannot be ſued to execution on civil accounts, and Gold pays only one-twentieth part to the king, which is called covo, from the name of the perſon to whom the king made the grant; becauſe they uſed before to pay the one-fifth, as they do of ſilver.

On the deſcent of this mountain there runs, during the winter, or, rather, during the rainy ſeaſon, a pretty briſk ſtream of water, which, paſſing through the Gold ore, waſhes away abundance of that rich metal, as it ripens and breaks from its bed: and, therefore, for about four months in the year, this is accounted one of the richeſt lavadero's in Chili, ſince there are found pellets of pure Gold of an ounce weight.

At Palma, which is but four leagues from Valparaiſo, there is another rich lavadero; and, every-where throughout the country, the fall of a brook or rivulet is attended, more or leſs, with theſe golden ſhowers, the richeſt whereof fall into the laps of the Jeſuits, who farm, or purchaſe, abundance of mines and lavadero's, which are wrought, for their benefit, by their ſervants.

Yet it is agreed, that a great part of the inhabitants do not ſeem to abound in wealth; which, however, may be very well accounted for, if we conſider that ſuch as deal in cattle, corn, and other the product of the country, acquire but moderate fortunes; and ſuch as are concerned in mines are frequently ruined, by launching into too great expence about them. But, after all, ſuch as are eaſy in their circumſtances, and, in conſequence of that eaſe, retire to St. Jago, live in ſuch a manner as ſufficiently demonſtrates the riches of Chili, ſince all their utenſils, even thoſe that are moſt common, are of pure Gold; and it is believed that the wealth of this city alone cannot fall ſhort of 20,000,000 l.— Add to this, that the Gold mines are continually increaſing; and it is only for want of hands that they are not wrought to infinitely more advantage, thoſe already diſcovered, and neglected, being ſufficient to employ 40,000 men. It may be likewiſe obſerved, that the frauds, practiſed for deceiving the king, daily increaſe; and, as they meaſure the riches of the Spaniſh Weſt-Indies by the ſtandard of the king's revenue, this muſt neceſſarily make them appear poorer than they really are.

As the policy of the Spaniards has hitherto conſiſted chiefly in endeavouring, by all ways and means poſſible, to reſtrain the vaſt riches of theſe extenſive dominions from paſſing into other hands; ſo the knowledge that other nations have of the mighty wealth of theſe countries, on the one hand, and of the great demand for European manufactures among their inhabitants, on the other, has excited almoſt every nation in Europe to practiſe all methods poſſible, in order to gain a ſhare in them; and this with ſo good effect, that it is very doubtful whether any conſiderable part of the riches of the Weſt-Indies centers among the inhabitants of Old-Spain.

But the ſyſtem of Spain is now upon the change; and they ſeem determined to reap all the benefit in their power by the commerce of the Spaniſh Weſt-Indies, as well as by that in Europe.

The Gold trade of Brazil, belonging to the king of Portugal, being carried on in much the ſame manner as that of Spain, it is needleſs to ſay any more at preſent, than to obſerve, that, in order to judge of the true value of Gold belonging to the king of Spain, which there paſſes through the hands of the preſident and commiſſioners, it is all ſold upon condition to be aſſayed, and not judged of merely by the touch, as is done in ſeveral parts of the Eaſt-Indies. For Gold is ſo precious a metal, that any very ſmall difference, in the aſſay of ſilver or copper in every piece, will run up to a conſiderable ſum; and, therefore, the laws have ſettled the value of Gold and ſilver, not by the touch, but by trial of aſſay, and this ſo exactly and demonſtrably, that what a very ſmall ſcale decides, is afterwards made out and proved by arithmetic. And, becauſe not only money was to be made of this metal, but jewels, chains, utenſils, and other things, therefore the law appointed, that there ſhould be a head marker and toucher, to overlook and approve of the reſt of them, that, being expert at touching Gold and trying ſilver, they might judge of the fineneſs of the Gold-ſmith's work. And whereas, in order to make an aſſay, ſomewhat is to be taken of the ingot of Gold or ſilver that is to be aſſayed, which cannot be done with jewels, chains, or rings, without ſpoiling the faſhion; therefore the only and univerſal method has always been to touch the Gold, and mark the plate, relying only upon the exactneſs of the eye at certain times of the day, and on a ſtone, upon which the true fineneſs does not ſometimes appear ſuperficially, either becauſe the Gold is ill-coloured, or not ſo perfectly refined.

As for ſilver, they rely altogether upon the colour that appears after it is tried; both which methods are no better than conjectures or ſurmiſes, in compariſon of the certainty of the aſſays. For which reaſon, in criminal cauſes, againſt ſuch as do not work Gold or ſilver according to the ſtandard, no caſe has been decided by the head aſſayer, or judges to whom it belongs, without making experiment by aſſay; and, had the touch been ſecure, it would certainly have been relied on in ſome caſes; whereas, on the contrary, ſeveral perſons have been cleared by the aſſay, who have been ſuſpected for cheats by the touch. It follows, therefore, that merchants ought to be perſuaded it is much ſafer for them to diſpoſe of their Gold by aſſay, than by touch; for otherwiſe there might be a vaſt trouble ſaved in aſſaying all the king's Gold over again, as is done at Seville, though it has all been actually aſſayed in the Indies. This has been the practice of all times, in Spain, ever ſince Gold was brought from the Indies, and touching was never yet admitted of.

The purifying of Gold *by cementation*, is to be performed in this manner: chuſe ſome tiles or bricks not vitrified by an exceſſive fire, nor too much tempered with ſand; the oldeſt alſo are the beſt; clean them well from lime and all other filthineſs, pound them in an iron mortar, and then ſift them through a coarſe ſieve; take four parts of this powder, and one part of colcothar not waſhed, and the ſame quantity of common ſalt; mix theſe thoroughly together, grind them in a mortar, and wet them with a little water or urine, ſo that they may cohere when preſſed between the hands. Then take a clean earthen veſſel of a proper ſize, it muſt be quite ſound, ſufficiently thick, and not glazed; ſtrew the bottom of this with the moiſtened powder, or cement, and diſtribute it evenly all over with a finger, and preſs it down very gently, ſo that the thickneſs of the cement may be half an inch all about; put upon this the Gold in ſmall pieces, and in thin plates, made perfectly clean by heating them red-hot in the fire; cover the ſurface of the cement with theſe pieces, then lay ſuch another bed of cement over theſe, and over that another of Gold, and ſo on alternately, till the veſſel is full within the breadth of a finger; let this laſt ſpace be filled with cement; lute well a tile upon the veſſel, and keep it moderately red-hot in a furnace for ſixteen or twenty hours, then open the pots and waſh the purified Gold. *Cramer's Art of Aſſaying.*

Gold *colour*.— The manner of giving this colour to glaſs is this: take cryſtal frit two parts, and rochetta frit one part, both made with tarſo, not ſand; mix theſe well, and to every hundred weight of this add of tartar in lumps, but well powdered afterwards, and of mangeneſe prepared, each one pound; mix theſe well together and put them into the frit; when this is done, put all into the furnace, and let it ſtand three or four days in a common fire not too violent, and at the end of this time work it. It will be thus very beautiful, but, if all cryſtal frit be uſed, it will be yet much finer. It may be made deeper or paler, by adding to, or diminiſhing the quantity of the ingredients, in proportion to that of the frit. *Neri's Art of Glaſs.*

Gold *on China ware*.— The Gold on this ware is never laid on alone, but managed in the following manner: they grind it in water to a fine powder, and leave it to dry in the ſhade: They then mix with every ten grains of Gold one grain of ceruſs, and, incorporating the whole with gum water, they lay it on in the manner of other colours.

There have been many methods of imitating the colour and appearance of Gold in the baſer metals, but none of them come up to that of Mr. Homberg, which is performed in this manner: make an amalgame of one part pure copper and three parts quickſilver, boil this in river water for two hours, then diſtil off the quickſilver, and cohobate it once; take out the copper, and fuſe it, and it will be found of a beautiful Gold colour, and more ductile than common copper under the hammer, and is extremely fitted for watch work, gilding, and the finer machines and utenſils. *Shaw's Lectures.*

Gold-*finch*. This bird is particularly fond of the buds of the gooſeberry-tree. They often come in whole droves at once into gardens, and will clear away the buds from the trees in a few days; they are eaſily ſhot, but the trees are uſually injured by this, ſo that it is better to lime the twigs. *Mortimer's Huſbandry.*

Gold-*fiſh*, in zoology, a name by which ſome authors have called the alauſa or ſhad, from the yellow colour it frequently has on the covering of the gills. See a farther account of it under the article Shad.

Gold-*ſize*. The method of making Gold-ſize, or burniſhed gilding, or wood, is this: take a pound and a half of pipe clay, half an ounce of red chalk, a quarter of an ounce of black lead, forty drops of ſweet oil, and three drachms of pure tallow; grind the clay, chalk, and black lead, all ſeparately, very fine in water; then mix them together, and add the oil and tallow, and grind all to a due conſiſtence. This is the ſize now in uſe, and is accounted the better, the older it is.

Gold-*ſmith*, or, as ſome chuſe to expreſs it, ſilver-ſmith, the artiſt, who makes veſſels, utenſils, and ornaments in Gold or ſilver. The Gold-ſmith's work is either performed in the mould, or beat out with the hammer, or other engine. All works that have raiſed figures are caſt in moulds, and afterwards poliſhed and finiſhed; plates or diſhes of ſilver or Gold are beat out from thin flat plates, and tankards and other veſſels of that kind are formed of plates ſoldered together, and their mouldings are beat, not caſt. The buſineſs of the Gold-ſmith formerly required much more labour than it does at preſent, for they were obliged to hammer the metal from the ingot to the thinneſs they wanted: but there are now invented flatting mills, which reduce metal to the thinneſs that is required at a very ſmall expence. The Gold-ſmith is to make his own moulds, and for that reaſon ought to be a good deſigner, and have a taſte in ſculpture: he ought alſo to know enough of metallurgy to be able to aſſay mixed metals, and to mix the allay.

The Gold-ſmith in London employs ſeveral hands under him for the various articles of his trade. In this great city there are always hands that excel in every particular branch of the trade, and there is commonly employment for every one in his particular branch. The jeweller, the ſnuff-box and toy maker, the ſilver turner, the gilder, the burniſher, the chaſer, the refiner, and the Gold-beater, are all employed by and under the Gold-ſmith.

GO'LDEN *rod, virga aurea*, in botany, a very beautiful ſpecies of plants cultivated in our gardens, where they are very great and laſting ornaments, beginning to flower in May, and one kind or other of them continuing flowering till October.

They are all eaſily propagated by parting their roots in the ſpring, before they begin to ſhoot; they will grow in any ſoil, or ſituation; but they ſucceed beſt in a light freſh earth and an open expoſure, and ſhould be planted in the middle of large flower-beds: they are perennial plants, dying down to the ground, as ſoon as they have ripened their ſeeds, but riſing again the following ſpring. Theſe ſeeds ſown will very freely grow, and often produce varieties in the flower. *Miller's Gard. Dict.*

GOOSE, *anſer*, in the Linnæan ſyſtem of zoology, the term uſed to denote one of the orders of the feathered kingdom, the general character of which is that the mouth is dentated or toothed, and jagged or ſerrated.

Soland Goose, the Engliſh name of a large water fowl, called by authors anſer Baſanus.

It is of the ſize of the common Gooſe, and its wings are very long and capable of extending to a very remarkable breadth; its beak is long and ſtrait, and of a duſky grey, and a little hooked at the end. It has alſo, near the hooked part, two ſmall appendages like teeth. It is naked behind the eyes. Its mouth opens to a great width, and it ſeems to have no noſtrils; but, in the place of them, has a long furrow running nearly the whole length of the bill; it has alſo a row of ſerratures or indentings all along, provided by nature for its holding fiſh more firmly. Its feet are black, and all the four toes are connected by the ſame membrane. It is all over of a clear white, when full grown, except that the larger wing feathers have blackneſs, and the head with age is apt to become yellow. Its ſkin adheres but looſely to its fleſh, and the young are mottled with grey and brown. It flies well, but, if it fall on the ground, does not eaſily raiſe itſelf. They are a bird of paſſage, and build in the iſland of Baſs in Scotland, in vaſt numbers. Each female lays only one egg. The young Geeſe are eſteemed a great delicacy, and ſell at a great price. *Ray's Ornitholog.*

GOO'SEBERRY-*buſh.*—The Gooſberry-buſh is propagated either by ſuckers or cuttings, but the latter way is preferable, as the roots are leſs ſubject to ſhoot out ſuckers afterwards.

The beſt ſeaſon for planting the cuttings is in February, juſt before the buds begin to open; obſerving always to take the handſomeſt ſhoots, and to pick them from ſuch branches as produce the greateſt quantity of fruit. The cuttings ſhould be about eight inches long, and ſhould be planted in a bed of light earth expoſed to the morning ſun; they muſt be planted about three inches deep, and watered to help their taking root. The ſhoots ſhould all be rubbed off from theſe plants, as they put out, except thoſe at the top, that there may be a regular ſtem. In the September following, they ſhould be removed to a bed of fine light earth, and planted at two feet diſtance. They ſhould remain here two years, and the croſs branches at times be cut off, as alſo the lower ones, ſo as to keep a clean ſtem about a foot above the ground. They will then be fit to plant out where they are to ſtand; which ſhould be in a light ſandy loam. They ſhould be kept from the ſhade of other trees; and, to have the fruit in its utmoſt perfection, ſhould be ſet in an expoſed place in rows of eight feet aſunder, and each of the ſhrubs, ſix feet from the others in the rows. The beſt time for tranſplanting them is in October, after the leaves are fallen. *Miller's Gard. Dict.*

GOOSEBERRY-*galls*, in natural hiſtory, the name given by authors to a ſpecies of protuberances of the gall kind, found very frequently on the oak. They are of a roundiſh figure, and ſometimes adhere to the tree by a ſhort pedicle, but more frequently by a part of their ſpheric ſurface. They are uſually found on the under ſide of the leaves of the oak, but ſometimes on the pedicles of the leaves.

They are moſt frequent in ſpring, but they are found at all times when the leaves are upon the trees. Theſe galls are greeniſh at firſt, and afterwards become yellowiſh, and finally red; in which laſt ſtate they very much reſemble the ſmall red Gooſe-berry. They are very ſoft to the touch, and, when opened, are found to contain a juicy ſubſtance, with a cavity in the middle, in which there is lodged a ſingle inſect. This, according to the time in which the gall is opened, is found in the form of a white worm, or elſe of a white chryſalis, or finally of a ſmall ſhort-bodied four-winged fly of a black colour. For the creature does not leave the gall to go through any of its changes, put paſſes all its ſtates in it. The gall, in all theſe caſes, is found whole and unhurt; but, if one is opened in which there is a hole perceived, this is ſure to be found empty, that being the paſſage by which the fly has made its way out. *Reaum. Hiſt. Inſ.*

GOOSEBERRY-*worm*, in natural hiſtory, the name of an inſect, found very frequently on the Gooſeberry buſhes, and uſually ſuppoſed to be a caterpillar, but differing eſſentially from that genus of animals, and being one of thoſe which the French call fauches chenilles. It has a round head, and has twenty-two legs, and finally becomes not a butter-fly, but a common four-winged fly. This worm is at firſt of a greeniſh colour, with ſome yellow variegations, and ſeveral black tubercles; but on the laſt change of its ſkin it becomes whitiſh or cream-coloured, and loſes its tubercles. *Reaum. Hiſt. Inſ.*

GRA'FTING (*Dict.*)—Mr. Du Hamel of the Academy of Sciences of Paris has obſerved that, in Grafting of trees, there always is found at the inſertion of the graft a change in the directions of the fibres, and a ſort of twiſting or turning about of the veſſels, which greatly imitates that in the formation of certain of the glands in animal bodies; and he very judiciouſly infers from thence, that, a ſort of new viſcus being formed by this means, the fruit may very naturally be ſo far influenced by it as to be meliorated on the new branch; but that no ſuch ſudden and eſſential changes can be effected by this means, as too many of the writers in agriculture pretend. This author obſerves, however, that this anatomical obſervation alone would not have convinced him of the falſity of too many of theſe relations, had not experiment joined to confirm it; he tried many grafts on different trees, and, for fear of error, repeated every experiment of conſequence ſeveral times; but all ſerved only to convince him of the truth of what he at firſt ſuſpected. He grafted in the common way the peach upon the almond, the plum upon the apricot, the pear upon the apple, the quince, and the white thorn; one ſpecies of plum on other very different ſpecies, and upon the peach, the apricot, and the almond; all theſe ſucceeded alike, the ſpecies of the fruit was never altered, and, in thoſe which would not come to fruit, the leaves, the wood, and the flowers, all were the ſame with thoſe of the tree from which the graft was taken.

Authors in agriculture have mentioned alſo a very different ſort of Grafting, that is, the ſetting grafts of one tree on ſtocks of a different genus of trees; ſuch as the Grafting the pear upon the oak, the elm, the maple, or the plum; the mulberry upon the elm, the quince, and the fig; the cherry upon the laurel; the peach upon the hazel; the vine upon the cherry-tree, and upon the hazel; and the like unnatural conjunctions. Mr. Du Hamel tried all theſe ſeparately and carefully, and the event proved very plainly, that thoſe who had mentioned them had never tried them; and a natural concluſion from this was, that there muſt be a natural alliance between the graft and the ſtock which receives it, otherwiſe it will never grow at all, or elſe very ſoon periſh. *Memoirs Acad. Par.* 1727.

Tools neceſſary for GRAFTING. In order to Grafting, a perſon muſt be provided with the following tools: 1. A neat and ſmall hand-ſaw to cut off the heads of large ſtocks. 2. A ſtrong knife with a thick back to make clefts in the ſtocks. 3. A ſharp penknife to cut the grafts. 4. A Grafting chiſſel and a ſmall mallet. 5. Braſs ſtrings, or elſe woollen yarn, to faſten on the grafts with; and, finally, a quantity of clay, which ſhould be prepared a month before it is uſed, and kept turned and worked about every day like mortar. The beſt mixture for this matter is: a quantity of ſtrong fat and viſcous loom muſt be got, and into this muſt be well beat and mixed ſome ſtone-horſe dung and ſome chopped ſtraw cut very ſhort and ſmall; finally, a quantity of common ſalt muſt be thrown in; this muſt be mixed up and beat together into a paſte with water, but it muſt not be expoſed to the froſts. This is equally proper to be employed for all the different ſorts of Grafting. *Miller's Gard. Dict.*

GRAIN *of iron.* Even iron has its grain as well as wood, and that not the ſame in all iron, though all iron is very evidently the ſame ſpecies of body. The common caſt iron has a Grain very different from that which has been hammered, or wrought; the granules, which compoſe the maſs, being in this laſt ſtate forced as it were into combinations with one another, by the repeated blows of the hammer; the tempering of iron into ſteel alſo alters its grain, partly by means of the ſalts and ſulphurs, which are by that operation introduced into it, and partly by the ſtopping the effect of the fiery particles received into it at a certain time.

But beſides theſe differences, the common wrought iron has, in its ſeveral pieces, or ſometimes in the ſeveral parts of the ſame piece, different grains. Firſt a laminated ore, ſecondly a granulated one, and thirdly a fibroſe one. Theſe, however, are not ſo different in reality, as they appear to be; for the laminæ, as they become ſmaller, become granules; and arrangements of theſe granules, in long lines, make the fibres of the thready kind. The artificers, however, know, by theſe marks of the Grain, what iron is fitteſt for tempering into ſteel, and they find the laminated pieces to be the worſt of all, and the granulated ones the beſt. *Mem. Acad. Scien. Par.*

GRAIN *weight.* The Grain weight in uſe among jewellers is one fourth of a carat; and the carat is about the one hundred and fiftieth part of an ounce troy, according to Mr. Jeffries, in his treatiſe on Diamonds and Pearls.

Hence, the jeweller's Grain is to the troy Grain, inverſely, as 600 is to 480, that is, directly as 4 to 5.

GRA'MEN, *graſs*; ſee the article GRASS.

GRA'MPUS, in ichthyology, an Engliſh name given to one of the cetaceous fiſhes, properly of the genus of the delphinus, or dolphin, according to the new Artedian ſyſtem, and diſtinguiſhed from the others of that genus by the name of the dolphin, with the ſnout bending upwards, and with broad ſerrated teeth. This is the orca of almoſt all the antient as well as modern writers, and is called the loper and north caper by the people of Scotland. Sibbald gives it the name of the balæna, but he diſtinguiſhes it from the common whale by its ſmaller ſize, and having teeth in both the jaws. Paulus Jovius calls it alſo capidolius. Theſe are all the names it is known by; and that of porpoiſe is ſometimes ignorantly given to it, but properly belongs to another ſpecies of the ſame genus, the phocæna.

GRANADI'LLA, *paſſion-flower*, a beautiful flower, greatly propagated, in our gardens, by laying down their branches, which in one year's time will take good root, and may then be removed to the places where they are deſigned to remain; the beſt ſeaſon for tranſplanting theſe plants is towards the latter end of October, or the end of March, or the beginning of April, juſt before they begin to ſhoot; for, if they are removed earlier, and it ſhould prove dry froſty weather, with cold north-eaſt winds (as it often happens in March) theſe plants will ſcarcely endure it, which is the occaſion of the death of ſo many of them, as is often obſerved upon tranſplantation; but thoſe which are removed early in the autumn, rarely fail.

The plants ſhould be planted againſt a wall, or other building, which ſhould face the ſouth-eaſt or ſouth-weſt; or elſe intermixed amongſt flowering ſhrubs in quarters; where, if they are regularly trained up to poles, they will flower extremely well, and have a very good effect in diverſifying ſuch plantations. The beſt ſeaſon for pruning of theſe plants is in the ſpring, after the cold weather is paſt; for, if they are pruned very early, and it ſhould happen to be froſty weather afterwards, it would endanger moſt of the young branches: therefore it is much the better way to let the whole plant remain untouched (ſuffering the rude part to hang down before the ſtem and branches) during the winter ſeaſon, which will be of ſervice in protecting them from the ſeverity of the cold; and, if at Michaelmas you lay a little dung, or other mulch, about a foot thick, upon the ſurface of the ground near the ſtems, it will effectually guard their roots from froſt; which method ſhould be conſtantly practiſed with ſuch as are planted in open quarters. The manner of pruning is nothing more than to cut off all the ſmall weak ſhoots, and ſhorten the ſtrong ones to about three feet in length: or, if the building is high, againſt which they are planted, they may be left much longer, though you ſhould be careful not to leave them too long; for, as they are vigorous growing plants, they will ſoon get above the building, and become troubleſome. Thoſe that are planted in quarters, and trained to ſtakes, muſt be cut ſhorter, in order to have the flowers nearer the ground: theſe, when their ſeaſon for flowering is paſt, ſhould have a little mulch laid about their roots; and then their ſtakes may be taken away, ſuffering their branches to lie upon the ground, which will alſo be of ſervice to protect the plants from the injuries of the winter; and in the beginning of April they may be trimmed, and ſtaked up again: and, when the plants begin to ſhoot, they ſhould conſtantly be kept trained up to the ſtakes, whereby they will not only appear handſome, but the place will be clearer to work in, as alſo to paſs through.

The fruit-bearing kind may alſo be propagated, by ſowing of the ſeeds in the ſpring of the year, in pots filled with light rich earth, which ſhould be plunged into a moderate hot bed, to facilitate the growth of the ſeeds; and, when the plants are come up, you muſt harden them by degrees to bear the open air: in theſe pots they ſhould remain till the ſucceeding ſpring, obſerving to ſhelter them in winter under a frame; or elſe place the pots into the earth under a warm wall, to prevent their roots from freezing through the pots; and the beginning of April you may ſhake them out of the pots, and divide the plants from each other, planting them in the places where they are deſigned to remain; or, if you have not the ground ready, they may be put each into a ſeparate pot; ſo that they may at any time be turned out into the ground, without diſturbing their roots; for they are difficult plants to remove, when old.

Theſe plants may alſo be planted to cover arbours or ſeats in warm-ſituated places, where they will flower extremely well, and anſwer the purpoſes of thoſe arbours, as well as any other plants which are at preſent made uſe of. *Miller's Gard. Dict.*

GRANA'DO (*Dict.*)—Granadoes of different kinds are repreſented, *plate* XXXV. *fig.* 17, in the Dictionary.

GRA'NARY, a building for preſerving corn, &c.

Experimental philoſophy has proved that the air is the great ſource of corruption; keep out that, and all is kept out; and the moſt corruptible ſubſtances, ſuch as meal, butter, milk, and the like, have been preſerved freſh four months in the exhauſted receiver of an air-pump.

They have, near Grand Cairo, a magazine or Granary, defended with good walls, and called Joſeph's Granaries. It is not probable that they are quite ſo old as the days of that patriarch, but they abundantly prove the utility of ſuch ſtorehouſes, by the vaſt quantities of grain annually preſerved in them.

Many parts of Africa abound with Granaries of this kind.

They are ſo many deep pits made in the ſolid rock; the deſcent into them is but juſt large enough for a man to go down into them by, but they grow larger, as ſoon as the perſon is in, and are uſually ſquare, from thirty to forty feet in diameter. In theſe the great men of the country preſerve their corn; they firſt ſtrew over the floor with ſtraw, then they lay on the corn; ſtill, as the heap riſes, placing a thin bed of ſtraw between the corn and the ſides, as they did at the bottom. In this manner they proceed till the whole cavity is filled: when this is done, they cover the mouth of the entrance with a ſort of hurdle of green boughs of trees, interwoven one with another. This they cover with about two feet thickneſs of ſand, and over this raiſe a ridge of earth, well beat together, in order to throw off the rain both ways, that none may ſettle on the place and ſoak into the magazine.

The corn thus ſtored up always keeps three, four, or more years very good; and, not unfrequently, the proprietor being taken off by the ſeverity of the eaſtern governments, under which they live, the magazine is forgotten, and, ſome accident diſcovering it many years afterwards, the corn is almoſt always found perfectly good in it. All the care they take, in regard to the corn, is to expoſe it two or three days to the ſun's heat, to dry it thoroughly, before they carry it into the magazine.

In the dutchy of Lithuania and in the Ukraine, the people always preſerve their corn in the ſame manner in wells or pits made in dry places; but in theſe countries great care is to be taken in the opening theſe ſtore-rooms; for, if people deſcend into them, before they have had ſufficient communication with the freſh air, they are often killed by the damps; this, however, is eaſily guarded againſt. By theſe, and numerous other inſtances of the practice of other countries, it appears evident, that the advantage of theſe ſubterranean Granaries over all others is very great.

Though theſe are to be recommended before all others, yet the common Granaries may, with proper care, be rendered greatly more uſeful than they are at preſent. The grand caution neceſſary to this purpoſe is to guard againſt the two great humidity, which there always is in places, where there is a great number of doors and windows. A too free acceſs of the external air is alſo to be carefully guarded againſt; for this brings in with it the eggs of a vaſt number of different inſects, which prey upon and deſtroy the corn. A third caution is, when the corn is the produce of the country, where it is preſerved, not to fill the place with the crop of one place only, but to mix the harveſts of two as different provinces as may be, the one dry, the other moiſt, or otherwiſe differing as much as may be; thus, the contrary qualities of the one will prevent the deſtruction of the other. Theſe are the three great rules to prevent the corrupting of corn; but, when the miſchief is once begun, it will prove very difficult to ſtop it: all the care that can be employed, ſhould therefore be taken in regard to theſe.

The two great cautions to be obſerved in the erecting of Granaries are to make them ſufficiently ſtrong, and to expoſe them to the moſt drying winds. The ordering of the corn in many parts of England is thus: to ſeparate it from duſt and other impurities after it is thraſhed, they toſs it with ſhovels from one end to the other of a long and large room; the lighter ſubſtances fall down in the middle of the room, and the corn only is carried from ſide to ſide, or end to end of it. After this, they ſcreen the corn, and, then bringing it into the Granaries, it is ſpread about half a foot thick, and turned from time to time about twice in a week; once a week they alſo repeat the ſcreening it. This ſort of management they continue about two months, and after that they lay it a foot thick for two months more, and in this time they turn it once a week, or twice, if the ſeaſon be damp, and now and then ſcreen it again. After about five or ſix months, they raiſe it to five or ſix feet thickneſs in the heaps, and then they turn it once or twice in a month, and ſcreen it now and then. When it has lain two years, or more, they turn it once in two months, and ſcreen it once a quarter, and, how long ſoever it is kept, the oftener the turning and ſcreening is repeated, the better the grain will be found to keep.

It is proper to leave an area of a yard wide on every ſide the heap of corn, and other empty ſpaces, into which they turn and toſs the corn, as often as they find occaſion. In Kent they make two ſquare holes at each end of the floor, and one round in the middle, by means of which they throw the corn out of the upper into the lower rooms, and ſo up again, to turn and air it the better. Their ſcreens are made with two partitions, to ſeparate the duſt from the corn which falls into a bag; and, when ſufficiently full, this is thrown away, the pure and good corn remaining behind.

Corn has by theſe means been kept in our Granaries thirty years; and it is obſerved, that, the longer it is kept, the more flower it yields in proportion to the corn, and the purer and whiter the bread is, the ſuperfluous humidity only evaporating in the keeping. At Zurich, in Swiſſerland, they keep corn eighty years or longer, by the ſame ſorts of methods.

The public Granaries at Dantzick are ſeven, eight, or nine ſtories high, having a funnel in the midſt of every floor to let down the corn from one to another. They are built ſo ſecurely, that, though every way ſurrounded with water, the corn contracts no damp, and the veſſels have the convenience of coming up to the walls for their lading. The Ruſſians preſerve their corn in ſubterranean Granaries of the figure of a ſugar-loaf, wide below, and narrow at top: the ſides are well plaiſtered, and the top covered with ſtones. They are very careful to have the corn well dried before it is laid into theſe ſtorehouſes, and often dry it by means of ovens; the ſummer dry weather being too ſhort to effect it ſufficiently. *Philoſophical Tranſactions*, N°. 26.

There are nine Granaries built in a large ſubterraneous cavern, near the town of Ardres, a little ſtrong place near Calais, deſigned to hold corn for the garriſon in caſe of a ſiege; theſe are commonly called the poires D'Ardres; from their model, I have drawn the plan and profiles on *plate* XXI. *fig.* 12, 13, 14. They may be made bigger or leſs than theſe exhibited here, as occaſion may require, or the convenience of the place affords opportunity. I have only given the draught of ſix, which will will be ſufficient to ſhew their diſpoſition: dig thirty feet deep in the ground, and build a firſt vault to have the cavern G, G, repreſented in the 14th figure, and at the ſame time raiſe the poires or ſtone cylinders F F, whoſe top terminating into a half ſphere abuts on a ſecond vault level with the ground floor; every poire muſt ſtand by itſelf, becauſe the air circulating round freely will keep the corn drier; theſe might be built in other places, as between two floors, inſtead of ſubterraneous caverns, but they would not be ſo ſafe, in any other ſituation, from cannon.

Each poire has two apertures E and G, one on the top to take in the corn, the other at bottom to let it out; the firſt ought to be eighteen inches ſquare, and is ſhut with a trap-door; the other which terminates in a pipe is ſhut by a clap-door which turns upon a hinge, and is faſtened by a padlock.

All who know theſe poires agree nothing can be better contrived; I am of opinion they might be of excellent uſe to preſerve

ſerve gunpowder, as they would contain larger quantities than the magazines made uſe of at preſent for that purpoſe with equal ſafety.

GRAPES.—Thoſe kind of Grapes which are thin-ſkinned, grow ſooner ripe than others, and will thrive in a temperate climate where the others will not. If it happens that Grapes are ſtruck with hail at the time that they are large and near ripening, they never become ripe at all, but harden and ſo remain. *Portzius de Vin Rhen.*

We have in the Philoſophical Tranſactions a remarkable account of the change of colour in Grapes of the ſame tree. A muſcadine Grape tree was raiſed from a cutting of a parent vine of this kind, whoſe fruit was white; it was planted againſt an eaſtern wall, where it had the benefit of the ſun, from its riſing, to half an hour after twelve. The ſoil a ſtiff clay, but rendered fitter for the growth of this ſort of tree, by a mixture of rubbiſh of an old wall.

At about five years ſtanding it was ſo pruned, as to make it ſhoot two principal branches, one to the right, the other to the left-hand; from hence it ſhot twenty-two inches on each ſide before it came to a joint. That on the right was a very luxuriant branch, as thick as the body of the tree; the other about half that bigneſs. The leaves on the right-hand were alſo of twice the bigneſs of thoſe on the left, and indeed larger than the leaves of the parent tree; but what is moſt ſingular is, that the luxuriant branch produced annually fine black Grapes in large bunches, and the left hand branch white ones. But the white were often in the greateſt quantity, though the black grew on the much ſtronger branch. It is obſervable, that, in all thoſe vines which bear black and blue Grapes, the leaves die red; but in this tree, whoſe origin was from a white Grape, the leaves on that branch which bore black Grapes died white as well as thoſe on the other. The ſucceeding year, the number of the branches on the right-hand ſhoot were greatly increaſed in number, and the ſucceeding year all bore fine deep-black Grapes in very large numbers. *Philoſophical Tranſactions*, N°. 366.

GRASS, *gramen*.—There are a great variety of this tribe, which are divided into ſeveral genera by ſome of the modern botaniſts; but I ſhall not inlarge ſo far on this article, as to enumerate all the differences which they have made; but ſhall beg leave to inſert ſome of the ſorts which are commonly found wild in England, or that have been introduced into the fields or gardens from abroad.

The beſt ſeaſon for ſowing Graſs ſeed is the latter end of Auguſt, and the beginning of September, that the Graſs may be well rooted before the froſt ſet in, which is apt to turn the plants out of the ground, when they are not well rooted. This ſeed ſhould be ſown in moiſt weather, or when there is a proſpect of ſhowers, which will ſoon bring the Graſs up; for, the earth being at that ſeaſon warm, the moiſture will cauſe the ſeed to vegetate in a few days: but, where this cannot be performed in autumn, the ſeeds may be ſown in the ſpring; towards the middle of March will be a good time, if the ſeaſon proves favourable.

The land on which Graſs ſeed is intended to be ſown, ſhould be well plowed, and cleared from the roots of noxious weeds, ſuch as couch Graſs, fern, ruſhes, heath, gorſe, broom, reſt-harrow, &c. which, if left in the ground, will ſoon get the better of the Graſs, and over-run the land. Therefore, in ſuch places where either of theſe weeds abound, it will be a good method to plow up the ſurface in April, and let it lie ſome time to dry; then lay it in ſmall heaps, and burn it. The aſhes ſo produced, when ſpread on the land, will be a good manure for it. The method of burning the land is particularly uſeful; (ſee the article BURNING *of land*;) eſpecially, if it is a cold ſtiff ſoil; but where couch Graſs, fern, or reſt-harrow, is in plenty, whoſe roots run far under ground, the land muſt be plowed two or three times pretty deep in dry weather, and the roots carefully harrowed off each plowing; which is the moſt ſure method to deſtroy them. Where the land is very low, and of a ſtiff clayey nature, which holds water in winter, it will be of ſingular ſervice to make ſome underground drains to carry off the wet; which, if detained too long on the ground, will render the Graſs ſour. The method of making theſe drains is preſcribed under the article LAND, which ſee.

Before the ſeed is ſown, the ſurface of the ground ſhould be made level and fine, otherwiſe the ſeed will be buried unequal. The quantity of Graſs-ſeed for an acre of land is uſually three buſhels, if the ſeed is clean, otherwiſe there muſt be a much greater quantity allowed: when the ſeed is ſown, it muſt be gently harrowed in, and the ground rolled with a wooden roller; which will make the ſurface even, and prevent the ſeeds being blown in patches. When the Graſs comes up, if there ſhould be any bare ſpots, where the ſeed has not grown, they may be ſown again, and the ground rolled, which will fix the ſeeds; and the firſt kindly ſhowers will bring up the Graſs, and make it very thick.

Some people mix clover and rye Graſs together, allowing ten pounds of clover, and one buſhel of rye Graſs, to an acre: but this is only to be done where the land is deſigned to remain but three or four years in paſture, becauſe neither of theſe kinds are of long duration; ſo that, where the land is deſigned to be laid down for many years, it will be proper to ſow with the Graſs-ſeed ſome white trefoil, or Dutch clover; which is an abiding plant, and ſpreads cloſe on the ſurface of the ground, ſending forth roots at every joint; and makes the cloſeſt ſward of any, and is the ſweeteſt feed for cattle: ſo that, whenever land is laid down to paſture, there ſhould always be ſix or eight pounds of this ſeed ſown upon each acre.

The following ſpring, if there ſhould be any thiſtles, ragwort, or ſuch other troubleſome weeds, come up among the Graſs, they ſhould carefully be cut up with a ſpaddle before they grow large; and this ſhould be repeated two or three times in the ſummer, which will effectually deſtroy them; for, if theſe plants are ſuffered to ripen their ſeeds, they will be blown all over the ground, their ſeeds having down adhering to them, which aſſiſts their tranſportation; ſo that they are often carried by the wind to a great diſtance, and thereby become very troubleſome weeds to the Graſs. For want of this care, how many paſtures may be ſeen almoſt over-run with theſe weeds, eſpecially the ragwort; when a ſmall expence, if applied in time, would have intirely extirpated them! for a man may go over ſeveral acres of land in one day with a ſpaddle, and cut up the weeds juſt below the ſurface of the ground, turning their roots upwards; which, if done in dry weather, they will ſoon decay; but this muſt always be performed before the plants come to have their ſeeds formed; becauſe, after that, many ſorts will live long enough to nouriſh their ſeeds after they are cut, ſo as to ripen them: and there will be a ſupply of weeds for ſome years after, which cannot be extirpated without a much greater expence.

The proper management of paſture land is the leaſt underſtood of any part of agriculture: the farmers never have attended to this, being more inclined to the plough; though the profit attending that has not of late years been ſo great, as to encourage them in that part of huſbandry: but theſe people never think of laying down land for paſture, to continue longer than three years; at the end of which time they plow it up again, to ſow it with grain.

Their uſual method is to ſow rye Graſs and trefoil with barley, when they intend to lay down the ground; or ſometimes ſow only clover with the barley; nor is it poſſible to convince theſe people of their error in ſowing corn with this Graſs; which they affirm to be uſeful, in ſhading the Graſs; not conſidering how much the corn draws away the nouriſhment from the Graſs: but it is in vain to write to theſe people, who are not to be convinced, either by argument or experiment; ſo much are they led by cuſtom, as not to be led or driven out of their own methods; but, as their practice of huſbandry has greatly leſſened the circumſtances of the farmers, ſo that the lands are daily falling into the hands of the owners, therefore, this part of huſbandry ſhould by them be principally attended to, as it may be carried on with a much leſs expence: for paſture land requires but few hands to manage; whereas the ſowing of corn is attended with great expence, and the profit is very precarious: but, when this is attended with ſucceſs, and the grain at a moderate price, if the whole labour is to be paid for, there will be little coming to the owner for rent, when the balance is fairly ſtated; but in this moſt gentlemen deceive themſelves, and often ſuppoſe they gain by farming, when, perhaps, the whole rent of the land is loſt: therefore, to avoid the trouble which attends this ſort of huſbandry, it will be the beſt method to turn as much of their land into paſture, as they can; which, by grazing and feeding of ſheep, will be attended with little expence, and a ſure profit. *Miller's Gard. Dict.*

GRA'SSHOPPERS.—Theſe animals are of the locuſt kind, and ſometimes come in ſwarms to particular places, in the ſame manner as that devouring creature does. They appeared ſome years ago in Languedoc, and ſome other places, in very formidable ſwarms, and eat up all the harveſt of ſeveral years. They took their flight like birds, and were about an inch long, and of a grey colour, in ſhape only like the common Graſshoppers. They were found in many places covering the whole ſurface of the earth four or five inches deep, and uſed to lie quiet till towards noon; but, when the ſun then ſhone warmly upon them, they uſed to ariſe and take wing, and, ſettling on the corn fields, they would in a few hours eat up the whole produce, ears, leaves, and even the more tender parts of the ſtalks. When they had deſtroyed one field in this manner, they uſed to take wing and fly to another. They uſually flew very high in the air, and directly againſt the wind; but, as ſoon as they ſaw a new crop of corn, they dropped together in a ſwarm, and cleared it as they had done the firſt. This practice they continued the whole day, and towards evening they ſettled upon the ground, where they remained quiet till the heat of the following day raiſed them again. When they had deſtroyed all the corn in the country, they ſeized upon the vines, garden-herbs, and willows, and at laſt upon hemp, whole fields of which they eat up, notwithſtanding its great bitterneſs. Towards autumn, they left off feeding, and were found in copulation, and ſoon after this, the females every-where ſeen laying their eggs, which they depoſited in the ground, making a hole with their tail large enough to receive a gooſe quill.

In theſe holes every female would lay forty or fifty eggs, each of the ſize of a millet ſeed, and when they had finiſhed the laying, they covered up the hole to keep out the water; after this they

they died a-pace, and the multitudes of their carcaſſes ſtunk intolerably, poiſoning the air. The next year they hatched in April, and from this one ſwarm there were ſuch prodigious numbers hatched, that fifteen tons of them were deſtroyed, while no bigger than flies, and nine tons of their eggs before the hatching, and yet there remained enough of them to deſtroy, in a great meaſure, the ſucceeding harveſt. After this, they gradually decreaſed for ſeveral years, till they were not more numerous there than elſewhere. This was attributed to the induſtry of the farmers in killing them ; but it is more probable, that unfavourable ſeaſons deſtroyed them. *Philoſophical Tranſactions*, N°. 182.

GRA'VEL, in gardening. — Gravel and graſs are naturally ornaments to a country-ſeat, and are the glory of the Engliſh gardens, and things by which we excel all other nations, as France, Holland, Flanders, &c.

There are different ſorts of Gravel, but, for thoſe who can conveniently have it, I approve of that Gravel on Black-heath, as preferrable to moſt we have in England ; it conſiſting of ſmooth even pebbles, which, when mixed with a due quantity of loam, will bind exceeding cloſe, and look very beautiful, and continue handſome longer than any other ſort of Gravel, which I have yet ſeen.

Some recommend a ſort of iron-mould Gravel, or Gravel with a little binding loam amongſt it, than which nothing, they ſay, binds better, when it is dry : but in wet weather is apt to ſtick to the heels of one's ſhoes, and will never appear handſome.

Sometimes loam is mixed with Gravel that is over ſandy or ſharp, which muſt be very well blended together, and let lie in heaps ; after which it will bind like a rock.

There are many kinds of Gravel which do not bind, and thereby cauſe a continual trouble of rolling, to little or no purpoſe : as for ſuch,

If the Gravel be looſe or ſandy, you ſhould take one load of ſtrong loam, and two of Gravel, and ſo caſt them well together.

There are many different opinions about the choice of Gravel : ſome are for having the Gravel as white as poſſible ; and, in order to make the walks more ſo, they roll them well with ſtone-rollers, which are often hewn by the maſons, that they may add a whiteneſs to the walks : but this renders it very troubleſome to the eyes, by reflecting the rays of light ſo ſtrongly ; therefore, this ſhould ever be avoided ; and ſuch Gravel as will lie ſmooth, and reflect the leaſt, ſhould be preferred.

If it be an old walk, that only wants coating over, it will be ſufficient to lay it two or three inches thick : but, where there is plenty of ſtrong reddiſh loam, you may lay it the full depth.

Some ſcreen the Gravel too fine, but this is an error : if it be caſt into a round heap, and the great ſtones only raked off, it will be the better.

Some are apt to lay Gravel-walks too round ; but this is likewiſe an error, becauſe they are not ſo good to walk upon, and, beſides, it makes them look narrow : one inch is enough in a crown of five feet ; and it will be ſufficient, if a walk be ten feet wide, that it lies two inches higher in the middle, than it does on each ſide ; if fifteen feet, three inches ; if twenty feet, four ; and ſo in proportion.

For the depth of Gravel-walks, ſix or eight inches may do well enough ; but a foot thickneſs will be ſufficient for any ; but then there ſhould always be a depth of rubbiſh laid under the Gravel, eſpecially if the ground is wet ; in which caſe there cannot be too much care to fill the bottom of the walks with large ſtones, flints, brick-rubbiſh, or any other materials, which can be beſt procured ; which will drain off the moiſture from the Gravel, and prevent its being poachy in wet weather.

In the making of Gravel-walks, there muſt be great regard had to the level of the ground, ſo as to lay the walks with eaſy deſcents towards the two parts of the ground, that the wet may be drained off eaſily ; for, when this is omitted, the water will lie upon the walks a conſiderable time after hard rains, which will render them unfit for uſe, eſpecially where the ground is wet or ſtrong : but where the ground is level, and there are no declivities to carry off the wet, it will be proper to have ſink-ſtones laid by the ſides of the walks, at convenient diſtances, to let off the wet ; and where the ground is naturally dry, that the water will ſoon ſoak away, the drains from the ſink-ſtones may be contrived ſo, as to convey the water in ſeſspools, from which the water will ſoak away in a ſhort time : but, in wet land, there ſhould be under-ground drains, to convey the wet off, either into ponds, ditches, or the neareſt place to receive it ; for, where this is not well provided for, the walks will never be ſo handſome, or uſeful.

The month of March is the propereſt time for laying Gravel : it is not prudent to do it ſooner, or to lay walks in any of the winter-months before that time.

Some indeed turn up Gravel-walks in ridges in December, in order to kill the weeds : but this is very wrong ; for, beſides that it deprives them of the benefit of them all the winter, it does not anſwer the end for which it is done, but rather the contrary ; for, though it does kill the weeds for the preſent, yet, it adds a fertility to them, as to the great future increaſe of both them and graſs.

If conſtant rolling them after the rains and froſt will not effectually kill the weeds and moſs, you ſhould turn the walks in March, and lay them down at the ſame time.

In order to deſtroy worms that ſpoil the beauty of Gravel or graſs-walks, ſome recommend the watering them well with water, in which walnut-tree leaves have been ſteeped, and made very bitter, eſpecially thoſe places moſt annoyed by them ; and this, they ſay, as ſoon as it reaches them, will make them come out haſtily, ſo that they may be gathered : but, if in the firſt laying of the walks, there is a good bed of lime-rubbiſh laid in the bottom, it is the moſt effectual method to keep out the worms ; for they do not care to harbour near lime.

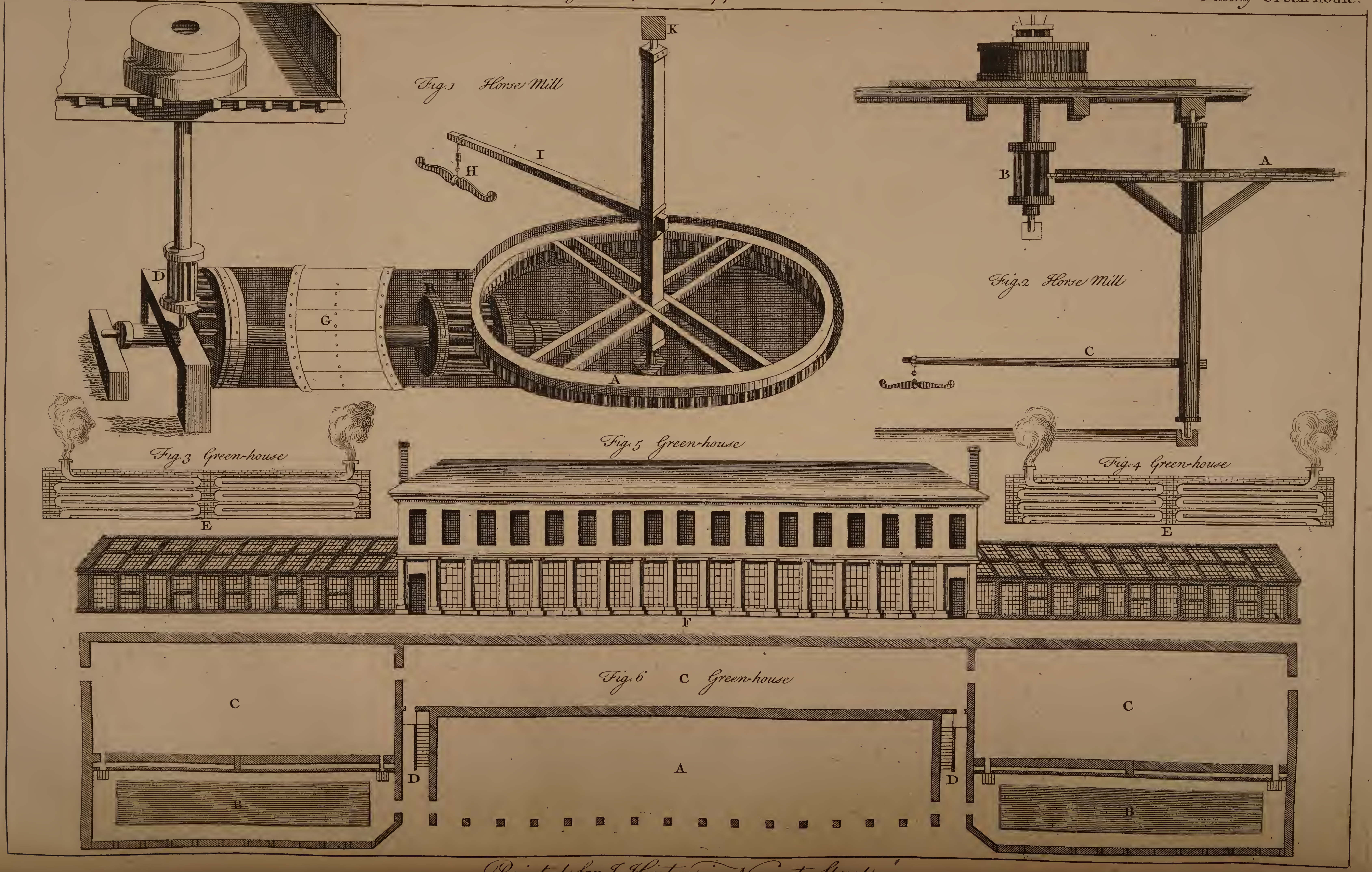
Grounds that are gravelly and ſandy, eaſily admit both heat and moiſture : but they are not much the better for it ; becauſe they let it paſs too ſoon, and ſo contract no ligature ; or elſe, if they have a clayey bottom, they retain it too long, and by that means either parch or chill too much, and produce nothing but moſs, or cancerous infirmities : but, if the bottom be a Gravel, and there are two feet of good earth upon the ſurface, it is preferrable to moſt other ſoils for almoſt any ſort of fruit ; for, though this ſoil will not produce the fruit planted thereon, ſo large as a loamy ſoil, yet they will be much better taſted, and earlier ripe. *Miller's Gard. Dict.*

GREEN (*Dict.*).—The fineſt method of giving this beautiful colour to glaſs is this : take five pounds of cryſtalline metal, that has been paſſed ſeveral times through water, and the ſame quantity of the common white metal of polverine, four pounds of common polverined frit, and three pounds of red-lead ; mix the red-lead well with the frit, and then put all into a pot in a furnace. In a few hours the whole maſs will be well purified ; then caſt the whole into water, and ſeparate, and take out the lead ; then return the metal into the pot, and let it ſtand a day longer in fuſion ; then put in the powder of the reſiduum of the vitriol of copper, and a very little crocus martis, there will be produced a moſt lively and elegant Green, ſcarce inferior to that of the oriental emerald. There are many ways of giving Green to glaſs, but all are greatly inferior to this. *Neri's Art of Glaſs.*

GREEN-*houſe* (*Dict.*)—As, of late years, there have been great quantities of curious exotic plants introduced into the Engliſh gardens, ſo the number of Green-houſes or conſervatories has increaſed ; and not only a greater ſkill in the management and ordering of theſe plants has increaſed therewith, but alſo a greater knowledge of the ſtructure and contrivance of theſe places, ſo as to render them both uſeful and ornamental, hath been acquired : and, ſince there are many particulars to be obſerved in the conſtruction of theſe houſes, whereby they will be greatly improved, I thought it neceſſary not only to give the beſt inſtructions for this I was capable of, but alſo to give a deſign of one in the manner I would chuſe to erect it, upon *plate* XXIV.

As to the length of theſe houſes, that muſt be proportioned to the number of plants they are to contain, or the fancy of the owner ; but their depth ſhould never be greater than their height in the clear ; which in ſmall or middling houſes may be ſixteen or eighteen feet ; but, for large ones, from twenty to twenty-four feet is a good proportion ; for, if the Green-houſe is long, and too narrow, it will have a bad appearance both within and without ; nor will it contain ſo many plants, if proper room be allowed for paſſing in front, and on the backſide, of the ſtands on which the plants are placed : and on the other hand, if the depth of the Green-houſe is more than twenty-four feet, there muſt be more rows of plants placed to fill the houſe, than can with conveniency be reached in watering and cleaning ; nor are houſes of too great depth ſo proper for keeping of plants, as thoſe of a moderate ſize.

The windows in front ſhould extend from about one foot and an half above the pavement, to within the ſame diſtance of the ceiling, which will admit of a cornice round the building, over the heads of the windows. As it is neceſſary to have theſe windows ſo long, it will be impoſſible to make them in proportion as to their breadth ; for, if in the largeſt buildings, the ſaſhes are more than ſeven, or ſeven and an half feet broad, they will be ſo heavy and troubleſome to move up and down, as to render it very difficult for one perſon to perform ; beſide their weight will occaſion their ſoon decaying. There is alſo another inconvenience in having the windows too broad ; which is, that of fixing proper ſhutters to them, in ſuch a manner, as that they may fall back cloſe to the piers, ſo as not to be incommodious ; or, when open, to abſtract any part of the rays of light from reaching the plants. The piers between theſe windows ſhould be as narrow as poſſible to ſupport the building ; for which reaſon I ſhould chuſe to have them of ſtone, or of hard well burnt bricks ; for, if they are built with fine rubbed bricks, thoſe are generally ſo ſoft, that the piers will require to be made thicker, and the building will be in danger of falling in a ſhort time ; eſpecially, if you have any rooms over the Green-houſe ; which is what I would always adviſe, as being of great uſe to keep the froſt out in very hard winters. If theſe piers are made of ſtone, I would adviſe them to be two feet and an half in front, and ſloped off backward to about eighteen inches broad ; whereby the rays of the ſun will not be taken off or obſtructed by the corners of the piers ; which it would be, if they were ſquare : but, if they are built with bricks, it will be proper to make them three feet in front, otherwiſe they



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will be too weak to ſupport the building: theſe I would alſo adviſe to be ſloped off in the manner directed for the ſtone.

At the back of the Green-houſe, there may be erected an houſe for tools, and many other purpoſes; which will be extremely uſeful, and alſo prevent froſt from entering the houſe that way; ſo that the wall between theſe need not be more than two bricks and an half in thickneſs; whereas, were it quite expoſed behind, it ſhould be at leaſt three bricks in thickneſs; and, by this contrivance, if you are willing to make an handſome building, and to have a noble room over the Green-houſe, you may make the room over the tool-houſe, and carry up the ſtair-caſe in the back, ſo as not to be ſeen in the Green-houſe; and, hereby you may have a room twenty-five or thirty feet in width, and of a proportionable length: and, under this ſtair-caſe, there ſhould be a private door into the Green-houſe, at which the gardener may enter in hard froſty weather, when it will not be ſafe to open any of the glaſſes in the front. The floor of the Green-houſe, which ſhould be laid either with marble, ſtone, or broad tiles, according to the fancy of the owner, muſt be raiſed two feet above the ſurface of the ground whereon the houſe is placed; which, in dry ground, will be ſufficient: but, if the ſituation be moiſt and ſpongy, and thereby ſubject to damps, it ſhould be raiſed at leaſt three feet above the ſurface: and, if the whole is arched with low brick arches, under the floor, it will be of great ſervice in preventing the damps riſing in winter, which are often very hurtful to the plants, eſpecially in great thaws, when the air is often too cold to be admitted into the houſe, to take off the damps. Under the floor, about two feet from the front, I would adviſe a flue of about ten inches in width, and two feet deep, to be carried the whole length of the houſe, which may be returned along the back part, and be carried up in proper funnels adjoining to the tool-houſe, by which the ſmoke may paſs off. The fire-place may be contrived at one end of the houſe; and the door at which the fuel is put in, as alſo the aſh-grate, may be contrived to open into the tool-houſe, ſo that it may be quite hid from the ſight, and be in the dry; and the fuel be laid in the ſame place, whereby it will always be ready for uſe.

I ſuppoſe many people will be ſurpriſed to ſee me direct the making flues under a Green-houſe, which has been diſuſed ſo long, and by moſt people thought of ill conſequence; as indeed they have often proved, when under the direction of unſkilful managers, who have thought it neceſſary, whenever the weather was cold, to make fires therein. But, however injurious flues have been under ſuch management, yet, when ſkilfully managed, they are of very great ſervice: for, though, perhaps, it may happen, that there will be no neceſſity to make any fires in them for two or three years together, as, when the winters prove mild, there will not, yet, in very hard winters, they will be extremely uſeful to keep out the froſt; which cannot be effected any other way, but with great trouble and difficulty.

Withinſide of the windows, in front of the Green-houſe, you ſhould have good ſtrong ſhutters, which ſhould be made with hinges, to fold back, that they may fall back quite cloſe to the piers, that the rays of the ſun may not be obſtructed thereby. Theſe ſhutters need not to be above an inch and an half thick, or little more; which, if made to join cloſe, will be ſufficient to keep out our common froſt: and, when the weather is ſo cold as to endanger the freezing in the houſe, it is but making a fire in your flue, which will effectually prevent it: and without this conveniency it will be very troubleſome, as I have often ſeen, where perſons have been obliged to nail mats before their windows, or to ſtuff the hollow ſpace between the ſhutters and the glaſs with ſtraw; which, when done, is commonly ſuffered to remain till the froſt goes away; which, if it ſhould continue very long, the keeping the Green-houſe cloſely ſhut up will prove very injurious to the plants: and as it frequently happens, that we have an hour or two of ſun-ſhine in the middle of the day, in continued froſts, which is of great ſervice to plants, when they can enjoy the rays thereof through the glaſſes; ſo, when there is nothing more to do than to open the ſhutters, which may be performed in a very ſhort time, and as ſoon ſhut again when the ſun is clouded, the plants may have the benefit thereof, whenever it appears; whereas, where there is ſo much trouble to uncover, and as much to cover again, it would take up the whole time in uncovering and ſhutting them up, and thereby the advantage of the ſun's influence be loſt. Beſides, where there is ſo much trouble required to keep out the froſt, it will be a great chance if it be not neglected by the gardener: for, if he be not as fond of preſerving his plants, and as much in love with them, as his maſter, this labour will be thought too great by him; and, if he takes the pains to cover the glaſſes up with mats, &c. he will not care to take them away again, until the weather alters; ſo that the plants will be ſhut up cloſe during the whole continuance of the froſt.

There are ſome people who commonly make uſe of pots filled with charcoal to ſet in their Green-houſe in very ſevere froſts; but this is very dangerous to the perſons who attend theſe fires; and I have often known they have been almoſt ſuffocated therewith; and at the ſame time they are very injurious to the plants: nor is the trouble of tending upon theſe ſmall; and the many hazards, to which the uſe of theſe fires is liable, have juſtly brought them into diſuſe with all ſkilful perſons; and, as the contrivance of flues, and of the fires, are but ſmall charges, they are much to be preferred to any other method for warming the air of the houſe.

The back part of the houſe ſhould be either laid over with ſtucco, or plaiſtered with mortar, and white-waſhed; for otherwiſe the air in ſevere froſt will penetrate through the walls, eſpecially, when the froſt is attended with a ſtrong wind; which is often the caſe in the moſt ſevere winters. There are ſome perſons who are at the expence of wainſcoting their Green-houſes; but, when this is done, it is proper to plaiſter with lime and hair behind the wainſcot, to keep out the cold; and, when they are lined with wainſcot, they ſhould be painted white, as ſhould the ceiling, and every part withinſide of the houſe: for this reflects the rays of light in much greater quantity than any other colour, and is of ſignal ſervice to plants, eſpecially in the winter, when the houſe is pretty much cloſed, and but a ſmall ſhare of light is admitted through the windows: for, at ſuch times, I have obſerved, that in ſome Green-houſes which have been painted black, or of a dark colour, the plants have caſt moſt of their leaves.

Where Green-houſes are built in ſuch places as will not admit of rooms over them, or the perſon is unwilling to be at the expence of ſuch building, there muſt be care taken to keep out the froſt from entering through the roof. To prevent which, it will be very proper to have a thickneſs of reeds, heath, or furz, laid between the ceiling and the tiles: in the doing of which, there muſt be care taken in framing the joiſts, ſo as to ſupport theſe, that their weight may not lie upon the ceiling; which might endanger it: for theſe ſhould be laid a foot thick at leaſt, and as ſmooth as poſſible, and faſtened down well with laths, to prevent their riſing; and then cover it over with a coat of lime and hair, which will keep out the air, and alſo prevent mice, and other vermin, from harbouring in them; which, if left uncovered, they would certainly do. For want of this precaution, there are many Green-houſes built, which will not keep out the froſt in hard winters; and this is many times attributed to the glaſſes in front admitting the cold, when the fault is in the roof: for, where there is only the covering, either of tiles or ſlates, and the ceiling, every ſevere froſt will penetrate through them.

In this Green-houſe you ſhould have truſſels, which may be moved out and into the houſe; upon which you ſhould fix rows of planks, ſo as to place the pots or tubs of plants in regular rows one above another, whereby the heads of the plants will be ſo ſituated as not to interfere with each other. The loweſt row of plants, which ſhould be the forwardeſt towards the windows, ſhould be placed about four feet therefrom, that there may be a convenient breadth left next the glaſſes to walk in front: and the rows of plants ſhould riſe gradually from the firſt, in ſuch a manner, that the heads of the ſecond rows ſhould be intirely advanced above the firſt, the ſtems only being hid thereby: and, at the backſide of the houſe, there ſhould be allowed a ſpace of leaſt five feet, for the conveniency of watering the plants; as alſo to admit of a current of air round them, that the damps, occaſioned by the perſpiration of the plants, may be the better diſſipated, which, by being pent in too cloſely, often occaſions a mouldineſs upon the tender ſhoots and leaves; and, when the houſe is cloſe ſhut up, this ſtagnating rancid vapour is often very deſtructive to the plants: for which reaſon alſo, you ſhould never croud them too cloſe to each other; nor ſhould you ever place ſedums, euphorbiums, torch thiſtles, and other tender ſucculent plants, amongſt oranges, myrtles, and other ever-green-trees; for, by an experiment which I made anno 1729, I found that a ſedum, placed in a Green-houſe among ſuch trees, almoſt daily increaſed its weight, although there was no water given to it the whole time: which increaſe of weight was owing to the moiſture imbibed from the air, which, being replete with the rancid vapours perſpired from the other plants, occaſioned the leaves to grow pale, and in a ſhort time they decayed, and dropped off: which, I have often obſerved, has been the caſe with many other ſucculent plants, when placed in thoſe houſes which were filled with many ſorts of ever-green trees, that required to be frequently watered.

Therefore, to avoid the inconvenience which attends the placing of plants of very different natures in the ſame houſe, it will be very proper to have two wings added to the main Green-houſe; which, if placed in the manner expreſſed in the annexed plan, will greatly add to the beauty of the building, and alſo collect a greater ſhare of heat. In this plan, the Green-houſe is placed exactly fronting the ſouth; and one of the wings faces the ſouth-eaſt, and the other the ſouth-weſt; ſo that, from the time of the ſun's firſt appearance upon any part of the building, until it goes off at night, it is conſtantly reflected from one part to the other; and the cold winds are alſo kept off from the front of the main Green-houſe hereby: and, in the area of this place, you may contrive to place many of the moſt tender exotic plants, which will bear to be expoſed in the ſummer-ſeaſon: and, in the ſpring, before the weather will permit you to ſet out the plants, the beds and borders of this area may be full of anemonies, ranunculus's, early tulips, &c. which will be paſt flowering, and the roots fit to take out of the ground, by the time you carry out the plants; which will render this place very agreeable during the ſpring ſeaſon that the flowers are blown; and here you may walk and divert yourſelf in a fine day, when, perhaps, the air in moſt other parts of the garden will be too cold for perſons not much uſed thereto, to take pleaſure in being out of the houſe.

In the center of this area may be contrived a ſmall baſon for water, which will be very convenient for watering of plants, and add much to the beauty of the place: beſides, the water, being thus ſituated, will be ſoftened by the heat, which will be reflected from the glaſſes upon it; whereby it will be rendered much better than raw cold water for theſe tender plants.

The two wings of the building ſhould be contrived ſo as to maintain plants of different degrees of hardineſs; which muſt be effected by the ſituation and the extent of the fire-place, and the manner of conducting the flues; a particular account of which will be exhibited under the article of STOVES. But I would here obſerve, that the wing facing the ſouth-eaſt ſhould always be preferred for the warmeſt ſtove; its ſituation being ſuch, as that the ſun, upon its firſt appearance in the morning, ſhines directly upon the glaſſes; which is of great ſervice in warming the air of the houſe, and adding life to the plants, after having been ſhut up during the long nights in the winter ſeaſon. Theſe wings, being, in the draught annexed, allowed ſixty feet in length, may be divided in the middle by partitions of glaſs, with glaſs doors to paſs from one to the other. To each of theſe there ſhould be a fire-place, with flues carried up againſt the back wall, through which the ſmoke ſhould be made to paſs, as many times the length of the houſe, as the height will admit of the number of flues; for, the longer the ſmoke is in paſſing, the more heat will be given to the houſe, with a leſs quantity of fuel: which is an article worth conſideration, eſpecially, where fuel is dear. By this contrivance, you may keep ſuch plants as require the ſame degree of heat in one part of the houſe, and theſe will thrive in a much leſs warmth in the other part; but this will be more fully explained under the article of STOVES.

The other wing of the houſe, facing the ſouth-weſt, may alſo be divided in the ſame manner, and flues carried through both parts, which may be uſed according to the ſeaſons, or the particular ſorts of plants which are placed therein: ſo that here will be four diviſions in the wings, each of which may be kept up to a different degree of warmth: which, together with the Green-houſe, will be ſufficient to maintain plants from all the ſeveral countries of the world: and, without having theſe ſeveral degrees of warmth, it will be impoſſible to preſerve the various kinds of plants from the ſeveral parts of Africa and America, which are annually introduced into the Engliſh gardens: for, when plants from very different countries are placed in the ſame houſe, ſome are deſtroyed for want of heat, while others are forced and ſpoiled by too much of it; and this is often the caſe in many places, where there are large collections of plants.

In the building theſe wings, if there are not ſheds running behind them, their whole length, the walls ſhould not be leſs than two bricks thick; and, if they are more, it will be better; becauſe, where the walls are thin, and expoſed to the open air, the cold will penetrate them; and when the fires are made, the heat will come out through the walls; ſo that it will require a larger quantity of fuel to maintain a proper temperature of warmth in the houſe. The back part of theſe houſes, having ſloping roofs, which are covered either with tiles or ſlates, ſhould alſo be lined with reeds, &c. under the covering, as is before directed for the Green-houſe; which will keep out the cold air, and ſave a great expence of fuel; for the cloſer and better theſe houſes are built, and the glaſſes of the ſlope, as alſo, in front, well guarded by ſhutters or reeds in a hard froſt, the leſs fuel will be required to warm the houſes; ſo that the firſt expence of building theſe houſes properly will be the cheapeſt, when the after expence of fires is taken into conſideration.

The ſloping glaſſes of theſe houſes ſhould be made to ſlide, and take off; ſo that they may be drawn down more or leſs, in warm weather, to admit air to the plants; and the upright glaſſes in front may be ſo contrived, as that every other may open as doors upon hinges; and the alternate glaſſes may be divided into two: the upper part of each ſhould be contrived ſo as to be drawn down like ſaſhes; ſo that either of theſe may be uſed to admit air, in a greater or leſs quantity, according as theſe may be divided into two: the upper part of each ſhould be contrived ſo as to be drawn down like ſaſhes; ſo that either of theſe may be uſed to admit air, in a greater or leſs quantity, according as there may be occaſion.

But, beſides the conſervatories here mentioned, it will be proper to have a deep hot bed frame, ſuch as is commonly uſed to raiſe large annuals in the ſpring; into which may be ſet pots of ſuch plants as come from Carolina, Virginia, &c. while the plants are too ſmall to plant in the open air; as alſo may other ſorts from Spain, &c. which require only to be ſcreened from the violence of the froſts, and ſhould have as much free air as poſſible in mild weather; which can be no better effected than in one of theſe frames, where the glaſſes may be taken off every day when the weather will permit, and put on every night; and, in hard froſts, the glaſs may be covered with mats, ſtraw, peaſe haulm, or the like, ſo as to prevent the froſt from entering the pots to freeze the roots of the plants, which is what will, many times, utterly deſtroy them; though a ſlight froſt pinching the leaves or ſhoots very ſeldom does them much harm: if theſe are ſunk a foot or more below the ſurface of the ground, they will be the better, provided the ground is dry; otherwiſe they muſt be wholly above ground: the ſides of this frame ſhould be built with brick, with a curb of wood laid round on the top of the wall, into which the gutters, on which the glaſſes ſlide, may be laid: the back wall of this frame may be four feet high, and the front one foot and an half; the width about ſix feet, and the length in proportion to the number of plants.

Explanation of *Plate* XXIV. *fig.* 3, 4, 5, 6, repreſenting a plan, elevation, &c. of a Green-houſe.

A, *fig.* 6, the ground plan of the Green-houſe.
B B, the ground plan of the two ſtoves.
C C C, the ſheds behind the Green-houſe.
D D, the paſſage of communication between the Green-houſe and ſtoves, where the ſtairs are placed which lead to the rooms over the Green-houſe.
E E, *fig.* 3, 4, ſection of the flues in the back of the ſtoves.
F, *fig.* 5, the elevation of the Green-houſe.

GRE'ENLAND *buck*, in natural hiſtory, a very thick and clumſy deer in compariſon with our's in England, being, for proportion of its parts, more like a well grown calf than a deer; from the ground to the top of the ſhoulders, it is about three feet high, Engliſh meaſure; it hath a much ſhorter neck, and thicker legs, than is common in the deer kind; in ſummer time it is covered with ſmooth ſhort hair of a mouſe colour; againſt winter there ſprings from beneath this a ſecond coat of long rough white hair, though it is a little brown on the back, and the lower part of the face; this long hair gives it a thick clumſy appearance; in the ſpring again, this rough winter cloathing is, as it were, thruſt off by the ſucceeding ſummer's coat, which is ſmooth and ſhort, and ſo it continues to change its coverings; what is moſt remarkable in this kind is the noſe, which is wholly covered with hair in that part, which in other deer is bare ſkin, and moiſt: I ſuppoſe, had it been naked, it muſt neceſſarily have froze in thoſe countries, ſo nature has given it this covering to defend it; the eyes are pretty large, ſtanding a little out of the head; both male and female have horns, which is not common; its hoofs are not pointed, they part pretty much in the cleft, and are broad at the bottom, in order, I ſuppoſe, to keep them from ſinking too far into the ſnow; it hath two ſmall hoofs or claws behind the greater on each foot, placed pretty high; the hoofs are of a dark horn colour; the horns in this were not perfect, it being young; they were covered with a pluſh-like ſkin, of a brown colour, and ſhaped as in the figure.

I ſaw a head of perfect horns brought over with theſe deer, which had two large palmed branches over the eyes, conveniently placed as ſhovels, to remove the ſnow from the graſs; a little above theſe were two other palms, but leſs, ſtanding outward; above theſe, each horn ſpread itſelf into five round branches not at all palmed. A male and female of theſe deer were preſented to Sir Hans Sloane, anno 1738, by captain Craycott, who brought them over. Sir Hans afterwards preſented them to his grace the duke of Richmond, who ſent them to his park in Suſſex. I hear they are ſince dead, without any increaſe. This is by ſome ſuppoſed to be the rain-deer of the Laplanders and Ruſſians. *Plate* XXV. *fig.* 3, repreſents it in its winter cloathing. *Edwards's Hiſtory of Birds.*

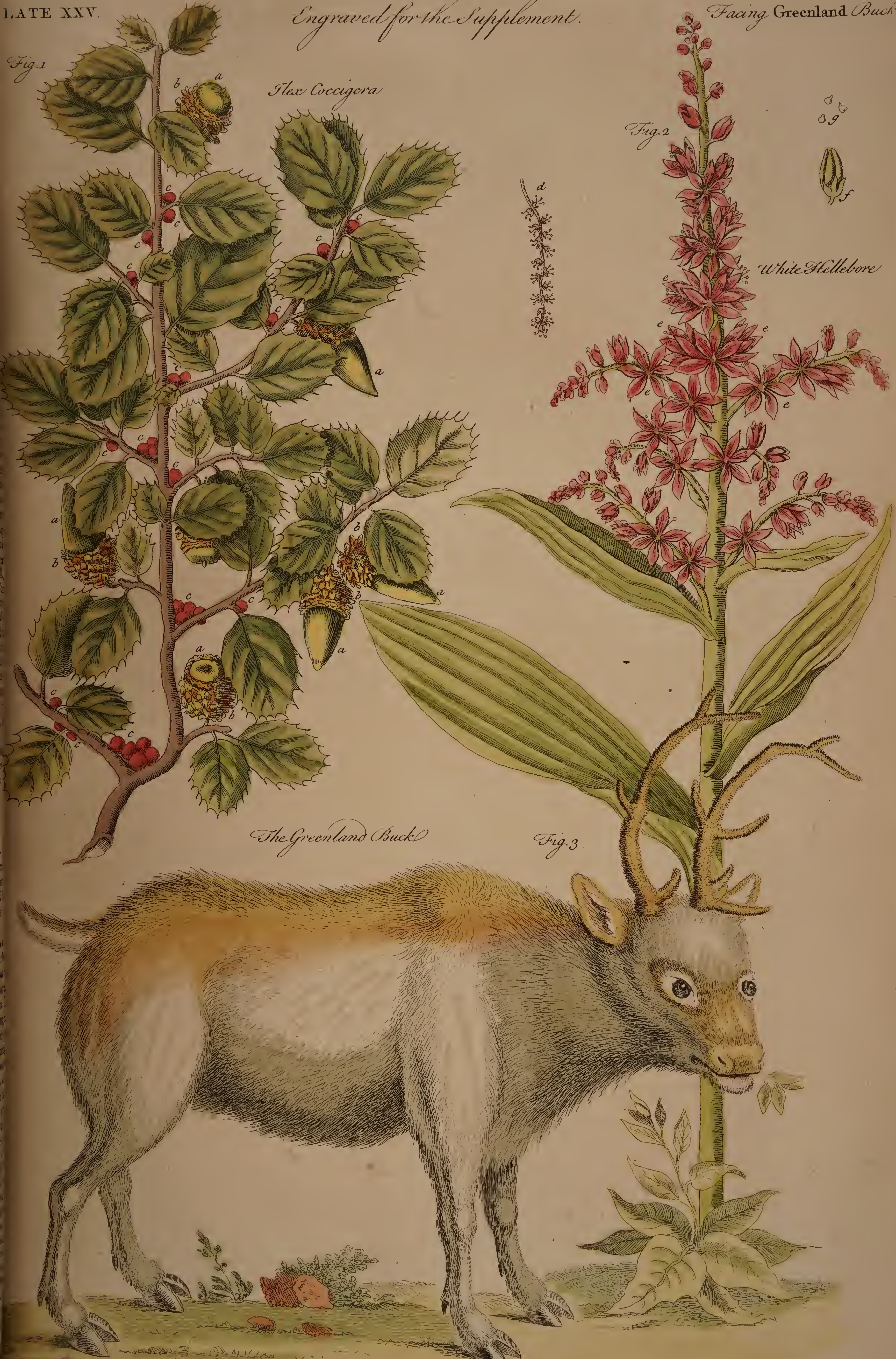
GRENAI'LLE, a name given by the French writers to a preparation of copper, which the Chineſe uſe as a red colour in ſome of their fineſt china; particularly for that colour which is called oil red, or red in oil. The china ware coloured with this is very dear. The manner in which they procure the preparation is thus: they have in China no ſuch thing as ſilver coined money, but they uſe, in commerce, bars or maſſes of ſilver; theſe they pay and receive in large bargains, and, among a nation ſo full of fraud as the Chineſe, it is no wonder that theſe are often adulterated with too great an alloy of copper. They paſs, however, in this ſtate in the common payments. There are ſome occaſions, however, ſuch as the paying the taxes and contributions, on which they muſt have their ſilver pure and fine: on this occaſion they have recourſe to certain people, whoſe ſole buſineſs it is to refine the ſilver, and ſeparate it from the copper and the lead it contains. This they do in furnaces made for the purpoſe, and with very convenient veſſels. While the copper is in fuſion, they take a ſmall bruſh and dip the end of it into water; then, ſtriking the handle of the bruſh, they ſprinkle the water, by degrees, upon the melted copper; a ſort of pellicle forms itſelf by this means on the ſurface of the matter, which they take off while hot with pincers of iron, and, immediately throwing it into a large veſſel of cold water, it forms that red powder, which is called the Grenaille; they repeat the operation, every time they in this manner ſeparate the copper; and this furniſhes them with as much of the Grenaille as they have occaſion for in their china works. *Obſervations ſur les Coutumes de l'Aſie.*

GROSSULA'RIA, *the gooſeberry-tree*, in botany, a genus of plants whoſe characters are:

The leaves are laciniated, or jagged: the whole plant is ſet with prickles: the fruit grows ſparſedly upon the tree, having,

for

LATE XXV. *Engraved for the Supplement.* *Facing* Greenland *Buck*



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for the moſt part, but one fruit upon a footſtalk, which is of an oval or globular figure, containing many ſmall ſeeds ſurrounded by a pulpy ſubſtance.

There are ſeveral varieties of this fruit, which have been obtained from ſeeds in different parts of England, which differ either in the ſhape or colour of the berries: but, as theſe are only ſeminal variations, it is needleſs, in this place, to enumerate them, eſpecially ſince the number of theſe will be increaſed continually from ſeeds.

Theſe are propagated either by ſuckers taken from the old plants, or by cuttings; the latter of which I prefer to the former, becauſe thoſe plants which are produced from ſuckers are always more diſpoſed to ſhoot out a great number of ſuckers from their roots, than ſuch as are raiſed from cuttings, which generally form much better roots.

The beſt ſeaſon for planting theſe cuttings is in autumn, juſt before their leaves begin to fall; obſerving always to take the handſomeſt ſhoots, and from ſuch branches as generally produce the greateſt quantity of fruit; for, if you take thoſe which are produced from the ſtem of the old plants, which are commonly very luxuriant, they will not be near ſo fruitful as thoſe taken from bearing branches: theſe cuttings ſhould be about ſix or eight inches long, and muſt be planted in a border of light earth, expoſed to the morning ſun, about three inches deep, obſerving to water them gently, when the weather proves dry, to facilitate their taking root; and in the ſummer, when they put out, you ſhould rub off all the under ſhoots, leaving only the uppermoſt or ſtrongeſt, which ſhould be trained upright, to form a regular ſtem. In October following, theſe plants will be fit to remove; at which time you ſhould prepare an open ſpot of freſh earth, which ſhould be well dug, and cleanſed from all noxious weeds, roots, &c. and, being levelled, you ſhould proceed to take up your plants, trimming their roots, and cutting off all lateral ſide branches; then plant them at three feet diſtance row from row, and one foot aſunder in the rows, obſerving to place ſome ſhort ſticks to the plants, in order to train their ſtems upright and regular. In this place they may remain one year; being careful to keep them clear from weeds, as alſo to trim off all lateral ſhoots which are produced below the head of the plant, ſo that the ſtem may be clear about a foot in height above the ſurface of the earth, which will be full enough: and, as the branches are produced commonly very irregular in the head, you muſt cut out ſuch of them as croſs each other, or thin them where they are too cloſe; whereby the head of the plant will be open, and capable of admitting the air freely into the middle, which is of great uſe to all kinds of fruits.

After theſe plants have remained in this nurſery one year, they will be fit to tranſplant to the places where they are deſigned to remain; for it is not ſo well to let them grow in the nurſeries too large, which will occaſion their roots to be woody, whereby the removing of them will not only hazard the growth of the plants, but ſuch of them as may take very well, will remain ſtinted for two or three years, before they will be able to recover their check. The ſoil in which theſe plants thrive to the greateſt advantage, is a rich light ſandy earth; though they will do very well upon moiſt ſoils, which are not too ſtrong or moiſt, and in all ſituations: but where the fruit is cultivated, in order to procure it in the greateſt perfection, they ſhould never be planted in the ſhade of other trees, but muſt have a free open expoſure; the diſtance they ought to be planted is eight feet row from row, and ſix feet aſunder in the rows: the beſt ſeaſon for tranſplanting them is in October, when their leaves begin to decay; obſerving, as was before directed, to prune their roots, and trim off all lateral ſhoots, or ſuch as croſs each other; ſhortening all long branches, ſo as to make the head regular.

In the pruning of theſe ſhrubs, moſt people make uſe of garden-ſheers, obſerving only to cut the head round, as it is practiſed for ever-greens, &c. whereby the branches become ſo much crouded, that what fruit is produced, never grows to half the ſize as it would do, were the branches thinned, and pruned according to art; which ſhould always be done with a pruning-knife, ſhortening the ſtrong ſhoots to about ten inches, and cutting out all thoſe which grow irregular, and thinning the fruit-bearing branches where they are too thick; obſerving always to cut behind a leaf-bud: with this management your fruit will be near twice as large as thoſe which are produced upon ſuch buſhes as are not thus pruned, and the ſhrubs will continue in vigour much longer: but you muſt obſerve to keep the ground clear from weeds, and dig it at leaſt once a year; and every other year you ſhould beſtow a little rotten dung upon it, which will greatly improve the fruit.

It is a common practice with the gardeners near London, who have great quantities of theſe buſhes, in order to ſupply the markets, to prune them ſoon after Michaelmas, and then to dig up the ground between the rows, and plant it with coleworts for ſpring uſe, whereby their ground is employed all the winter, without prejudicing the gooſeberries; and in hard winters theſe coleworts often eſcape, when thoſe which are planted in an open expoſure are all deſtroyed; and theſe are generally pulled up for uſe in February or March, ſo that the ground is clear before the gooſeberries come out in the ſpring; which is a piece of huſbandry well worth practiſing where ground is dear, or where perſons are confined for room. *Miller's Gard. Dict.*

Gooſeberries, in the beginning, are green, and of an acid taſte, becauſe the acid ſalt, contained therein in a large proportion, is not yet encumbered with ſulphurs, and thus it can operate upon the nerves of the tongue very powerfully; inſomuch that this ſalt, being at that time united with nothing elſe but ſome proportion of earth, excites an aſtringent and ſtyptic ſenſation; whereas, afterwards, the little oil contained in the gooſeberries, which before was kept back by paſſive principles, gets looſe, riſes, and, by the help of fermentation, unites itſelf with the ſalts, and diveſts them partly of their ſtrength; then it is that gooſeberries are ripe, when they have a ſweet ſmell, and yellowiſh colour: from whence we may conclude, that, the riper gooſeberries are, they are ſo much the leſs aſtringent; and ſo, when you have a mind to have gooſeberries preſerved, the green are to be preferred before thoſe that are ripe.

The ſaid eſſential ſalt, wherewith gooſeberries abound, is the cauſe of the principal effects wrought by them. In ſhort, they would not create an appetite, were it not that this ſalt lightly pricks the little fibres of the ſtomach; they would not cool, and be good for people ſick of fevers, and be endued with the little virtues, but becauſe this ſalt, by imparting a little more conſiſtence to the humours, ſtops their violent and impetuous motion. *Lemery on Foods.*

GROTTO (*Dict.*)—A cement for artificial Grotto's may be made thus: take two parts of white reſin, melt it clear, and add to it four parts of bees wax; when melted together, add two or three parts of the powder of the ſtone you deſign to cement, or ſo much as will give the cement the colour of the ſtone; to this add one part of flower of ſulphur: incorporate all together over a gentle fire, and afterwards knead them with your hands in warm water. With this cement the ſtones, ſhells, &c. after being well dried before the fire, may be cemented. *Smith's Laboratory.*

Artificial red coral branches, for the embelliſhment of Grotto's, may be made in the following manner: take clear roſin, diſſolve it in a braſs pan; to every ounce of which add two drachms of the fineſt vermilion: when you have ſtirred them well together, and have choſen your twigs and branches, peeled and dried, take a pencil and paint the branches all over, whilſt the compoſition is warm; afterwards ſhape them in imitation of natural coral. This done, hold the branches over a gentle coal fire, till all is ſmooth and even, as if poliſhed.

In the ſame manner white coral may be prepared with white lead, and black coral with lamp-black.

A Grotto may be built with a little expence of glaſs, cinders, pebbles, pieces of large flints, ſhells, moſs, ſtones, counterfeit coral, pieces of chalk, &c. all bound or cemented together with the above deſcribed cement.

GROVES (*Dict.*)—Groves are the greateſt ornaments to a garden; nor can a garden be complete which has not one or more of theſe. In ſmall gardens there is ſcarce room to admit of Groves of any extent; yet, in theſe, there ſhould be at leaſt one contrived, which ſhould be as large as the ground will allow it: and, where theſe are ſmall, there is more ſkill required in the diſpoſition, to give them the appearance of being larger than they really are.

Groves are of two ſorts, viz. open and cloſe Groves; open Groves are ſuch as have large ſhady trees, which ſtand at ſuch diſtances, as that their branches may approach ſo near each other, as to prevent the rays of the ſun from penetrating through them: but as ſuch trees are a long time in growing to a proper ſize for affording a ſhade; ſo, where new Groves are placed, the trees muſt be placed cloſer together, in order to have ſhade as ſoon as poſſible: but, in planting of theſe Groves, it is much the beſt way to diſpoſe all the trees irregularly, which will give them a greater magnificence, and alſo form a ſhade ſooner, than when the trees are planted in lines; for, when the ſun ſhines between the rows of trees, as it muſt do ſome part of the day in ſummer, the walks between them will be expoſed to the heat, at ſuch times, until the branches of theſe trees meet; whereas, in the irregular plantations, the trees intervene, and obſtruct the direct rays of the ſun.

When a perſon, who is to lay out a garden, is ſo happy as to meet with large full grown trees upon the ſpot, they ſhould remain inviolate, if poſſible; for it will be better to put up with many inconveniencies, than to deſtroy theſe, which will require an age to retrieve; ſo that nothing but that of offending the habitation, by being ſo near as to occaſion great damps, ſhould tempt the cutting of them down.

Moſt of the Groves which have been planted either in England, or thoſe celebrated gardens in France, are only a few regular lines of trees; many of which join to the habitation, or lead to ſome building, or other object: but theſe do not appear ſo grand, as thoſe which have been made in woods, where the trees have grown accidentally, and at irregular diſtances; where the trees have large ſpreading heads, and are left at ſuch diſtance as to permit the graſs to grow under them, then they afford the greateſt pleaſure; for nothing is more noble, than fine ſpreading trees, with large ſtems, growing thro' graſs, eſpecially if the graſs is well kept, and has a good verdure; beſide, moſt of theſe planted Groves have generally a gravel walk, made in a ſtraight line between them; which greatly offends the ſight of perſons who have a true taſte: therefore, whenever a gravel walk is abſolutely neceſſary to be carried through theſe Groves, it will be much better to twiſt it about, according as the trees naturally ſtand, than to attempt regularity: but dry walks under large trees are not ſo uſeful, as in open places; becauſe the dropping of the trees will render theſe walks uſeleſs, after rain, for a conſiderable time.

Cloſe Groves have frequently large trees ſtanding in them; but the ground is filled under theſe with ſhrubs, or underwood; ſo that the walks which are made in them are private, and ſcreened from winds; whereby they are rendered agreeable for walking, at ſuch times when the air is too violent or cold for walking in the more expoſed parts of the garden.

Theſe are often contrived ſo as to bound the open Groves, and frequently to hide the walls, or other incloſures, of the garden: and, when they are properly laid out, with dry walks winding through them, and on the ſides of theſe ſweet-ſmelling ſhrubs and flowers irregularly planted, they have a charming effect: for here a perſon may walk in private, ſheltered from the inclemency of cold or violent winds, and enjoy the greateſt ſweets of the vegetable kingdom: therefore, where it can be admitted, if they are continued round the whole incloſure of the garden, there will be a much greater extent of walk: and theſe ſhrubs will appear the beſt boundary, where there are not fine proſpects to be gained.

Theſe cloſe Groves are by the French termed boſquets, from the Italian word boſquetto, which ſignifies a little wood: and in moſt of the French gardens there are many of them planted; but theſe are reduced to regular figures, as ovals, triangles, ſquares, and ſtars: but theſe have neither the beauty or uſe which thoſe have that are made irregularly, and whoſe walks are not ſhut on each ſide by hedges, which prevents the eye from ſeeing the quarters; and theſe want the fragrancy of the ſhrubs and flowers, which are the great delight of theſe private walks; add to this, the keeping of the hedges in good order is attended with a great expence; which is a capital thing to be conſidered in the making of gardens. *Miller's Gard. Dict.*

GROUND *angling*, the art of catching fiſh under water without a float, only with a plumb of lead, or a bullet. This method is moſt expedient in cold weather, when the fiſh ſwim low. The bullet is to be placed nine inches from the baited hook; the top of the rod is to be very gentle, that the fiſh may more eaſily run away with the bait, and not be ſcared with the ſtiffneſs of it. The angler in this way is not to ſtrike, as ſoon as he feels the fiſh bite, but ſlacken his line a little, to give the fiſh an opportunity to ſwallow the hook.

The tackle here is to be fine and ſlender, ſtrong and big lines being apt to fright the fiſh. Morning and evening are the chief ſeaſons for the Ground line for trout; but in a cloudy day, or a muddy water, you may fiſh at Ground from morning to night. *Dict. Ruſt.*

Ground *plates*, in architecture, are the outermoſt pieces of timber lying on, or near the Ground, and framed into one another with mortiſes and teniſons. In theſe alſo, are mortiſes made to receive the tenons of joints, the ſummers and girders; and, ſometimes, the trimmers for the ſtair-caſe and chimney-way, and the binding joiſts.

Ground *timbers*, in a ſhip, are thoſe timbers which lie on her keel, and are faſtened to it with bolts through the keelſon. They are ſo called, becauſe the ſhip lies at reſt upon them, when ſhe is aground.

GROUSE, in zoology, the name of the tetrao, or urogallus minor, called alſo the black game, and the heath-hen, and, by Turner, the moor-hen. It is a large bird of the gallinaceous kind. The male is all over black, but the edges of his feathers, eſpecially on the neck and back, have a bluiſh gloſs mixed among the black, and its thighs very grey. The female is of the colour of the partridge, and is variegated with tranſverſe black lines on the back, and the breaſt and belly are grey. Its beak is black and crooked. It is found in the mountainous and heathy parts of the kingdom, and is a very well taſted bird. The male and female differ ſo much in colour, that ſome very accurate writers on theſe ſubjects have been deceived into an opinion of their being two different ſpecies of birds; and Geſner has diſtinguiſhed them in this manner, calling the female of this the grygallus minor, and that of the great urogallus or cock of the mountain, the grygallus major. *Ray's Ornithol.*

GRO'WAN, in natural hiſtory, a word uſed by the miners in Cornwall to expreſs a ſort of coarſe and gritty ſtone, which they are uſually obliged to dig through before they come at the veins of ore. This is uſually grey or whitiſh, but ſometimes it is of various colours, often yellowiſh, and ſometimes ſpotted with iron colour, and an inky black; and often its texture is ſo looſe and ſpongy, that there are holes in it of the ſize proper to receive a pea, or a horſe-bean; theſe are ſometimes empty, but more uſually they are filled up either with chalk, or with ſpar. Beſide the ſtrata of this ſtone that lie over the ore, there is alſo a large quantity of it often placed by its ſide. They have this, and two other ſorts of ſtone, lying in their way to the tin ore in Cornwall. The firſt of the others they call moor-ſtone; a very uncertain name, as it is alſo given by ſome to the common white granate of that country; but the miners only mean by it a looſe ſort of free-ſtone, ſomewhat ſofter than that uſually employed in building. The other ſtone is called killos. This is a grey ſtone of the ſlate kind, eaſily ſplitting into thin plates, and is very full of talcky flakes. This killos is, however, a very indeterminate name, as well as the other; for the ſame people ſometimes uſe it alſo to ſignify a white earth, common among them; this laſt, however, they ſometimes diſtinguiſh by the epithet white. The word Growan ſeems the only name they have kept to any determinate ſignification, for they never expreſs by this word any other ſubſtance, than the ſtone above deſcribed.

GRUB, the Engliſh name of the hexapode worms, or maggots, hatched from the eggs of beetles. Grubs are an excellent bait for many kinds of fiſh. In angling for the grayling, the aſh Grub is to be preferred to all others. This is plump, milk-white, but round from head to tail, and has a red head. There is alſo another Grub, which is very common, and is longer and ſlenderer than the aſh Grub. It is yellower and tougher, and is known by having a red head, and two rows of legs along the belly. The trout and grayling uſually frequent the ſame places, and it is not uncommon to take the trout, while fiſhing for the other. Theſe Grubs are to be kept in bran, in which they will grow tougher than they were at firſt; but the aſh Grub is always ſo tender, that it is difficult to make a good bait of it. The beſt method is to wrap it in a piece of ſtiff hair with the arming, leaving it ſtanding out about a ſtraw's breadth at the head of the hook, ſo as to keep the Grub from totally ſlipping off, when baited. The horſe-hair that the hook is faſtened to ſhould be as white as poſſible, that it may reſemble the colour of the bait, and not be ſuſpected.

Grub *of the box, or box puceron*, in natural hiſtory, a name given to a ſort of inſect approaching to the nature of the puceron of the elder and other trees, but differing from that animal in ſome eſſential characters, and being more properly of the ſame genus with the fig-inſect or falſe puceron.

GRU'BBING, a term uſed by our farmers, to expreſs the taking up the roots of trees out of the ground. Several occaſions offer for the doing this; as, when trees are old and paſt growing to any uſe, the roots muſt be taken up, that young trees may be planted in their places. This is a chargeable operation in moſt places, but, in ſome countries, the farmers have deviſed a machine, which does a great part of the work in a much ſhorter time than in any other way can be done. It is a hook of iron, of about two feet and a half long, with a large iron ring faſtened to its ſtreight end or handle. The whole inſtrument may be made for about three or four ſhillings, and is to be uſed in this manner: the ground is firſt to be cleared away about the root, and any ſtraggling ſide roots found running horizontally are to be cut off. Then they faſten the point of the hook to ſome part of the ſtump or root, and, putting a long and ſtrong lever through the ring, two men at the end of it go round forcing it every way, till they tear the root out, twiſting the top roots off at ſome diſtance under ground. The digging down to which, in the common way, is one great article of the expence. It is very effectual in ſtubbing up the roots of the underwood, but, when large tree roots are to be taken up by it, it is beſt to cleave them firſt with wedges into ſeveral pieces, and then pull them out ſeparately. *Mortimer's Huſbandry.*

GRYLLOTA'LPA, *the mole cricket*, in natural hiſtory, a creature approaching to the locuſt kind, and very properly called by this name by Moffet, as it has much of the form of the cricket, and makes a noiſe like it in the evening; and is, like the mole, continually employed in the digging the ground. It is an inſect of a very unpleaſant form. It is of the length and thickneſs of a man's little finger, and is of a brown colour; which is darker in the male than in the female. There are on each ſide of the anus two hairy proceſſes, reſembling the tails of mice; its belly is compoſed of eight joints, and is covered with as many ſcales, which are of a pale fleſh colour, and are covered with ſhort hair. The back is covered by a pair of pointed wings, along each of which there runs a black ſtreak or line. Theſe wings fold any way at the creature's pleaſure, and, when fully expanded, are very large. Over theſe lie the antennæ; theſe are variegated alſo with black, and reach about half the length of the wings. It has only four legs; the hinder pair are long and fit for hopping; the anterior pair are ſhort, and furniſhed with a ſort of hands for digging in the manner of the mole. The breaſt is covered with a cruſtaceous ſubſtance which is blackiſh, and hairy on the outſide, and ſmooth and pale within. The eyes are very bright and black, and are very hard, and the mouth is wide, and has two tonſils, and teeth in both jaws. This creature lives under ground, and is principally found in damp and boggy places. There has for many years been a breed of them in the gardens of Lord Burlington, at Chiſwick, under the graſs walk toward the lower end of the canal, where they are now very numerous. They come out in the duſk of the evening, and make a very loud noiſe, of the nature of that of the cricket.

GRY'LLUS, *the cricket*, in natural hiſtory, the name of a genus of inſects nearly allied to the locuſt claſs. The two principal kinds are the houſe and field cricket. The firſt of theſe is ſmaller, and is of a brown colour ſpotted with black. The latter is more than an inch long, and has a great head and very large eyes. The antennæ in this ſpecies have no articulations.

GRY'PHIUS *pes, the griffon's claw*, a name of a chirurgical inſtrument deſcribed by Ambroſe Parey, and uſed for extracting moles from the uterus.

GRY'PHUS, in ſurgery, a ſort of crooked pincers uſed by ſurgeons.

GUA'DUM, *woad*. See ISATIS.

GUAI'ACUM (*Dict.*)—*Analyſis of* GUAIACUM.—Fill a clean glaſs retort, almoſt up to its neck, with the ſmall raſpings of the beſt, green, cloſe, ponderous, and freſh Guaiacum, with care to prevent any of it from falling through the neck into the receiver. Set the retort in a ſand furnace; apply a very large receiver, and lute the juncture cloſe, with a luting of linſeed meal. Diſtil, firſt, with a degree of heat not exceeding that of boiling water; and continue this carefully, ſo long as any moiſture will be thereby driven from the wood. A liquid, tart, and ſharply odorous water will thus come over, which is to be poured out, and kept apart. The receiver being now, again, luted on, increaſe the fire, by ſlow degrees; and, again, a conſiderably limpid, but ſomewhat more acid, unctuous, and reddiſh liquor will come over, which muſt carefully be urged with the ſame degree of heat, ſo long as it riſes. This, alſo, may be kept ſeparate, as being conſiderably ſtrong, odorous, and ſmelling almoſt perfectly like red herrings. The fire, being now raiſed and kept up, drives over a red, unctuous, and highly acid liquor, together with a red oil floating in a conſiderable quantity therein: at length increaſe the fire to the utmoſt, that the bottom of the iron pot may begin to be red-hot; there will now aſcend a ſmoke, and a thick, black, viſcid oil, which ſinks to the bottom of the former liquor. And, if this fire be continued as ſtrong as the glaſs will endure without melting, the ſame fume will conſtantly continue to riſe, how long ſoever the fire be kept up. In the laſt place, apply live coals upon the ſand, all round and above the retort, which is called a fire of ſuppreſſion; and keep this up, alſo, for ſome time, till no more oil comes over. Now ſuffer all to cool ſpontaneouſly, and, by this laſt extremity of the fire, a little very thick, black, and ponderous oil, like pitch, will be driven over.

Make a little filtre of cap-paper, put it into a glaſs funnel, and pour therein the water which firſt came over, without any oil, that the ſtrainer, being thus well moiſtened, may tranſmit this pure water of the Guaiacum, which is to be kept ſeparate. This water will be tartiſh, limpid, and penetrating, but have little of the ſmell or taſte of the Guaiacum; but a ſomewhat burnt odour, a little reſembling that of ſmoaked herrings. Then put the ſecond water into the ſame filtre, and this will come through a little reddiſh, tranſparent, but more acid, and ſmelling ſtronger of ſmoaked herring; ſo as to prove ſomewhat empyreumatic, and much ſharper than the former. And, if any oil was lodged in the ſecond water, it will remain in the filtre; which, having been moiſtened by the preceding liquor, will not permit the oil to paſs. Into the ſame filtre pour, likewiſe, the vinegar, and third ſpirit, together with its light oil; the vinegar will immediately paſs through red, pellucid, ſharp, acid, and empyreumatical, but leaves its oil behind, floating upon the liquor, in the filtre: for which purpoſe the filtre muſt always be kept filling up with more of the oily liquor, to prevent the oil from ever touching the lower part of the paper; for, thus, nothing of the oil will come through with the acid liquor. When, now, nearly all the liquor is come through, immediately remove the funnel, with the filtre, to another glaſs, before the oil begins to ſink through the paper; which would happen, when the paper begins to grow dry. At this time, therefore, the light and thin oil may be poured, out of the filtre, into a veſſel apart.

Pour the oil, which came over laſt, along with its highly acid, fetid, and unctuous liquor, into the ſame filtre, whilſt it remains ſtill wet with the former liquor; there will now come through a red, acid, tranſparent fluid; and a groſs, black, pitchy, ponderous oil remains in the paper: this, alſo, is to be poured out, and kept ſeparate.

If theſe acid liquors be preſerved in clean glaſſes, they depoſit, at the ſides and bottom thereof, a ſmall oily cruſt, which gradually increaſes, whereby the liquor gradually becomes leſs unctuous; whence it appears, that this diſtilled vinegar is a compound of water, acid, and oil, and may, therefore, properly be called a volatile, acid, oily, ſaponaceous ſalt. If this acid liquor, when become perfectly limpid, and affording no more viſible oil, be poured upon clean chalk, it effervesces therewith, depoſits its acid in the chalk, and becomes a water, which immediately throws the oil, before latent in it, to the ſurface, in a viſible form: or, if the ſame liquor be again diſtilled with a gentle fire in a clean veſſel, it alſo preſently manifeſts its latent oil, and ſeparates it from itſelf, and thus becomes pure and clear acid liquor.

If the oils be required in greater perfection, let a quantity of them be collected, and diſtilled by boiling water; whereby the purer part will be raiſed, and the groſſer left behind; and, by often repeating this operation, theſe oils gradually come nearer to the perfection of the eſſential kind, and, by loſing their more unactive and terreſtrial part, become liquid, bright, beautifully red, penetrating, pure, thin, and not fetid. When thus all that is volatile has been drawn over from the ſubject, by the violent and long continued action of the fire, extremely black, light, inſipid, and almoſt inodorous, and very brittle ſhavings remain in the retort, being the coal mentioned by Helmont, which can never, by the moſt continued force of fire, be calcined into white aſhes, whilſt the veſſel remains cloſe, but always continues black, and therefore inflammable; becauſe this blackneſs is the fixed oil, tenaciouſly adhering to the earth, and ſubtly extended upon its ſurface; whence the coal becomes ſubject to take fire, and burn, ſo long as this oil remains unconſumed, for, if theſe black raſpings be now put into a large open pan, and a ſmall live coal be thrown into the middle of them, they will immediately burn and flame all over, till the whole blackneſs be ignited, after which the ſubject preſently falls into white aſhes; ſo that, in a ſhort time, the whole body of the ſhavings may, by means of the ſmalleſt ſpark, be perfectly converted into aſhes: nor could the wood itſelf be ſo eaſily and ſo readily fired, with a ſmall ſpark, unleſs, by a like preparation, it were firſt brought to a coal, and then broke to powder. The white aſhes, thus obtained from Guaiacum, are inſipid, inodorous, and almoſt without any ſalt; though, if the wood were recent, they prove conſiderably rich in alcaline ſalt.

In making decoctions of Guaiacum, for medicinal uſes, it is to be remarked, that the raſpings of the freſh and green wood are much preferrable to thoſe of that which is old and dry; and that, the longer it is boiled, the better.

Tincture of GUAIACUM.—Take the raſpings of freſh, green, and ponderous Guaiacum wood, or the bark thereof, in powder; and put it into a tall chemical glaſs; pour thereon rectified ſpirit of wine, ſo as to float four inches above it, without any other addition: boil them together, in the manner abovementioned, for four hours, often ſhaking the glaſs; the liquor will thus become red, which is to be ſtrained, after it is clarified by reſt, through a linen ſtrainer, to ſeparate it from any impurities; then, pouring freſh ſpirits upon the remains, boil them again, and preſerve the ſeveral tinctures pure. The liquor, thus obtained, will be of a pungent, aromatic, acrid, hot taſte, and odour; but, if the alcohol, employed, was perfect, the tincture will always be the better.

If this tincture, prepared with pure alcohol, be diſtilled in a tall body, with a gentle fire, till only one fourth part be left behind, this will be a very rich tincture, fully impregnated with the virtue of the Guaiacum. But, if the ſpirit employed contained any water, the roſin would begin to fall, if the tincture was inſpiſſated ſo high. But, when pure alcohol is uſed, the tincture will eaſily bear to be thickened, and thus increaſe in virtue, without growing turbid.

This tincture of Guaiacum, externally applied, is a wonderful remedy in malignant venereal ulcers, whether in the ſkin, fat, mouth, jaws, or throat.

When this tincture of Guaiacum, prepared with pure alcohol, and inſpiſſated to an half, is mixed with four times its quantity of the ſyrup of the five opening roots, and taken upon an empty ſtomach, in the morning, lying in bed, it preſently diſtributes itſelf over the whole body, which it thus warms, and promotes a copious ſweat; and hence it is commended in the venereal diſeaſe, when it has ſeized upon the ſubcutaneous parts. *Boerhaave's Chemiſtry.*

GU'AJAVA, *the guava*, in botany, a genus of plants whoſe characters are:

The extremity of the pedicle paſſes into an ovary, of an oval figure, crowned, quinquefid, and like a calyx. The flower is roſaceous, pentapetalous, growing on the ovary within the crown, and furniſhed with numerous ſtamina. The ovary is furniſhed with a long tube, and becomes a fleſhy fruit, full of very numerous ſmall ſeeds.

The tree grows to the height of twenty feet, or more, in the Weſt-Indies, and has a trunk as big as a man's thigh: in England it is preſerved in ſtoves, and is rarely ſeen above ſix or ſeven feet high. *Miller's Dict.*

The fruit reſembles our pears, with an umbilicus full of chaps, and covered with a thin whitiſh green rind. The pulp is of a pale bloody colour, in ſome whitiſh, and, when ripe, of a ſweet and grateful taſte, and a pleaſant ſmell. The fruit has three different ſorts of taſte, according to its ſeaſon. In the time of its ripening, before it is ſoft and yellow, it is auſtere and aſtringent, and is then good, when boiled, for the ſtomach; when it becomes a little riper, it is of a middle nature, and in its beſt ſtate; but it is more adviſeable, for health, to eat it either boiled or preſerved in ſugar, than raw; beſides, it is of a more grateful taſte and ſmell, when thus prepared. When it is come to perfect maturity, and is intirely ſoft and yellow, it has the taſte and ſmell of raſpberries, looſens the belly, and is not ſo wholeſome to be freely eaten, becauſe it is eaſily corrupted, and breeds worms. The root, with its aſtringent bark, boiled in water, and drank, is an excellent remedy for the dyſentery, where aſtriction and ſtrengthening are indicated. The leaves are acid and aſtringent, and proper to be uſed in bathing. F. Hernandez adds, that the leaves uſed in lotions cure the itch, and that a decoction of the bark is good for ſwelled legs; that it cures fiſtulous ulcers, helps deafneſs, and removes pains in the belly: a ſyrup, alſo, made of the leaves, is very effectual againſt a flux of the belly. *Raii Hiſt. Plant.*

The fruit is refrigerating, and ſomewhat aſtringent: the roots are aſtringent, and therefore good for the dyſentery, and to comfort the ſtomach: the leaves are vulnerary, reſolvent, and uſed in bathing. *Hiſt. Plant. aſcript. Boerh.*

GUAINU'MBI. See HUMMING *bird*.

GUANA'BANUS, *the cuſtard apple*, in botany, a genus of plants whoſe characters are:

The empalement of the flower conſiſts of three ſmall pointed leaves: the flowers of ſome ſorts have only three, but in others ſix petals; in the latter, three are alternately leſs than the others: from the empalement ariſes the pointal, which afterwards becomes an oval or round fleſhy ſoft fruit, incloſing ſeveral oblong ſmooth hard ſeeds.

All theſe plants which are natives of the warm parts of America, are too tender to live in this country, if they are not preſerved in warm ſtoves: they come up very eaſily from the ſeeds which are brought from America, if they are freſh: but the ſeeds muſt be ſown on a good hot bed, or in pots of light earth, and plunged into an hot bed of tanners bark. Theſe ſeeds ſhould be ſown as ſoon as poſſible when they ariſe, unleſs it is very late in the autumn, or in winter; in which caſe, they ſhould not be ſown till February; becauſe, if the ſeeds receive much damp in the winter, they will rot; and, if the plants ſhould come up at that ſeaſon, it will be very difficult to preſerve them till ſpring; ſo that, when theſe ſeeds come to England, pretty early in the ſpring, it is by much the beſt time; becauſe the plants come up early, and will have time to get ſtrength, before the cold comes on.

If theſe plants are kept in the bark ſtove, and carefully managed, they will make great progreſs; but in warm weather, they ſhould have plenty of freſh air admitted to them; for, when the air is excluded from them too much, they are apt to grow ſickly; when they will ſoon be attacked by vermin, which will multiply and ſpread over the whole ſurface of the leaves, and cauſe them to decay: but, if the plants are carefully managed, their leaves will continue green all the winter, and make a very good appearance in the ſtove at that ſeaſon.

There are ſome of theſe plants in England, which are upwards of twelve feet high, and have produced flowers; ſo that they may probably produce fruit here. As theſe plants advance in their growth, ſo they become more hardy, and ſhould have a greater ſhare of air admitted to them, eſpecially in the ſummer: but there ſhould be great care taken, not to let them remain in the bark bed too long unremoved; becauſe they are very apt to root through the holes of the pots into the tan; and then theſe roots will be torn off, whenever the pots are removed, and the plants ſeldom ſurvive this; and, when they do, it is generally a long time before they perfectly recover their former vigour. Theſe plants, when young, will require to be kept in the ſame degree of warmth with ananas; but, as they get more ſtrength, ſo they will thrive with leſs warmth.

GUA'ZUMA, *baſtard cedar-tree*, in botany, a genus of trees whoſe characters are:

It hath a regular flower conſiſting of five leaves, which are hollowed like a ſpoon at their baſe; but at their tops are divided into two parts, like a fork; the flower cup conſiſts of three leaves, from whence ariſes the pointal, which afterward becomes a roundiſh warted fruit, which has five cells incloſing many ſeeds.

Theſe plants may be propagated by ſeed, which ſhould be ſown early in the ſpring, in ſmall pots filled with freſh light earth, and plunged into an hot-bed of tanners bark. When the plants appear above ground, they muſt be carefully cleared from weeds, and often refreſhed with water; and the glaſſes muſt be raiſed to admit freſh air to them, otherwiſe they will draw up too weak: and, when they are about three inches high, they muſt be ſhaken out of the pots, and parted carefully, planting each into ſeparate ſmall pots filled with light freſh earth; and then plunge them into the hot-bed again, being careful to ſcreen them from the heat of the ſun, until they have taken new root. In this bed the plants may remain all the ſummer, being careful to keep them clear from weeds; and, when the plants have filled the ſmall pots with their roots, they ſhould be ſhaken out, and their roots trimmed, and then put into pots a ſize larger. About Michaelmas the plants muſt be removed into the ſtove, and plunged into the tan in a warm part of the ſtove. During the winter ſeaſon, they will not require ſo much water as in ſummer: if their leaves ſhould contract filth, it muſt be carefully waſhed off with a ſponge; for, if it is ſuffered to remain on them, it will greatly injure the plants. Theſe plants being very tender, they muſt conſtantly remain in the ſtoves, giving them a good ſhare of freſh air in the ſummer; but in winter, they muſt be kept very warm, otherwiſe they will not live in this country; but, if they are carefully managed, they will thrive very well, and afford an agreeable variety in the ſtove, amongſt other tender exotic plants of the ſame countries. *Miller's Gard. Dict.*

GU'DGEON, in ichthyology, the Engliſh name of the fiſh called by authors the gobio, and gobius fluviatilis. According to the new Artedian ſyſtem, the word gobius is made the name of another genus of fiſhes, and the Gudgeon is reduced to the genus of the cyprini, of which, according to the diſtinctions and characters of that author, it is a true ſpecies.

GUDGEONS, *in a ſhip*, is uſed for the eyes driven into the ſtern-poſt, into which the pintles of the rudder go, to hang it on.

GUI'NEA *Pig*, the name given by our common people to a ſort of animal, diſtinguiſhed by authors by the name of mus porcelli pilis et voce, the rat with the hair and voice of a hog. It is a very ſingular kind of animal, and there are three ſorts of it, all very different from one another. 1. The porcellus Indicus, or common Guinea pig. 2. The aguti; and 3. The paca of the Americans. This creature ſeems to partake of the nature of ſeveral animals. Its hair and voice are like the hog's; its teeth and head reſemble the rabbit's, as does alſo its general ſize; and its ears are wholly like thoſe of the mouſe and rat kind.

GUITA'RRA, *in the Italian muſic*, the name of a muſical inſtrument of the ſtring kind, with five double rows of ſtrings, of which, thoſe that form the baſs, are in the middle, unleſs it be one for the burden, an octave lower than the fourth.

This inſtrument was firſt uſed in Spain, and the Italians give it the particular denomination of Spagnuola. It is found in Italy, and other countries, but more frequently in Spain. *Breſſ. Muſ. Dict.*

GUM-*apples*, in Languedoc, and ſome other parts of France. The juice of apples will ſometimes exſudate through their rind, and congeal all about them in form of a clear white gum, hard like ice, by reaſon of its being ſoon dried in the ſun into a thin cake. The people call ſuch an apple, pomme gelée, or a frozen apple. It is very common to ſee apples covered in part with this Gum in ſeveral ſpecks; but it is more rare to meet with them wholly ſo. The Gum is inſipid to the taſte.

We have one plant cultivated in ſome gardens, which yields, in the heat of ſummer, ſuch another white icy and taſteleſs Gum. This is the common rhubarb, of the ſtalks of the leaves of which tarts are made. The ribs of the larger leaves of this plant, in June and July, are covered with large tranſparent drops of this Gum, and an ounce of it may be ſometimes collected from a ſingle plant. *Phil. Tranſ.* N°. 224.

GUM-*boils*, a morbid affection of the Gums called by the writers of ſurgery parulides. Theſe are of different degrees, and uſually ariſe from pains in the teeth. They are to be treated by diſcutients or other inflammatory tumors, but if theſe fail, or the diſorder is neglected, it uſually terminates in an abſceſs or fiſtula. Sage, camomile, and elder flowers, boiled in milk and water, make a good gargariſm to be held in the mouth, and the remaining herbs may be ſewed up in a bag to be kept hot to the cheek. A half roaſted fig is a very good internal application, and, when the ſoftneſs of the tumor ſhews that the matter is ſuppurated, it ought immediately to be opened with the lancet, to prevent the matter's lodging there, and eroding the bone, and producing a fiſtula or caries. After it is opened, the matter ſhould be gently preſſed out with the fingers, and the mouth frequently waſhed with red wine mixed with a decoction of vulnerary herbs till it is well. When the ulcer has penetrated deep, it will be neceſſary to inject the ſame liquors with a ſyringe, and compreſs the part by a proper external bandage, to make the bottom part heal firſt; and, when it is already become fiſtulous, and has callous edges, it may then often be cured by injecting tincture of myrrh, and elixir proprietatis, continuing this for ſome time. If all theſe prove ineffectual, the fiſtula muſt be laid open by inciſion, and the caries removed by medicines, cauſtics, or the actual cautery. If this proceeds, as ſometimes it does, from a carious tooth, this is firſt to be drawn before any thing elſe can be done; and it is a good rule in theſe caſes always to be rather too ſoon than too late in laying them open. *Heiſter's Surg.*

GUN is alſo a name given by the miners to an inſtrument uſed in cleaving rocks with gun-powder. It is an iron cylinder of an inch and a quarter thick, and about ſix inches long, and having a flat ſide to receive the ſide of a wedge, and a hole drilled through it to communicate with the inſide of the hole in the rock. The hole is made of about eight inches deep, and in the bottom of it are put about two or three ounces of Gun-powder; then this Gun is driven forcibly in, ſo as to fill up the hole, and the wedge is driven in on its flat ſide to ſecure it. The priming at the hole is then fired by a train, and, the orifice being ſo well ſtopped by this Gun, the force of the powder is determined to the circumjacent parts of the rock which it ſplits.

GUN-*room*, in a ſhip, is the apartment under the great cabbin, where the maſter gunner and his crew rendezvous, get ready their cartridges, &c. and do all things belonging to their buſineſs.

GUNNERY (*Dict.*)— Mr. Robins, from the experiments related in his New Principles of Gunnery, having concluded, that the force of fired gun-powder, at the inſtant of its exploſion, is the ſame as that of an elaſtic fluid of a thouſand times the denſity of the common air, and that the elaſticity of this fluid, like that of air, is proportionable to its denſity, propoſes the following problem :

The dimenſions of any piece of artillery, the weight of its ball, and the quantity of its charge being given, to determine the velocity which the ball will acquire from the exploſion, ſuppoſing the elaſticity or force of the powder at the firſt inſtant of its firing to be given.

In the ſolution of this problem he aſſumes the two following principles: 1. That the action of the powder on the bullet ceaſes, as ſoon as the bullet is got out of the piece. 2. That all the powder of the charge is fired, and converted into an elaſtic fluid, before the bullet is ſenſibly moved from its place.

Theſe aſſumptions, and the concluſions before-mentioned, make the action of fired gun-powder to be entirely ſimilar to that of air condenſed a thouſand times; and from thence it will not be difficult to determine the velocity of the ball ariſing from the exploſion. For the force of the fired powder diminiſhing in proportion to its expanſion, and ceaſing when the ball is out of the piece ; the total action of the powder may be repreſented by the area of a curve, the baſe of which repreſents the ſpace through which the ball is accelerated, and the ordinates to which repreſent the force of the powder at every point of that ſpace. And theſe ordinates being in reciprocal proportion to their diſtance from the breech of the gun, becauſe, when the ſpaces occupied by the fired powder are as 1, 2, 3, 4, &c. the force of the powder, or the ordinates repreſenting it, will be as 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. it appears that the curve will be a common hyperbola, and that the area intercepted between it, its aſymptote, and the two ordinates repreſenting the force of the powder at the firſt exploſion, and at the muzzle of the piece, will repreſent the total action of the powder on the ball. But, if the ball were urged through the ſame ſpace, by an uniform force equal to its gravity, the total action of this force would be repreſented by a rectangle, the baſe of which would be the baſe of the curve or intercepted portion of the aſymptote before-mentioned, and the height of which would repreſent the uniform force of gravity. Hence the ſquare of the velocity of the ball, reſulting from the action of the gun-powder, will be to the ſquare of the velocity reſulting from the action of gravity, as the area of the hyperbolic ſpace is to the area of the rectangle. But the velocity of the ball reſulting from gravity is given, being the velocity it would acquire from a height equal to the ſpace through which the powder accelerates it; and the proportion between the hyperbolic and the rectangle is alſo given, from the analogy of the hyperbolic ſpaces and logarithms; therefore the velocity of the ball ariſing from the action of the fired gun-powder will be given.

Mr. Robins has alſo given us an ingenious way of determining, by experiments, the velocity which any ball moves with, at any diſtance of the piece it is diſcharged from.

This may be effected by means of a pendulum made of iron, having a broad part at bottom, covered with a thick piece of wood, which is faſtened to the iron by ſcrews. Then having three poles joined together by their tops and ſpreading at bottom, ſuch as are vulgarly uſed in weighing and lifting heavy bodies, and called by workmen triangles ; on two of theſe poles, towards their tops, are ſcrewed on ſockets, on which the pendulum is hung by means of a croſs piece, which becomes its axis of ſuſpenſion, and on which it ought to vibrate with great freedom. Something lower than the bottom of the pendulum there ſhould be a brace, joining the two poles to which the pendulum is ſuſpended ; and to this brace there is faſtened a contrivance made with two edges of ſteel, ſomething in the manner of a drawing pen ; the ſtrength with which theſe edges preſs on each other being diminiſhed or increaſed at pleaſure, by means of a ſcrew. To the bottom of the pendulum ſhould be faſtened a narrow ribbon, which, paſſing between the ſteel edges, may hang looſly down by means of an opening cut in the lower piece of ſteel.

The inſtrument being thus fitted, if the weight of the pendulum, the reſpective diſtances of its center of gravity, and of its center of oſcillation, from its axis of ſuſpenſion, be known, it may from thence be found, what motion will be communicated to this pendulum by the percuſſion of a body of a known weight moving with a known degree of velocity, and ſtriking it in a given point ; that is, if the pendulum be ſuppoſed at reſt before the percuſſion, it will be known what vibration it ought to make in conſequence of ſuch a blow ; and if the pendulum, being at reſt, is ſtruck by a body of a known weight, and the vibration which the pendulum makes after the blow is known, the velocity of the ſtriking body may from thence be determined.

Now, the extent of the vibration, made by the pendulum, may be meaſured by the ribbon. For if the preſſure of the ſteel edges on the ribbon be regulated by the ſcrew, ſo as to be free and eaſy, though with ſome minute reſiſtance to hinder its ſlipping of itſelf : then, ſetting the pendulum at reſt, let the part of the ribbon between the pendulum and the ſteel edges be drawn ſtraight, but not ſtrained, and fixing a pin in the part of the ribbon contiguous to the edges, the pendulum, ſwinging back by the impulſe of the ball, will draw out the ribbon to the juſt extent of its vibration, which will be determined by the interval on the ribbon between the edges and the place of the pin.

The computation by which the velocity of the ball is determined from the vibration of the pendulum after the ſtroke, is founded on this principle of mechanics: that if a body in motion ſtrikes on another at reſt, and they are not ſeparated after the ſtroke, but move on with one common motion, then that common motion is equal to the motion with which the firſt body moved before the ſtroke : whence, if that common motion and the maſſes of the two bodies are known, the motion of the firſt body before the ſtroke is thence determined. On this principle it follows, that the velocity of a bullet may be diminiſhed in any given ratio, by its being made to impinge on a body of weight properly proportioned to it ; and hereby the moſt violent motions, which would otherwiſe eſcape our examination, are eaſily determined by the retarded motions which have a given relation to them.

It is to be obſerved, that the length, to which the ribbon is drawn, is always near the chord of the arch deſcribed by the aſcent ; it being ſo placed, as to differ inſenſibly from thoſe chords which moſt frequently occur ; and theſe chords are known to be in the proportion of the velocities of the pendulum acquired from the ſtroke. Hence it follows, that the proportion between the lengths of the ribbon, drawn out at different times, will be the ſame with that of the velocities of the impinging bullets.

Now, from the computations delivered by Mr. Robins, it appears, that the velocity of the bullet was 1641 feet in one ſecond of time, when the chord of the arch deſcribed by the aſcent of the pendulum, in conſequence of the blow, was 17$\frac{1}{4}$ inches. Therefore, by the proportion of any other lengths of ribbon drawn out, by any percuſſion, to 17$\frac{1}{4}$, the proportion of the velocity with which the bullets impinge, to the known velocity of 1641 feet in 1″, will be determined.

GUN-SHOT *wounds* are attended with much worſe conſequences than wounds made by ſharp inſtruments, for the parts are more ſhattered and torn, eſpecially when the ſhot falls upon the joints, bones, or any conſiderable part. Wounds of this kind have an eſchar formed upon them, and are therefore attended with little or no hæmorrhage at firſt, unleſs ſome conſiderable veſſel is wounded ; but, as ſoon as this eſchar falls off, the hæmorrhage is ſometimes ſo violent, as to endanger the life of the patient, unleſs the ready aſſiſtance of a ſurgeon can be had. For the five or ſix firſt days there is little or no diſcharge of matter from theſe wounds ; there is therefore no wonder that Gun-ſhot wounds exceed all others in violence of ſymptoms, ſuch as inflammation, pain, gangrene, &c.

The eſchar which is formed upon theſe wounds, is not occaſioned ſo much by the heat of the bullets, as by the rapidity with which they deſtroy the parts ; and the violence of the ſymptoms is owing chiefly to this manner of wounding. Neither is there any thing poiſonous in theſe wounds, as has been by ſome imagined ; for nothing poiſonous enters the compoſition, either of powder or ball.

Gun-ſhot wounds are ſome deeper than others, and in ſome, the muſcular parts alone are hurt ; in others, the veſſels, bones, or viſcera, are wounded. Sometimes the ball paſſes clear through, and ſometimes it remains fixed in the wound, and frequently carries part of the cloths or wadding with it. From the difference of theſe circumſtances very different ſymptoms ariſe.

Gun-ſhot wounds in the cranium, even the lighteſt of them, are attended with very great danger, and frequently bring on terrible ſymptoms, by the concuſſion of the internal parts, which they occaſion ; inſomuch that it is ſurpriſing to ſee how ſmall an external wound upon this part will bring on death, if not prevented by the trepan. Internal wounds of this ſort are alſo extremely dangerous ; but if no large veſſel is wounded, they are frequently cured.

When they are inflicted on the bones or joints, they are attended with very bad ſymptoms ; for, in this caſe, it is next to impoſſible to eſcape inflammation, gangrene, caries, and dangerous fiſtulæ, which either require amputation of the limb, or leave it without ſenſe or motion.

If any part of the cloths, wadding, or any other extraneous body, be forced into the wound, it muſt be removed before you can attempt to heal the wound ; and the ſame caution is to be obſerved in regard to any ſplinters of bone : when theſe are removed, the hæmorrhage is to be ſtopped, then ſuppuration is to be promoted, and new fleſh encouraged, and care taken to procure an even cicatrix.

Extraneous bodies are much eaſieſt to be removed at firſt ; for after ſome delay the tumor, and inflammation of the part, render it difficult and painful : beſides, the bullets will by degrees work themſelves deeper, and be buried under the muſcles, which will occaſion fiſtulæ, rigidity of the limb, and other inconveniencies. In extracting balls that lie deep, you muſt take great care not to lay hold of blood-veſſels or nerves; which accident will be beſt avoided, by introducing the forceps ſhut, and not opening them till you feel the ball.

Sometimes the orifices of theſe wounds are ſo narrow, that it is impoſſible to come at the body you are to extract, without making a larger opening; this then muſt be done on the moſt convenient ſide, always obſerving that no nerve, blood-veſſel, tendon, or ligament, lies in the way. When the parts are very much inflamed and ſwelled, an opening of this kind is frequently of ſervice; for by this means the obſtructed blood is diſcharged, and the bad conſequences of the inflammation are prevented. When the extraction of the ball is attempted, the patient muſt be put into the ſame poſture and ſituation that he was in when he received the wound. When the ball has penetrated ſo deep, that it may be eaſily felt with the finger on the oppoſite ſide, it is ſometimes better to make an inciſion there, and take it out in that place, than to attempt the getting it back the other way. If the wound cannot ſafely be inlarged, nor the ball extracted at firſt, without great pain and danger, it muſt be left in the wound, either till the pain is abated, or the wound is ſo inlarged by ſuppuration, that it either can work itſelf out, or be extracted with leſs danger. On the other hand, all other extraneous bodies are inſtantly to be removed, where there is danger of their bringing on pain, inflammation, and convulſions, by being left behind. If a ball has paſſed into the cavities of the body, it is beſt not to attempt to extract it, but to heal the wound, leaving it there. Perſons have carried a ball in them thus, for many years, without inconvenience; and, at one time or other, it frequently happens that it will work itſelf into ſome part of the body, out of which it may be extracted with ſafety.

If a large artery is wounded by the ball, either in the arms or legs, which will be known by the loſs of blood, the tournequet muſt be applied, and, the blood being ſtopped, the veſſel muſt be taken up by a crooked needle; but, if this cannot be done, or little hopes of a cure appear from future dreſſings, it will be prudent to take off the limb juſt above the wound.

When wounds of this kind have been well cleaned, and the blood ſtopped, the firſt intention is to uſe the utmoſt endeavours to prevent, or aſſwage the tumor and inflammation. The wound ſhould be dreſſed with lint dipped in warm ſpirits of wine, and covered with a compreſs wetted with the ſame liquor; or with camphorated ſpirits of wine, either alone, or diluted with lime water. Having done this, the next intention is to forward the ſuppuration of the bruiſed and torn parts; to which end, it is common to uſe the common digeſtive made of turpentine diſſolved in the yolk of an egg, or a mixture of baſilicon and Arcæus's linament, ſoftened with ſpirits of wine and oil; and, where there is a very great corruption of the parts, a little myrrh and aloes are to be added, as alſo Venice treacle, the brown ointment, and, where the occaſion requires it, and the nerves do not lie bare, a little of the red precipitate.

In deep wounds, where the ball has gone quite through, a ſkein of thread being drawn through the eye of a blunt needle, and well ſaturated with the digeſtive ointment, is to be paſſed through the wound in the manner of a ſeton, and kept there till the wound is found in a condition to heal, and then the common methods are purſued to heal and cicatrize. *Heiſter's Surgery.*

GUNTER'S *Scale* (*Dict.*)— The line of numbers on theſe ſcales conſiſts of two equal lengths, commonly called two radii; the firſt containing the logarithms of numbers from 10 to 100; and in the ſecond are inſerted thoſe between 100 and 1000, or ſuch of them as can conveniently be introduced.

Theſe diviſions are taken from a ſcale of equal parts; ſuch, that 100 make the length of one radius; and from this ſcale the diviſions for the ſines, tangents, and verſed ſines, are alſo taken. Now, from this conſtruction of the line of numbers, it is plain, that, as the numbers in one radius exceed thoſe in the other, by one place in the ſcale of numeration, therefore the differences of their indices muſt alſo be unity: ſo that ſuch numbers only, whoſe index differs by 1, can be eſtimated in a length of two radii: but, in a length of three radii, numbers, whoſe indices differ by 2, may be read; and a difference of 3 may be reckoned in a length of 4 radii, &c. The tables of logarithmic ſines, tangents, ſecants, and verſed ſines, are generally computed for a circle, whoſe radius is 10,000,000: therefore,

In the ſines, the index 9 belongs to all between	90° 0′ 0″	and	5° 44′ 36″
The index 8	5 44 36	and	0 34 23
The index 7 to all between	0 34 23	and	0 3 27
6	0 3 27	and	0 0 21 &c.

In the tangents, the index 9 belongs to all between	45° 0′	and	5° 42′ 10″

And the indices, 8, 7, 6, &c. fall as in the ſines.

In the verſed ſines, the index 10 belongs to all between	180° 0′	and	90° 0′
9	90 0	and	25 51
8 belongs to all between	25° 51′	and	8° 7′
7	8 7	and	2 34
6	2 4	and	0 45 &c.

Now, as the length of the Gunter's ſcale admits of no more than two radii, or of ſuch numbers only, whoſe index differs by unity; therefore, within this length, no more of the ſines, tangents, or verſed ſines, can be introduced, than thoſe whoſe index differs by unity: and as not only the greateſt number among the ſines and tangents, but alſo thoſe more generally wanted, have the indices 9 and 8 differing by unity; therefore all the ſines from 90° to 0° 34′, and all the tangents from 45° to 0° 34′, are thoſe only, which are put on theſe ſcales; the diviſions anſwering to the leſſer ſines and tangents being omitted for want of room. And this is the reaſon, why the ſine of 90°, and the tangent of 45°, are limited by the ſame termination as the ſecond radius on the line of numbers.

To conſtruct the line of logarithmic ſines on GUNTER'S *Scale*—From the ſcale of equal parts, take the numbers expreſſing the arithmetical complements of the log-ſines of the ſucceſſive degrees, and parts of degrees, intended to be put on the ſcale, deſcending orderly from 90°: then theſe diſtances, ſucceſſively laid from the mark repreſenting 90° at the right-hand end of the ſcale, will give the ſeveral diviſions of a ſcale of logarithmic ſines.

For, the ends of any ſcale being aſſigned, the progreſſive diviſions of that ſcale are laid thereon from that end, which repreſents the beginning of the progreſſion: or the ſame diviſions may be laid from the other end, by taking the complements of the terms to the whole length of the ſcale.

Conſequently the arithmetical complements of the ſines are to be laid from the diviſion repreſenting 90 degrees.

To conſtruct the line of logarithmic tangents on GUNTER'S *Scale.*—Theſe are laid down in the ſame manner, and for the ſame reaſons, that the ſines were; the tangent of 45° ſtanding againſt the ſine of 90°.

The diviſions for the tangents above 45° are reckoned on the ſame line from 45° towards the left hand; or any tangent and its cotangent are expreſſed by the ſame diviſion.

Thus one mark ſerves for 40° and 50°, and the diviſion at 30° ſerves alſo for 60°; that at 20° ſerves for 70°, &c. and the like is to be underſtood for the intermediate diviſions.

For as the tangent of an arc is to a radius;
So is radius to the co-tangent of that arc.

Therefore the tangent is equal to the ſquare of radius divided by the co-tangent.

And the co-tangent is equal to the ſquare of radius divided by the tangent.

Now, the radius being unity, its ſquare is alſo unity.

Therefore the tangent and co-tangent of any arc are the reciprocals one of the other.

But the reciprocals of numbers are correlatives to the arithmetical complements of their logarithms.

Therefore the logarithms of a tangent and its co-tangent are arithmetical complements one of the other, and conſequently will fall at equal diſtances from 45 degrees.

Therefore, in the line of logarithmic tangents, the diviſions to degrees under 45 ſerve alſo for thoſe above, both being equally diſtant from 45 degrees.

To conſtruct the line of logarithmic verſed ſines on GUNTER'S *Scale.*—As the greateſt number of degrees will fall within the limits of the ſcale by beginning at 180°, therefore the termination of this line is at 180°, which is put againſt 90° on the ſines: and, although the numbers annexed to the diviſions increaſe in the order from right to left, yet they are only the ſupplements of the verſed ſines themſelves.

Now ſubtract the logarithmic verſed ſines of ſuch degrees and parts of degrees as are intended to be put on the ſcale, from the logarithm verſed ſine of 180°; then the remainder taken from the foreſaid ſcale of equal parts, and laid ſucceſſively from the termination of this line, will give the ſeveral diviſions ſought.

The following table to every 10 degrees was conſtructed in the foregoing manner, and are the numbers to be taken from the ſcale of equal parts, for the degrees they ſtand againſt.

Deg.	Supplements. of Verſed Sines.	Deg.	Supplements. of Verſed Sines.	Deg.	Supplements. of Verſed Sines.
180	0,00000	120	0,12494	60	0,60206
170	0,00331	110	0,17327	50	0,74810
160	0,01330	100	0,23149	40	0,93190
150	0,03011	90	0,30103	30	1,17401
140	0,05402	80	0,38387	20	1,52066
130	0,08545	70	0,48282	10	2,21941

From this table it appears, that the leaſt verſed ſine which can be introduced within the length of a double radius, falls between 10° and 20°, where the index changes from 1 to 2; which will happen about 11° 28′.

If a table of logarithm verſed ſines to 180° are wanting, they are eaſily made by the following rule :

" Take the logarithm ſine of 30 degrees from twice the logarithm ſine of (N) any number of degrees ; the remainder is the logarithm verſed ſine of (2 N, or) twice thoſe degrees."

For it is a well known geometrical property, that the ſine of any arc (A) is a mean proportional between radius (R) and half the verſed ſine of twice that arc.

Therefore, puting v for the verſed ſine, and s for the ſine ;

The $v\ 2\ A = \left(\frac{2\,s\,s\,A}{R} = s\,s\,A \times - \frac{2}{R} = s\,s\,A \times \frac{2}{10} = \right) s\,s\,A \times \frac{1}{5}$; radius being 10.

Or the log. $v\ 2\ A = 2$ log. $s\ A$ — log. 5.

But, when radius is 10, the ſine of 30° is 5.

Therefore the log. $v\ 2\ A = 2$ log. $s\ A$ — log. ſine of 30°.

Moſt of the writers on this ſubject give the following rule for laying down the diviſions of this line :

" From the line of logarithmic ſines, take the diſtance between 90° and any arc ; that diſtance being twice repeated, from the termination of the line of verſed ſines, will give the diviſion for twice the complement of that arc."

Thus the diſtance between 90° and 20° on the ſines twice repeated gives the verſed ſine of 140° ; or twice 70°, the complement of 20°. For the diviſions, to be laid on this line, are the differences between the logarithm verſed ſine of 180°, and the logarithm verſed ſines of the ſucceſſive arcs.

Now the difference between the logarithm verſed ſines of 180°, and of any arc 2 A, is log. ver. ſine 180 — 2 log. ſin. A + log. ſin. of 30°.

Or, 10,30103 + 9,69897—twice log. ſin. of A.

Or, 20,00000 — twice logarithm ſine of A.

Or the arithmetical complement of twice logarithm ſine of A.

That is, the difference between the logarithm verſed ſine of 180°, and the logarithm verſed ſine of any arc, is equal to double the arithmetical complement of the logarithm ſine of half that arc, rejecting the indices.

But, as the differences give the diviſions to the ſupplements of the real verſed ſines, therefore the arithmetical complement of the logarithm ſine of any arc, being doubled, will give the diſtance of the diviſion for the ſupplement of twice that arc on the line of verſed ſines.

Thus, for 70°, the logarithm ſine is 9,97299.

The arithmetical complement is 0,02701.

Its double is 0,05402

Which is the number in the foregoing table ſtanding againſt 140°, and is the ſupplement verſed ſine of twice 70 degrees.

Now, as the arithmetical complement of the log. ſines of arcs are the diſtances on the line of ſines between 90°, and the diviſions to thoſe arcs ; therefore the diſtances between 90° and any arc, being twice repeated, will give the diviſion of the ſupplemental verſed ſine to twice the co-ſine of that arc. *Phil. Tranſ.* Vol. XLIX.

GU'NWALE, *or gunnel* of a ſhip, is that piece of timber which reaches on either ſide of the ſhip, from the half deck to the forecaſtle, being the uppermoſt bend, which finiſhes the upper works of the hull in that part, and wherein they put the ſtanchions which ſupport the waſte trees. This is called the Gunwale, whether there be guns in the ſhip or not. The lower part of any port, where any ordnance are, is alſo termed the Gunwale.

GUR, in minerology, a word uſed to expreſs a fluid matter looking like milk, but reduced ſometimes, by evaporation, to the conſiſtence of honey, and appearing in form of a white ſediment. It always contains more or leſs ſilver, and is common in the mines of Sweden, and in ſome other places.

GUTTA *roſacea*, in medicine, denotes a red or pimpled face ; a diſtemper, which, though not always owing its original to hard drinking, is nevertheleſs moſt incident to tipplers of ſtrong beer, wines, ſpirits, &c.

As to the cure, beſides making a revulſion by bleeding, bliſtering, cupping, iſſues, &c. the diet ought to be moiſtening and cooling, as lettuce, purſlain, ſorrel, and ſpinach : the drink may be an emulſion of the cold ſeeds, milk and water, clarified whey, &c.

In the uſe, however, of this cooling regimen, great caution is neceſſary ; for, if a perſon be taken off at once from his ſtrong liquors, and allowed nothing but whey, or milk and water, it may coſt him his life, by haſtening a ſudden decay of heat, palling his appetite, and bringing on a leucophlegmatia, or dropſy.

As for what concerns topics, much caution is likewiſe to be uſed. If there be only redneſs without pimples, and the diſeaſe recent, refrigerants and repellents take place : but, if puſtules appear, diſcutients muſt be mixed ; and if theſe puſtules ſeem hard, and the diſeaſe be of long ſtanding, there may be reaſon for emollients to ripen and digeſt the tough and viſcid matter, which is afterwards to be let out.

If the diſeaſe be ſtubborn, and the tubercles grown hard, we are to begin with emollients, both fotus and ointment : ſuch are the decoction of mallows, vervain, Solomon's ſeal, and linſeed, alſo a cerate of ſperma ceti, or Bates's white cerate. *James's Med. Dict.*

GYMNO'PYRIS, in natural hiſtory, the name of a genus of foſſils, the characters of which are theſe : they are of the claſs of the pyritæ, and are compound, inflammable metallic bodies, found in detached maſſes, of no determinately angular figure ; of a ſimple internal ſtructure ; not ſtriated ; and are naked, or not covered with any inveſtient coat, or cruſt, in which they differ from the pyriplaces. *Hill's Hiſt. of Foſſils.*

GYNA'NDRIA, in botany, a claſs of plants, in which the male and female parts of the flower are joined at their origin, the ſtamina or male parts of which grow to the piſtillum or female part, and not to the receptacle of the ſeed.

The word is formed of the Greek γυνὴ female, and ἀνὴρ male. Among the plants of this claſs are the paſſion-flower, birthwort, &c.

The general character of this claſs of plants is very obvious : they are diſtinguiſhed at firſt ſight from all others, by the ſtamina being placed upon the ſtyle ; or, in other words, the receptacle is elongated into the form of a ſtyle, and bears on it both the piſtil and ſtamina.

H.

HADE, in mining, is where any ſhaft or turn goes deſcending like the ſide of a houſe, or like the deſcent of a ſteep hill. It is then ſaid to Hade. *Houghton's Compl. Miner.*

HALLE'RIA, African fly honey ſuckle, in botany, a plant ſo named by Dr. Linnæus, in honour to Albertus Haller, profeſſor of botany at Gottingen. The characters are:

The empalement of the flower is of one leaf, which is cut into three ſegments, the upper one being much broader than either of the others: the flower conſiſts of one leaf, and is in ſhape like the ſnap-dragon, having a tube, and the upper part joined, and reflexed, and at the brim is divided into four parts: in the center of the flower is ſituated the pointal, attended by four ſtamina, two of which are longer than the others: the pointal afterwards changes to a round berry having two cells, each having one ſeed.

This plant grows to the height of ſix or eight feet, having a woody ſtem, which is well furniſhed with branches: theſe have oval ſawed leaves, which are placed oppoſite by pairs, and continue green through the year: the flowers come out ſingly, and are of a red colour; but, being intermixed with the leaves, make but ſmall appearance: yet, as the leaves are green in winter, the plants make a variety in the green-houſe during that ſeaſon.

It may be propagated by cuttings, which, if planted in pots filled with light earth in the ſpring, and plunged into a gentle hot bed, will ſoon take root. Theſe plants may be expoſed in ſummer, and will require plenty of water: in winter they muſt be houſed with myrtles, and other hardy exotic plants.

HAMA'MELIS, *witch hazel*, in botany, a genus of trees whoſe characters are:

The empalement of the flower is of one leaf, which is cut into four ſegments to the bottom: the flower conſiſts of one leaf, which is cut into four narrow ſegments to the bottom, and turn backwards: the pointal is ſituated in the center of the flower, which is hairy, and attended by four ſtamina: the pointal afterwards changes into a capſule or huſk, having two cells, each containing one oblong ſmooth ſhining ſeed.

This is propagated by laying down the young branches in the autumn, which will take root in one year, provided they are duly watered in dry weather: but moſt of the plants which are in the gardens, have been produced from ſeeds which came from America. Theſe ſeeds always remain a whole year in the ground; ſo they ſhould be ſown in pots, which may be plunged into the ground in a ſhady part of the garden, where they may remain all the ſummer, and require no other care than to keep the pots clear from weeds, and in very dry weather to water them now and then: in autumn, the pots may be moved to a warmer ſituation, and plunged into the ground under a warm hedge; and, if the winter ſhould prove very ſevere, they ſhould have ſome light covering thrown over the pots, which will ſecure the ſeeds from being deſtroyed. In the ſpring the plants will come up; therefore, as the ſeaſon grows warm, the pots may be removed where they may have the morning ſun till eleven o'clock; and, if they are duly watered in dry weather, the plants will have made good progreſs by the autumn; when they ſhould be tranſplanted, either into ſmall pots, or in a nurſery bed; where in one, or at moſt two years time, they will be ſtrong enough to plant where they are deſigned to grow.

HÆMA'NTHUS, *blood-flower*, in botany, a genus of plants, whoſe characters are:

The empalement of the flower is large, compoſed of ſix oblong leaves, which grow in form of an umbel, and do not fall off: the flower is of one leaf, which is cut into ſix ſlender parts at top; but the bottom is tubulous and angular: in the center of each flower is ſituated the oblong pointal, attended by ſix ſtamina, which are inſerted at their baſe into the petals of the flower, but are ſtretched out much longer at the top: the pointal afterwards changes to a roundiſh berry, having three cells, each containing one triangular ſeed.

It is propagated by off-ſets, which ſhould be taken of in May, at which time theſe plants begin to loſe their leaves; for they are ready to put out new leaves in July, and continue growing all the autumn and winter; but, towards the end of May, the leaves begin to decay; at which time the plants ſhould be new potted; and, if they have any off-ſets which are ſufficiently rooted, they muſt be taken off, and planted in pots filled with light rich earth. In tranſplanting of theſe plants, there muſt be particular care to lay ſome ſtones and rubbiſh in the bottom of the pots to let the moiſture paſs off; for, if the wet is detained in the pots, it will ſoon cauſe the roots to periſh. During the ſeaſon of their inactivity, which is commonly from the beginning of May to the beginning of July, they muſt not have too much water, leſt it rot their roots; but, when they are in vigour, they will require a little more wet.

Theſe plants muſt be conſtantly kept in the dry ſtoves; for they do not thrive well, if they are ſet abroad, even in the warmeſt part of the ſummer; ſo that it is much the better method to let them remain in the ſtove, with euphorbiums, and other tender ſucculent plants, which require a large ſhare of free air in warm weather; in which ſituation they will thrive exceeding well, and will annually produce their beautiful flowers, which make a fine appearance among other rare plants. During the winter ſeaſon, they muſt be kept in a moderate temperature of heat, and ſhould be frequently refreſhed with water; but it muſt not be given to them in large quantities, leſt it rot them. This plant is not conſtant in the time of its flowering, but the moſt uſual ſeaſon is in July or Auguſt; but, when it flowers in the ſpring, it frequently perfects ſeeds in this country; which, if ſown ſoon after they are ripe, and preſerved in the ſtove till ſpring, and then placed in an hot-bed of tanners bark, will grow very well; and, by this method, a much greater increaſe of the plants may be obtained in a year or two, than could be by off-ſets in many years.

HÆ'MORRHOIDS (*Dict.*) *Chirurgical treatment of the* HÆMORRHOIDS.—Though, ſome are deſirous of having this flux moderated or ſtopped, a ſkilful ſurgeon will be ſo far from complying, that he will lay before them many inconveniencies which muſt attend ſuch a practice. If, however, they perſiſt, or the flux is exceſſive, then he may, at the ſame time applying other proper remedies, ſtop up ſome of the mouths, leaving one or two open, according to the direction of Hippocrates. He muſt proceed in the following manner: firſt, bleed plentifully, then give gently cooling purges, and, laſtly, a clyſter, five or ſix hours before the operation.

The patient muſt be laid on his belly, either upon a bed, or table, ſo that his feet may touch the ground; or, according to ſome, on the ſide of a bed, as, for a clyſter; then, his legs and nates muſt be ſo diſtended, by two aſſiſtants, that the ſurgeon may have free acceſs to, and inſpection of the parts. Next, if there are no tubercles, he is to tie up the bleeding veins with a crooked needle and thread; if there are, he is to take hold of the parts preternaturally tumefied with his forceps, and cut them off, tying them up likewiſe; but he muſt be ſure to leave one vein, and that the ſmalleſt, ſtill open. Laſtly, if the profuſion does not ſtop ſpontaneouſly, in a ſhort time, he may apply ſtyptics, ſcraped lint, and compreſſes, with the T bandage. In the ſubſequent dreſſings he may uſe cicatrizing medicines; and, if any thing foreign ſtill remains, he muſt remove it by the ſciſſars, or a cauſtic. When theſe bleeding tubercles were ſeated very high in the rectum, the ancients recommended an actual cautery; but this was ſevere and dangerous: I, therefore, prefer the ſpeculum ani, which dilates the parts, in ſuch a manner, that the tubercles may be tied, or the open veins ſtopped by lint, impregnated with aſtringents: this, with the application of proper internal medicines, will reſtrain a profuſe Hæmorrhage in theſe parts; though it is ſeldom neceſſary to come to the laſt operation.

Sometimes the veins, diſperſed about the rectum and anus, are ſo much dilated with blood, as to be very painful, and raiſe tubercles as large as peas, grapes, or eggs; ſometimes, too, they extend to a finger's length. Theſe we call the blind piles, and diſtinguiſh them from other tubercles of the anus by their colour, and reſiſtance to the touch; for they appear livid, or black, from the ſtagnation of a thick blood; and, when preſſed by the fingers, feel like a bladder filled with liquor; which circumſtances are not obſerved in the others. Theſe diſtended veſſels vary; for ſome are ſoft, giving little or no pain; others hard, very painful, and inflamed, rendering the patient unable to ſit, ſtand, or walk, and ſometimes even bring on fainting-fits.

The blind piles generally occur in men of a coſtive, plethoric habit, and ſuch whoſe conſtitutions incline them to the bleeding

ing piles; and women are moſt ſubject to them from a difficult labour, a ſuppreſſion of the menſes, geſtation, or a ſanguine habit. In all theſe, the veins ſometimes become ſo turgid as to diſcharge their blood, and from blind become bleeding piles, with ſo profuſe an hæmorrhage as to endanger the patient's health. The blind Hæmorrhoids are ſometimes attended with ſuch intenſe pains as to cauſe a ſpaſm of the anus, and a difficulty of ſitting, even to that degree as not to admit of the adminiſtration of a clyſter; ſometimes they produce troubleſome itching ulcers, eſpecially, if they do not burſt within three or four days; and very often give birth to an abſceſs, or ſtubborn fiſtula.

When the blind piles are neither large, nor troubleſome, they may be left to nature; but when they encompaſs the anus like a bunch of grapes, ſo that the patient can neither ſit, ride, nor go to ſtool without difficulty; if they do not ſubmit to ſpirits of wine, the moſt ſpeedy remedy is gradually to remove thoſe which are full and large, by a ligature; but, if there is a violent inflammation, it is proper, firſt, to bleed and give, internally, temperating and laxative medicines, preſcribing a regular diet, while diſcutient and emollient fomentations are externally applied. The ſame end is anſwered by the unguentum nutritum, unguentum linariæ, freſh butter, oil of ſweet almonds, and the like, applied to the parts.

But linen, dipped in warm ſpirits of wine, and emollient clyſters, are frequently of infinite ſervice; and, when they are not effectual, leeches may be applied to exhauſt the blood; if they are not at hand, or the parts inflamed, the lancet muſt be uſed; and, after bleeding in proportion to the patient's ſtrength, the dreſſings muſt be made of lint with compreſſes and the T bandage: theſe are to be renewed, till the diſorder is completely cured. Sometimes, the piles are ſo high in the rectum, as to render the uſe of the ſpeculum ani neceſſary. When the anus is properly dilated by this inſtrument, they muſt be ſcarified with a lancet, or divided with ſciſſars; for thus the inſpiſſated noxious blood will be diſcharged, and the pains relieved. Sometimes theſe wounds are ſo far from healing, that, of blind, they become bleeding piles, and the patients, eſpecially, if they are cauſtic, always, or very often at leaſt, diſcharge blood with their excrements; which flux, though not entirely free from trouble, ſhould not be ſuppreſſed while it is moderate, as it leſſens the pains, conduces to the patient's health, and prevents or removes many diſtempers, as the hypochondriac melancholy, diſorders of the kidnies and bladder, gout, and iſchiadic pains. For this reaſon, many moderns recommend and excite this evacuation. But, as this often induces many inconveniencies, and diſeaſes, I prefer other methods of cure.

The beſt method of preventing theſe piles is a regular, temperate diet, with bleeding twice or thrice in a year, and oftener, if required; for theſe evacuations will leſſen the quantity of blood, and conſequently remove the cauſe. Internally may be taken ſome temperating powder, or a decoction of yarrow, drank like tea, carefully avoiding all heating and aſtringent medicines, ſuch as aloes, myrrh, and ſaffron, and all aliments of the like quality, wine overloading the ſtomach, anger, violent exerciſe, profuſe venery, and riding. If, notwithſtanding this regimen, the hæmorrhoidal veins ſhould begin to ſwell, reſolvent and temperating medicines ſhould be given internally, while, externally, fomentations and cataplaſms may be applied; if the pains are acute, then recourſe muſt be had to leeches, or the lancet, as before directed. *Heiſter. Inſtitut. Chirurg.*

HÆ'MORRHOUS, *the blood-ſtrake*, the name of a peculiar ſpecies of ſerpent; ſo called, becauſe it was ſuppoſed, that on a perſon being bit by it the blood flowed out of every part of the body. It is a ſmall ſerpent, ſeldom ariſing to more than a foot long; its eyes are remarkably vivid, bright, and ſparkling; its ſkin is very gloſſy, and its back variegated with a great number of black and white ſpots; its neck is very ſlender, its tail extremely ſharp, and it has a ſort of ſmall horns placed over its eyes; it is found in Egypt. There is alſo an American kind of this found in the ſouthern parts, and called by the natives a hucyatli, which is larger than the other, and reſembles the rattle-ſnake in many particulars, but wants the diſtinguiſhing characters of the rattle in the tail.

HAIR-*weed*, *conferva*, in botany, the name of a genus of moſſes, the characters of which are theſe: it is a water plant, deſtitute of flower and ſeed, ſo far as hitherto been obſerved, and compoſed only of ſimple and uniform filaments, which uſually extend to a great length, and are often branched, and uſually of a cylindric figure. The generality of authors have ſuppoſed that theſe are not produced of ſeeds, but are formed of ſome viſcous or gelatinous matter floating in the water, by mere oppoſition of parts; but this ſeems erroneous, and probably will be hereafter confuted by the diſcovery of their ſeeds, as has been already the caſe in the ſea-fucus's, and in many other genera of plants ſuppoſed formerly to want them. The confervæ are uſually divided into ſeveral orders, according to the nature of the filaments they conſiſt of. Some conſiſt of equable and even threads, others are knotted or jointed in the manner of a worm, or other ſuch inſect. Theſe are called the geniculated confervæ, to diſtinguiſh them from the other ſimple ones; and, finally, others are compoſed as it were of ſeveral globules joined one to another; theſe laſt are called the knotted confervæ. *Dillen. Hiſt. Muſc.*

HAND-*barrow*, in the military art, is commonly made of hard light wood. It is of great uſe in fortification, for carrying earth from one place to another, and in a ſiege, for carrying bombs, or cannon ball, along the trenches, and for ſeveral other uſes.

HAND-*ſpike*, a lever, or piece of aſh, elm, or other ſtrong wood, five or ſix feet long, cut thin like a wedge at one end, that it may get the eaſier betwixt things which are to be ſeparated, or any other thing that is to be raiſed; it is better than a crow of iron, becauſe its length allows a better poiſe.

HAND-*ſpikes* are frequently uſed in ſhips, as to traverſe the ordnance, to heave withal in a windlaſs, to weigh up the anchor, &c.

HANDLES *of a plough*, the name given by farmers to the two pieces of the plough faſtened to the earth-board, and to the ſheat, and ſerving the plough-man to reſt his force upon in the guiding of the plough. When they are conſiderably long, the plough is always guided the better, and the land is better tilled; but the lazy plough-men are apt to cut them off ſhorter, that, by bearing their whole weight upon them, they may, in a manner, ride, inſtead of walking. If they ſhould ride, in this manner, on the long handles, they would tilt up the end of the beam, and raiſe the plough out of the ground. *Tull's Huſbandry.*

HA'RBOUR (*Dict.*)—*A machine for cleanſing and deepening* HARBOURS, *and clearing ſea-ports*, &c.

There are a great variety of machines of this kind, but the following will be ſufficient for us, being that made uſe of at Toulon for this occaſion. See *plate* XXVI. *fig.* 1.

This machine conſiſts firſt of a barge, fifty-three feet in length from ſtem to ſtern, about eighteen feet and a half wide in the middle, and four feet and a half deep. Secondly, of two wheels, the firſt of twenty-two feet and a half diameter, the ſecond only twelve feet diameter. Thirdly, of two ſpoons which dig the bottom, and are filled alternately with ſand or gravel by the help of the wheels before-mentioned, which men turn different ways by the following method:

To the axis of the great wheel, are faſtened two iron chains C E and F, going on the wheels of the cranes C F; from thence, they come to the ſpoons, which they ſet at work. Obſerve the chain C E paſſes under the axis, and the other F G paſſes above it, that is, one lengthens, the other takes up and ſhortens, alternately, according to which ſide the great wheel turns, to oblige one ſpoon to deſcend while the other aſcends: the leſſer wheel contributes to this by the means of the two ropes Z Y, S D, called draw-backs, acting oppoſite, to the chains; each ſpoon is fixed to a long handle M N, which ſometimes bears againſt the roller H, ſometimes againſt the other I; and it is impoſſible this ſhould ſlip aſide, becauſe it is confined within the frame K L, where it acts in the following manner:

The men turning both wheels together, as in the draught, the chain A F G ſhortens, as it rolls round its axis, while the draw-back D S lengthens; then a boy placed at R catches the rope and twiſts it round a cleet, to check the ſpoon, and prevent it from ſliding over the ſurface, inſtead of biting at the bottom; the maſter and director of the machine at Q conſpires in the ſame intention, by holding the rope O H P, called the loader, in his hand, tied to the pole N M; from thence it paſſes over the roller H, under which the maſter twiſts it round the cleet P, to veer it out by degrees, as he draws it towards him, to make the ſpoon A dig itſelf in, ſo that it may fill itſelf, as it works, by the action which is communicated to it by the great wheel; the boy at R looſens his rope gradually, ſo as to let the handle become vertical, after which it falls upon the other roller I. The maſter immediately lets go the loader, and goes to T, to wait till the ſpoon A comes into the ſituation repreſented by the ſpoon B, in order to open the door of it, which he performs with the hook X by lifting up the catch which kept it ſhut; this being emptied into a lighter placed below for that purpoſe, the door of the ſpoon is ſhut again with the extremity of the hook. After this operation, the men who were placed at *a*, paſs on to V, to turn the wheels in a contrary motion to the preceding, which lets out the chain F G to lower the ſpoon which is emptied, and the rope D S draws it towards itſelf, as it winds up on its own axis; on the contrary Z Y veers out, as the chain C E draws in to bring the ſpoon B back to the ſituation in which A is exhibited, which fills in the ſame manner as deſcribed before, and the two ſpoons are worked alternately by the two contrary motions of the wheels.

To work the machine, it muſt be moored to ſix poſts anſwering to the bites Æ, and four anchors diſpoſed as in figure 2. in order to move aſide backwards or forwards, as there may be occaſion.

The maſter ſtiffens or looſens the loader, with which he governs the ſpoons according to the reſiſtance of the bottom, becauſe in ſome caſes, if this rope be held too tort, he would be in danger of breaking ſome part of the machine by the force which the great wheel communicates; and, if he holds it too ſlack, the ſpoon does not bury itſelf deep enough to fill: he likewiſe ſhortens or lengthens the chains according to the different depths of the bottom: the chains and handles are made of a ſufficient length to dig thirty feet beneath the ſurface of the water.

The alternate motion of the ſpoons makes two trenches on each ſide of the barge, which muſt be ſhifted to make ſeveral ſimilar trenches, which afterwards form one only, and clean out the Harbour completely, which the maſter will judge of by frequent ſoundings.

HA'RDENING *of timber*. The Venetians are famous for the ſoundneſs of their ſhips, which do not rot as thoſe of other nations, but will endure many times the common period. Tachenius tells us, that the whole ſecret of this conſiſts in the manner of their Hardening of their timber intended for this ſervice; and that this is done by ſinking it in the water while green, and leaving it there many years. This prevents the alkali, or that ſalt which furniſhes the alkali in burning, from exhaling afterwards; and by this means the timber becomes almoſt as incorruptible as ſtone. It is evident that the exhaling of this ſalt, and the rotting of wood, have ſome very great connection with one another, ſince, the more ſound any piece of timber is, the more ſalt it proportionably yields; and the wood which is rotten is found on trial to contain no ſalt at all. See the article TIMBER.

HA'RDY *ſhrubs*. The two hardeſt ſhrubs we are poſſeſſed of, are the ivy and box; theſe ſtand the ſeverity of our ſharpeſt winter unhurt, while other ſhrubs periſh, and trees have their ſolid bodies ſplit and torn to pieces. In the hard winter of the year 1683, theſe two ſhrubs ſuffered no injury any where; though the yews and hollies, which are generally ſuppoſed very Hardy, were this winter in ſome places killed, and, in others, ſtripped of their leaves, and damaged in their bark. Furze buſhes were found to be ſomewhat harder than theſe, but they ſometimes periſhed, at leaſt down to the root. The broom ſeemed to occupy the next ſtep of hardineſs beyond theſe; this lived where the others died; and, where even this died, the juniper ſhrubs were ſometimes found unhurt. This laſt is the only ſhrub that approaches to the hardineſs of the box and ivy, but even this does not quite come up to them; for, while they ſuffer nothing in whatever manner they are expoſed, the juniper, though it bears cold well under the ſhelter of other trees, yet cannot bear the viciſſitudes of heat and cold, inſomuch that ſome juniper ſhrubs were found half dead, and half vigorous; that ſide, which faced the mid-day ſun, having periſhed by the ſucceſſive thawings and freezings of its ſap; while that which was not expoſed to the viciſſitudes of heat, had bore the cold perfectly well. Such ſhrubs as are not Hardy enough to defy the winter, but appear half dead in the ſpring, may often be recovered by Mr. Evelyn's method of beating their branches with a ſlender hazel wand, to ſtrike off the withered leaves and buds, and giving a free paſſage to the air to the internal parts. Where this fails, the method is to cut them down to the quick; and, if no part of the trunk appears in a growing condition, they muſt be taken off down to the level of the ground. *Phil. Tranſ.* N°. 165.

HARE.— The ſportſmen diſtinguiſh four ſorts of this animal: the one lives in the mountains; the ſecond kind in open fields; and a third kind in marſhy grounds; and the fourth is a rambler, having no particular fixed ſpot of reſidence. It is eaſy to ſee that theſe are no diſtinctions in the eye of the naturaliſt; but they have their ſeveral properties according to theſe differences of place, which are of conſequence to the ſportſman. Thus the mountain Hares are the ſwifteſt of all, and the marſh Hares the ſloweſt; the field Hares have a middling degree of ſwiftneſs between theſe; and the rambling Hares are the moſt difficult of all to hunt, for they are not only conſiderably ſwift, but they generally know all the coverts and thickets, and have the art to make a thouſand doublings and eſcapes that the others would not think of.

Hares and rabbits are very miſchievous to new planted orchards, by peeling off the barks of the tender young trees for their food; they do alſo the ſame ſort of miſchief to nurſeries; for the prevention of which, ſome bind ropes about the trees to ſuch a height as they are able to reach; ſome daub them with tar; but, though this keeps off the Hares, it is itſelf miſchievous to the trees; but this hurtful property of it is in ſome degree taken off by mixing any kind of fat or greaſe with it, and incorporating them well over the fire. This mixture is to be rubbed over the lower part of the trees in November, and will preſerve them till that time the next year, without any danger from theſe animals. It is only in the hard weather in the winter ſeaſon, when other food is ſcarce, that theſe creatures feed on the bark of trees.

People who have the care of warrens, pretend to an odd way of making Hares fat, when they get them there. This is the ſtopping up their ears with wax, and rendering them deaf. The Hare is ſo timorous a creature, that ſhe is eternally liſtening after every noiſe, and will run a long way on the leaſt ſuſpicion of danger; ſo that ſhe always eats in terror, and runs herſelf out of fleſh continually. Theſe are both prevented by her feeding in a ſafe place, and that without apprehenſion; and they ſay ſhe will always readily be thus fattened.

HART.— Harts at one year old have no horns, but only bunches; and at two years they are very imperfect, being ſtraight and ſingle; at three years old they grow out into two ſpears; at four into three; and ſo increaſe every year in number of branches, till they are ſix years old; but after that their age is not to be known by their heads. February and March are the months in which they caſt their horns; and in general the old ones caſt them ſooner than the young ones. Thoſe that have been injured at rut, or which have been gelded, never caſt them at all; if they are gelded while young, they never have any horns; if, after their horns are grown, they keep thoſe which they had on at the time, as long as they live. The horns of ſome are reddiſh, thoſe of ſome black, thoſe of others are finally white. The red horns are generally largeſt and ſtrongeſt, the black are uſually ſhorter, and the white are worſt of all, being the leaſt ſolid or ſtrong.

This animal is the moſt cunning in its care of itſelf of all the deer kind. It is the moſt timorous of any, and by its windings and turnings and other ſubtleties, as the running among the herds of cattle, often deceives the huntſman, and puts a foil upon the dogs. In the chace, which is generally a long one, he takes over hedge, ditch, or river, or whatever comes in his way, nothing ſtopping him.

This creature loſes its horns in the ſpring time, as the other deer do; but, during the time that it is without them, does not appear, but abides in the thick woods, and only comes out in the night-time for food.

HA'RVEST-*fly*, *cicada*, in natural hiſtory, the name of a large fly, remarkable for the noiſe which it makes in the ſummer months, and particularly about the time of Harveſt. The generality of authors have very improperly tranſlated cicada by the Engliſh word graſhopper; but this is extremely erroneous, the cicada having not the leaſt reſemblance to the graſhopper. It is called the cigale in France, in the provinces of Languedoc, &c. it is very common in that country; Italy and all the hot countries abound with it; and it is in moſt of theſe places called by the common people by a name expreſſing the Harveſt-fly; but in England we have not the inſect, and few of us have any notion of what it is. It is probable, that people who found the cicada, according to the deſcription of the ancients, very noiſy, fancied the graſhopper muſt be the ſame creature, this being of all our inſects the moſt noiſy in the ſummer months.

The cicada is a large four-winged fly; its body is ſhort and thick, and its wings long and large: the great or common cicada is by far the largeſt of all the known ſpecies of ſhort-bodied flies, and the ſmaller kinds are larger than the hornet. The head of the cicada is ſhort and obtuſe; the eyes are reticulated as thoſe of other inſects of the winged kind, but they are ſmaller, in proportion to the ſize of the body, than thoſe of moſt other ſpecies; they are placed at the two ſides of the back part of the head, and leave a very large naked ſpace of forehead between them; the breadth of this plain ſpace is not leſs than that of the breaſt of the animal, and it therefore makes a very ſingular figure. The reticulated eyes are of an oblong figure, and are cut into a vaſt number of faces, and between theſe there are in the plain ſpace of the forehead three other ſmall and ſhining eyes, reſembling thoſe of ſpiders, and placed in a triangle. The corſlet, or breaſt of this fly, is divided into two; the head is fixed to the anterior diviſion, and the body to the other; the anterior has a triangular figure delineated upon it in creux, and the poſterior to which the body is fixed has a ridge in the middle, riſing above the reſt of the ſurface. *Reaumur's Hiſt. Inſ.*

HASINE'LLAS, in the glaſs-making trade, are a number of hooks faſtened to the ſides of the working furnace, by means of which the workmen are able to reſt and turn their veſſels, as they ſcald them. *Neri's Art of Glaſs.*

HA'STING *pear*, a name given, by the gardeners, to a ſpecies of pear, called alſo, by ſome, the green chiſſel pear. This is a moderately large pear, and is longiſh toward the pedicle; its ſkin is thin, and of a whitiſh green; the pulp is melting, and of a ſugary flavour. It ripens in July.

HAT (*Dict.*)— Under this article in the Dictionary we have given the whole proceſs of Hat-making, and in order to elucidate that deſcription, we ſhall give a perſpective view of the whole operation on *Plate* XXVII. Where

A, is a man bowing the ſtuff, or compoſition for Hats.
B, the bow.
C, the ſtuff.
D, a man rolling a Hat on the plank, or ſlooping ſide of the baſon.
E, a man putting a piece on a thin part of a Hat.
F, a man ſhaping a Hat on a block.
G, a lamp for giving light when they work in the night.
H, the plank, or ſloping ſide of the baſon.
I, a flue which carries of the ſmoak from the fire under the baſon.
K, a man ſtiffening the Hats.
L, the ſteaming baſon.
M, a furnace containing the fire which heats the ſteaming baſon.

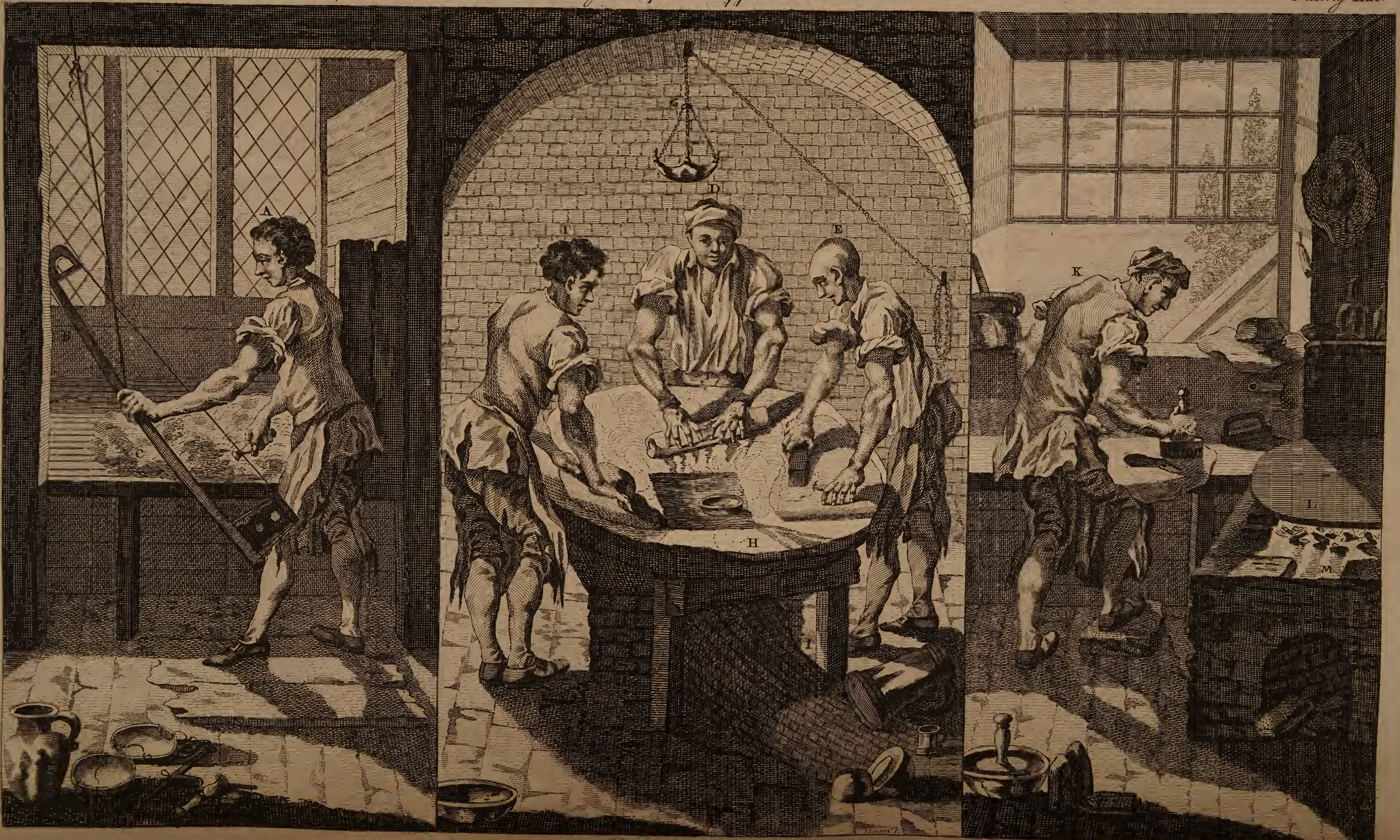
HA'TCHES, in mining, a term uſed, in Cornwall, to expreſs any of the openings of the earth, either into mines, or in ſearch of them. The fruitleſs openings are called eſſay Hatches; the real mouths of the veins, tin Hatches; and the places where they wind up the buckets of the ore, wind Hatches. See the article WIND-HATCH, &c.

Coamings of the HATCHES, in a ſhip. When the Hatches are raiſed up higher than the reſt of the deck, thoſe planks, or pieces

PLATE XXVII

Engraved for the Supplement.

Facing Hat.



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pieces of timber, which raiſe and bear them up, are called coamings of the Hatches.

HATCHING (*Dict.*)—The artificial method of Hatching eggs, as practiſed in Egypt, has been mentioned in the Dictionary; and Mr. Reaumur has diſcovered, that the heat, neceſſary for this purpoſe, is nearly the ſame with that marked 32 upon his thermometer or that marked 96 on Fahrenheit's. If, therefore, eggs be kept in this degree of heat, they will as certainly hatch, as if the parent hen had ſat upon them; and indeed, it is impoſſible it ſhould be otherwiſe, ſince this heat anſwers nearly to that of the ſkin of the hen, or even of mankind; ſo that the empreſs Livia, as Pliny relates, might truly hatch a chicken in her boſom, if ſhe had but the patience to keep an egg there, for the ſame number of days that it ought to have continued under a hen.

After many experiments, Mr. Reaumur, found, that ſtoves, heated by means of a baker's oven, ſucceeded equally well with thoſe made hot by layers of dung. The furnaces of glaſs-houſes, and thoſe of the melters of metals, might, no doubt, be made to anſwer the ſame purpoſe. If, therefore, an eaſy method could be found to regulate the heat of the ſtove, it would be extremely convenient for bakers or paſtry-cooks to hatch, with little or no expence, a very great number of chickens; which they might diſpoſe of to the country people to be reared up till marketable. Should a thermometer be judged neceſſary for this purpoſe, it will be ſufficient to mark on it only ſuch degrees as are abſolutely neceſſary; by which means the inſtrument will not only come cheaper, but be the more readily underſtood by the ignorant people, for whoſe uſe it is deſigned.

Such an inſtrument, however, may be wholly diſpenſed with; a lump of butter, of the ſize of a walnut, melted with half as much tallow, ſerving to indicate the heat of the ſtove with ſufficient exactneſs. When the heat is too great, this mixture, which is to be kept in a phial, will become as liquid as oil; and, when the heat is too ſmall, it will remain fixed in a lump; but it will flow like thick ſyrup, upon inclining the bottle, if the ſtove be of a right temper. Great attention, therefore, ſhould be given to keep the heat always at this degree, by letting in freſh air, if it be too great, or ſhutting the ſtove more cloſe, if it be too ſmall.

But this is not all. That all the eggs in the ſtove may equally ſhare the irregularities of the heat, it will be neceſſary to ſhift them from the ſides to the center, and vice verſa; thereby imitating what the hens themſelves do by thoſe upon which they ſit; for hens are frequently ſeen to make uſe of their bills, to puſh to the outer parts thoſe eggs that were neareſt to the middle part of their neſts, and to bring into that middle part ſuch as before lay neareſt to the ſides of the ſame.

As to the form of the ſtoves, no great nicety is neceſſary. A chamber over an oven will do very well; only, in order to aſcertain the due degree of heat, it will be neceſſary to have phials of butter, as directed above, in ſeveral parts of the room; and, when the heat wants to be either increaſed or diminiſhed, it is ſufficient to diminiſh or increaſe the communication between the air in the room and that abroad, by opening or ſhutting ſome of the openings made in the wall for that purpoſe.

In order to cheriſh the new hatched chickens, capons may be taught to tend them in the ſame manner as hens do. Mr. Reaumur tells us, that he has ſeen above two hundred chickens, at once, all led about and defended, by only three or four ſuch capons; which clucked like hens, to call in the chickens that had ſtrayed too far off; and even redoubled their call, when they found any nice bits, to invite the young brood to come and pick them up. Nay cocks may be taught to do the ſame office, which they, as well as the capons, will continue to do all their lives afterwards.

But Mr. Reaumur, not ſatisfied with the aſſiſtance he could thus procure from cocks and capons, has invented a ſort of low boxes without bottoms, and lined with furs. Theſe, which he calls artificial parents, not only ſhelter the chickens from the injuries of the air, but afford a kindly warmth; ſo that they preſently grow fond of them, and take the benefit of their ſhelter as readily as they would have done under the wings of a hen.

For a few weeks after Hatching, it will be neceſſary to keep the chickens in a room artificially heated, and furniſhed with theſe boxes; but afterwards they may be ſafely expoſed to the air in the court-yard, in which it may not be amiſs to place one of theſe artificial parents to ſhelter them, ſhould there be any occaſion.

As to the manner of feeding the young brood, they are generally a whole day after being hatched, before they take any food at all; and then a few crumbs of bread may be given for a day or two, or millet-ſeeds mixed with the crumbs; after which they will begin to pick up inſects and graſs for themſelves.

People in the country, who have plenty of conveniencies for the raiſing of poultry, will hardly give themſelves the trouble to hatch chickens in this artificial manner. It is in villages near great towns, and principally in the neighbourhood of the capital city, that it would be of the greateſt importance to promote the eſtabliſhment of this kind of ſtoves. Vid. Mr. Trembley's abſtract of the art of Hatching domeſtic fowls, tranſlated from the original treatiſe of Mr. Reaumur, where he explains every difficulty.

HAUSTI'LIA *ſuccina*, in natural hiſtory, a term uſed to expreſs that kind of amber, or, more properly ſpeaking, thoſe maſſes of amber which are obtained by dragging the bottoms of the ſea near Pruſſia, or found on the ſhores, in diſtinction from thoſe pieces which are found foſſile in the ſame or other kingdoms.

HA'ZLE, *corylus*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the amentaceous or catkin kind, being compoſed of a number of leaves affixed in a ſquamoſe order to an axis; under each of theſe there are placed a number of apices. Theſe flowers are barren, and the embryo fruits are placed in different parts of the tree; theſe finally become a hard and roundiſh ſhell, containing a ſingle kernel, and ſurrounded by a callous fimbriated cup.

HAZLE-*earth*, in agriculture, a moderately compact earth, much approaching to the nature of the chiſely ſoil, and indeed properly a ſpecies of it, but always containing a large quantity of a reſin-coloured ſand. *Morton's Northampt.*

HAY.—Whatever uplands are deſigned to be mowed for Hay, are to be ſhut up in the beginning of February, and no cattle ſuffered to come upon them afterwards; but the meadows and marſh lands, where the graſs grows quicker, need not be ſhut up till April, except the ſpring be bad; and many farmers feed thoſe meadows which are in danger of overflowing till the firſt of May, and then ſhut them up for mowing.

In ſpring, the ſtones, ſticks, and all other kinds of foulneſs that lie upon the land, are to be picked up, and the mole-hills all levelled and ſpread, becauſe they hinder the mowers. If the meadows lie any thing uneven, or if they have been trodden down in winter, they ſhould be rolled all over with a large wooden roller; the mowers will then be able to cut much cloſer; for this, and the quantity of the Hay, will very well anſwer the trouble.

The time of mowing the graſs muſt be proportioned to its ripeneſs; nothing can be more prejudicial to the crop, than the cutting it too ſoon, becauſe the ſap is not then fully come out of the root; and ſuch graſs, when dried into Hay, ſhrinks up almoſt into nothing. It is very wrong alſo to let it ſtand too long, for, when the ſeed has been ripened, and is ſhed, the moiſture of the ſap all dries away out of the ſtalks, and they become no better than ſo much ſtubble; as is plainly ſeen in thoſe graſſes which grow in hedges, and, not being moved, die away after they have perfected their ſeeds, and become taſteleſs and very different from Hay. The middle or latter end of June is the general ſeaſon for mowing; and the red flowers of the honey-ſuckle, beginning to wither, generally give the farmer notice that the time is coming on. But he may be more aſſured of this, by the tops or heads of the graſs looking full, bending downward, and looking brown: it is then in the proper ſtate to be cut down.

If there is great plenty of the Hay, and it lie thick in the ſwarth, the Hay-makers ſhould follow the mowers, and turn the ſwarths, as they cut them, unleſs there ſeems danger of wet weather; but in that caſe it is better to let them lie in the ſwarth. At night it muſt be made up into little cocks, and theſe in the morning muſt be ſpread again and turned, ſo that the other ſide may wither. After this it is to be made into ſmall cocks again, and the next day it is to be ſpread again, and drawn into long rows, which they call winrows. From theſe it is to be made up into large cocks after a little drying; and theſe large ones, if any wet comes, are to be ſpread open once again before they are carried in.

Mowing of land too often, or continuing it too long, is a very great prejudice to it, unleſs it have the advantage of being fed and renewed by land-floods at times. The farmer who has not this advantage to his lands, ſhould feed them once in two or three years, inſtead of making Hay from them, unleſs he chuſes to lay on manure conſtantly to keep them in heart. Feeding the Hay lands is the ſame ſort of reſpite that fallowing is to corn lands, both very neceſſary and advantageous.

HEAD-*ſails*, in a ſhip, thoſe which belong to the foremaſt and boltſprit; for it is by theſe that the head of the ſhip is governed, and by which it is made to fall off, and keep out of the wind. And theſe in quarter winds are the chief drawing ſails.

HEAD-*tin*, in metallurgy, is a preparation of tin ore toward the fitting it for working into metal. When the ore has been pounded and twice waſhed, that part of it which lies uppermoſt, or makes the ſurface of the maſs in the tub, is called the Head-tin; this is ſeparated from the reſt, and after a little more waſhing becomes fit for the blowing-houſe. *Ray's Engliſh Words.*

HEART-*ſhells*, *conchæ cordiformes*, in natural hiſtory, the name of a genus of ſhells, by ſome authors referred to the pectunculus or cockle kind, but by later writers juſtly diſtinguiſhed into a ſeparate genus. The characters are theſe: it is a bivalve ſhell-fiſh of a globoſe elated form, furrowed in deep lines, and in ſome ſpecies imbricated, in others prickly, never auriculated, and always expreſſing what we call the figure of a heart. *Hiſt. Nat. Eclairc.*

HEAT (*Dict.*)—The learned Dr. Knight, after ſuppoſing a repellent fluid every where diſſeminated through the univerſe, accounts for the effects of Heat, in the following manner:

If light in a ſufficient quantity enters the pores of a ſolid or fluid body, the quantity of repellent matter will be thereby increaſed, the body expanded, and the common effects of Heat produced.

Light is nothing but the repellent fluid put into very violent vibrations. When theſe vibrations are continued in a right-line, till they arrive near the ſurface of a body, they will begin to be acted upon by the repellent and true atmoſphere ſurrounding that ſurface, and either be repelled thereby, or have force ſufficient to penetrate within thoſe atmoſpheres: if the latter, the ſame vibrations will be continued through the repellent atmoſphere, only the direction will be changed towards the perpendicular; becauſe the repellent particles will be acted upon by two forces, in different directions; except when the light falls perpendicular to the ſurface, for within the atmoſphere of bodies the repellent matter it attracted towards the ſurface. Light will therefore move within the atmoſphere of bodies, in the diagonal of the projectile and attracting force; and by the continuation and increaſe of that attracting force, will be made to deſcribe a curve, and come nearer the direction of a line drawn perpendicular to the ſurface; where, when it arrives, it will either fall upon a pore or ſolid part: if the former, it will enter among component corpuſcles of the body, and increaſe the repulſive force betwixt thoſe corpuſcles, which muſt make them recede farther from each other, and conſequently the body will be dilated. The greater the quantity of light that thus enters amongſt the component corpuſcles of bodies, the greater will be their expanſion: Heat therefore will be moſt produced, where the greateſt number of repellent particles are in a vibratory motion without the body. Nor is it neceſſary that thoſe vibrations ſhould be always ſo violent as to excite in us the ſenſation of light. A very ſmall vibration will be ſufficient, when the direction of it is perpendicular to the ſurface. Hence we ſee the difference betwixt light and Heat: the firſt may be produced by a few vibrating rays, provided that thoſe vibrations are briſk enough; the latter may be produced by much weaker vibrations, provided the rays are ſufficiently numerous.

Heat, in medicine.—Great Heats are not ſo much the immediate, as the remote cauſe of a general ſickneſs, by relaxing the fibres, and diſpoſing the fibres to putrefaction; eſpecially among ſoldiers, and perſons expoſed the whole day to the ſun; for the greateſt Heats are ſeldom found to produce epidemic diſeaſes, till the perſpiration is ſtopped by wet cloaths, fogs, dews, damps, &c. and then ſome bilious or putrid diſtemper is the certain conſequence, as fluxes and ardent intermitting fevers. Nevertheleſs, it muſt be allowed, that Heats have ſometimes been ſo great, as to prove the more immediate cauſe of particular diſorders. As when centinels have been placed without cover, or frequent reliefs, in ſcorching heats; or when troops march, or are exerciſed in the heat of the day: and when people imprudently lie down and ſleep in the ſun: all theſe circumſtances are apt to bring on diſtempers, varying according to the ſeaſon of the year. In the beginning of ſummer, theſe errors produce inflammatory fevers; and, in the end of it, or in the beginning of autumn, a remitting fever or dyſentery.

To prevent, therefore, the effects of intemperate Heat, commanders have found it expedient ſo to order the marches, that the men come to their ground before the Heat of the day; and to give ſtrict orders, that none of them ſleep out of their tents; which in fixed encampments may be covered with boughs, to ſhade them from the ſun. It is likewiſe a rule of great importance to have the ſoldiers exerciſed before the cool of the morning is over; for, by that means, not only the ſultry Heats are avoided, but the blood being cooled, and the fibres braced, the body will be better prepared to bear the Heat of the day. Laſtly, in very hot weather, it has been found proper to ſhorten the centinel's duty, when obliged to ſtand in the ſun. *Pringle's Obſervations on the Diſeaſes of the Army.*

HEATH-*moſs*, *coralloides*, in botany, the name of a genus of the moſſes; the characters of which are theſe: they are compoſed of ſtalks often branched in the manner of corals, and compoſed of parts of a different figure and appearance, not ſimple and uniform as the byſſi and confervæ. On the ſummits of the branches there grow a ſort of fleſhy tubercles, which Micheli calls the receptacles of flowers; and the little atoms, which are ſeen adhering to the different parts of the ſtalks, he calls the ſeeds.

HE'DERA, *ivy*, in botany, a genus of plants, whoſe characters are:

The paraſitic tendril ſends forth fibres, or roots, into any thing they come near, capable of ſuſtaining them: the leaves are angular; the flower roſaceous, and, generally, hexapetalous; the ovary, at the bottom of the flower, becomes a round berry, pregnant with ſeeds, which are gibbous on one ſide, and flat on the other.

The leaves of ivy, while they run upon the ground, are more angular and cornered; but, when the ſtalks riſe up, and are faſtened to a wall or tree, they become rounder, ending in one point: whence moſt of the old botanic writers have made two ſpecies; that with the cornered leaves, becauſe it bore no fruit, while it lay on the ground, they called helix, or barren ivy; and the other corymboſa: the leaves of both are of a firm texture, and a dark green colour; thoſe of the firſt frequently full of ſmall white veins: the branches inſinuate themſelves, by ſhort cirrhi, into a wall, or body of a tree, that it climbs on: the flowers grow in corymbi or umbels, conſiſting of ſmall ſix-leaved yellowiſh flowers, followed by round umbilicated berries, black, when ripe; including ſeveral angular ſeeds: ivy grows every-where in hedges, and flowers late in the year; the berries being not ripe till January, or later.

The leaves are ſeldom or never uſed inwardly; but, outwardly, they are applied to iſſues, to keep them cool, and free from inflammations; as, alſo, to ſcabs, and ſores, and ſcald heads. Mr. Boyle, in his Uſefulneſs of Experimental Philoſophy, commends a large doſe of the full ripe berries, as a remedy againſt the plague; though Schroder ſays, they purge upwards and downwards. The gum of ivy is ſomewhat cauſtic, and commended to take away ſpots and freckles out of the face. *Miller's Bott. Off.*

The gum is a reſinous, dry, hard, and compact ſubſtance; of a bay colour, inclining to that of gold, ſhining like glaſs, but not pellucid; of a ſubacrid and ſubaſtringent taſte, and fragrant ſmell.

Geoffroy ſays, it is neither cauſtic nor depilatory, as the ancients imagined; but a powerful reſolvent and diſcutient, in which intentions it is an ingredient in ſeveral plaiſters.

Hedera *terreſtris*, *ground-ivy*; ſee the article GROUND-IVY, in the Dictionary.

HEDGE (*Dict.*)—The hawthorn is allowed to be the beſt of all the Engliſh ſhrubs for quick-ſet Hedges. The beſt method of raiſing this for uſe, is to put the haws into the ground as ſoon as ripe, and cover them with earth; and, by the ſpring twelvemonth, the young ſhoots will be of due ſize to tranſplant from the ſeed-plot into Hedge-rows. The crab-tree is a common mixture with the hawthorn in Hedges; but grows faſter than the hawthorn, and requires cutting to keep the Hedge even. The young hawthorns raiſed from ſeed always thrive better than thoſe picked up wild in the fields. *Moreton's Northampt.*

The great conſideration, in making quick-ſet Hedges, is to bring the plants from a worſe ſoil than that in which it is intended to ſet them. They muſt be about the thickneſs of one's thumb, well rooted and ſtrong, and muſt be planted about four or five inches out of the ground. If there be a ditch to the Hedge, it ſhould be three feet wide at the top, one at the bottom, and two deep; and, if wider, then deeper in proportion.

If the bank be without a ditch, the plants ſhould be ſet in two rows at a foot diſtance below one another. The turf is to be laid with the graſs ſide downward on that ſide of the ditch on which the bank is deſigned to be made, and ſome of the beſt mould muſt be laid upon it to bed the quick; then the quick is to be laid upon it a foot aſunder, ſo that the end of it may be inclining upwards; and at equal diſtances of thirty feet, plant an aſh, oak, crab, or elm, to grow with the quick. When the firſt row of quick is laid, it muſt be covered with mould, and the turf laid upon it as before, and ſome more mould upon that; ſo that when the bank is a foot high, another row of ſets may be laid againſt the ſpaces of the lower quick. Theſe muſt be then covered as the former, and the bank is to be then topped with the bottom of the ditch, and a dry or dead Hedge laid, to ſhade the under plantation. There ſhould then be ſtakes driven into the looſe earth quite down to the firm ground, at about two feet and a half diſtance from each other; oak ſtakes are accounted the beſt of all for this uſe, and, the next to this, thoſe of black-thorn or ſallow. Small buſhes are to be laid below, but not too thick, only to cover the quick from being injured, as it ſhoots. *Miller's Gard. Dict.*

HE'GEN, Arabian name of the camel which has only one bunch on its back. Its hairs are ſoft to the touch, and are ſhorter than thoſe of our oxen, except that there are ſome longer on the head, the throat and the top of the neck; and on the middle of the back, there are hairs of a foot long, and theſe though very ſoft and flexile, yet naturally ſtanding in an erect poſture, they make the moſt viſible part of the bunch. For when theſe are removed by the hand, the fleſh ſcarce appears more prominent, than that of the back of a hog, and there is not the leaſt fleſhy or callous excreſence there. See DROMEDARY.

The head is ſmall in proportion to the body; the upper lip is divided as in the hare; the feet are not hoofed; but each terminated by two ſmall claws; the ſole of the foot is broad and very fleſhy; and ſeems ſoft to the touch, though the ſkin is very hard and callous; the feet are indeed cloathed as it were with living ſhoes, which are of very great ſervice to it in travelling over the ſandy countries. It has ſix callous hardneſſes on the knees and ſhoulders of the fore legs, and one on each of the hinder ones. And, beſide theſe, there is another much larger, which adheres to the breaſt, on an eminence which is there, as if made to ſupport it; this is uſually eight inches long, ſix inches broad, and about two thick. The uſe of theſe is to ſuſtain the weight of the creatures body on occaſion of his ſtooping to reſt, or to be loaded.

Its ſtomach is very large, and divided into four parts as in other ruminating animals, but of a ſingular ſtructure; in that at the upper part of the ſecond ventricle, there are ſeveral ſquare holes, which are the orifices of a great number of a ſort of bags placed between the membranes which compoſe the ſtomach, and theſe ſeem to be the receptacles of water kept for the time of neceſſity, for the creature always drinks a vaſt quantity at once, and will then live a great while without drinking again. It is yet a queſtion to be decided, whether this creature is of the retromengent kind, and whether it copulates backwards? This has been affirmed by ſome, but it is greatly doubted by others. See *Plate* XXVIII. *fig.* 3. *Ray's Syn. Quad.*

HELE'NIA, *baſtard elecampane, or willow-leaved ſun-flower*, in botany, a genus of plants whoſe characters are:

It hath a compound radiated flower, conſiſting of many florets, which are hermaphrodite, and of ſemi-florets, which are female: the ovaries ſtand on a naked placenta, each leaving an antient crown: all theſe parts are included in a ſimple empalement, which expands, and is cut almoſt to the bottom in ſeveral parts.

The beſt ſeaſon to tranſplant the old roots, and to part them for increaſe, is in October, or the beginning of March, juſt before they begin to ſhoot; but, if the ſpring ſhould prove dry, they muſt be duly watered, otherwiſe they will not produce many flowers the ſame year. Theſe plants ſhould not be removed oftener than every other year; for as they do not ſpread their roots very wide, they will very well continue two years within due compaſs. They delight in a ſoil rather moiſt than dry, provided it be not too ſtrong, or hold the wet in winter: but if they are planted in a dry ſoil, they muſt be often and plentifully watered in dry weather, to make them produce plenty of flowers.

Theſe plants generally riſe about three feet and an half, or four feet high; therefore ſhould be planted in the middle of large borders, intermixed with flowers of the ſame growth, where they will make a pretty variety, becauſe they continue a long time in flower: and as they require very little care to cultivate them, they deſerve a place in every large garden. Their flowers reſemble thoſe of the ſmaller kinds of ſun-flower, and have been by ſome botaniſts ranged in that genus. The time of their flowering is from July until the froſt ſtops them.

HE'LIOTROPE, *heliotropium*, among the ancients, an inſtrument or machine, for ſhewing when the ſun arrived at the tropics and the equinoctial line. *Hoff. Lex.*

White HE'LLEBORE (*Dict.*)—The characters are:

The flower is naked, conſiſting of ſix leaves, which expand in form of a roſe; in the middle of which ariſe the pointal, ſurrounded by ſix ſtamina or threads, which afterwards turn to a fruit; in which, for the moſt part, three membranaceous ſheaths are gathered into a little head, and are full of oblong ſeeds, reſembling a grain of wheat, and encompaſſed, as it were, by a leafy wing.

Theſe plants are very pretty ornaments, when planted in the middle of open borders of the pleaſure garden; for if they are placed near hedges or walls, where generally ſnails harbour, they will greatly deface the leaves, by eating them full of holes; and as a great part of the beauty of theſe plants conſiſt in their broad folded leaves, ſo, when they are thus defaced, the pleaſure is almoſt loſt.

The leaves of theſe plants are very broad, eſpecially if the ground is good where they grow, and are plaited ſomewhat reſembling thoſe of the palms; but are of a much thinner conſiſtence. From each head of the root is generally produced a flower ſtem, about three feet high, having a ſpike of flowers about a foot in length at their top. The flowers of the firſt kind, being green, make not much appearance; but thoſe of the ſecond, which are of a dark red, or purple colour, are generally preferred by thoſe perſons who cultivate them in the pleaſure garden.

They may be propagated either by parting their roots in autumn, or towards the latter end of February, or the beginning of March, juſt before they begin to ſhoot, and ſhould be planted in a light freſh rich ſoil; in which they will thrive exceedingly, and produce ſtrong ſpikes of flowers. Theſe roots ſhould not be removed oftener than once in three or four years; by which time, if they like the ſoil, they will be very ſtrong, and afford many heads to be taken off; but, if they are frequently tranſplanted, it will prevent their increaſing, and cauſe them to flower very weak.

You may alſo propagate theſe plants by ſeeds, which ſhould be ſown as ſoon as ripe, either in a bed or box filled with freſh light earth, and the ground kept conſtantly clear from weeds. In the ſpring the plants will appear, at which time, if the ſeaſon be dry, you ſhould now and then refreſh them with water, which will greatly promote their growth; and you muſt carefully clear them from weeds, which, if permitted to grow, will ſoon overſpread and deſtroy theſe plants while young. The ſpring following, juſt before the plants begin to ſhoot, you ſhould prepare a bed of freſh light earth, and carefully take up the young plants, obſerving not to break their roots, and plant them therein about ſix inches ſquare, where they may remain until they are ſtrong enough to flower, when they ſhould be tranſplanted into the borders of the pleaſure garden. But as theſe plants ſeldom flower in leſs than four years from ſeeds, ſo this method of propagating them is not very much practiſed in England. See *Plate* XXV. *fig.* 2. where *e* is the flower, *f* the fruit, *g* the ſeed.

HE'NBANE *louſe*, in natural hiſtory, a name given by ſome to a peculiar inſect found very frequently on that plant in the ſummer months. It is one of the cimices of authors, and is very well deſcribed by Liſter in the Philoſophical Tranſactions. It is a very large cimex, of a fine red, ſpotted with black; it feeds on the juices of the Henbane, whoſe leaves and ſtalk it pierces with its trunk. It is very remarkable that the juices of this ſtinking plant acquire a very agreeable and aromatic flavour in the body of this inſect, and on trial it may perhaps be found, that the miſchievous narcotic quality of the plant may be rendered wholeſome, and a good medicine, in the body of this inſect. *Phil. Tranſ.* N°. 71.

HE'PAR *ſulphuris*, brimſtone melted with half the quantity of a fixed alkali. A like ſubſtance may alſo be produced by tartarum vitriolatum, ſandiver, or other of the neutral ſalts containing the vitriolic acid, if, when they are red-hot in the fire, there be added to them powder of charcoal, or any other more fixed phlogiſtic; but the hepar ſulphuris is not ſo ſtrong, as otherwiſe, when it is made with nitre fixed with coals, or with the alkali compoſed of tartar and nitre, or with neutral ſalts with an addition of ſulphur already containing the vitriolic acid. The Hepar ſulphuris runs earths and ſtones into fuſion over the fire; and when melted with the metals it makes them eaſily fuſe, but renders them brittle, and in ſome degree ſoluble in water. *Hoffman's Obſerv. Phyſ. Chem.*

HEPA'TICA *trifolia*, *noble liverwort*, in botany, a genus of plants, whoſe characters are:

The root is fibrous and perennial; the pedicles of the leaves ariſe from the root; the leaves conſiſt of three lobes, the ſtalks are naked, florigerous, or flower-bearing, ſimple, and ſpring from the root. The perianthium or calyx is monophyllous, deeply cut, commonly into three, rarely into four lobes, and permanent. The flower is roſaceous, polypetalous, naturally pentapetalous, and furniſhed with numerous ſtamina. The fruit is globular, and has every one of its cells furniſhed with a crooked tube: in other reſpects it reſembles the leſſer celandine.

The flowers of this liverwort ariſe out of the ground early in the ſpring, before the leaves; they grow on long, ſlender, and ſomewhat hairy foot-ſtalks, four or five inches long, incloſed in a three-leaved green calyx: they are made up of ſix blue roundiſh-pointed leaves, ſet about a ſmall green head, with ſeveral whitiſh-blue chives in the middle; the green head afterwards is inlarged into ſeveral ſmall naked ſeeds. The leaves come up when the flowers are paſt, conſiſting each of a leaf of three equal lobes, round, and ſomewhat pointed at the end, of a dull green colour, growing on long foot-ſtalks. The root is ſmall and ſtringy. It is uſually planted in gardens, and flowers in March.

The leaves are uſed, though but very rarely, here in England; but they are commended by ſome foreign authors, as a very good vulnerary, and uſeful in diſtempers of the liver.

It is cultivated in gardens, and flowers in the ſpring. As to its virtues, it corroborates the ſtomach by its aſtringent quality, and is, therefore, proper in all diſorders proceeding from relaxation, and where aſtriction is required: hence it is of ſervice in vulnerary drinks, in a diabetes, ſpitting of blood, or making of bloody urine. It is much commended in an hernia; and the leaves, pulverized, are excellent in the dyſentery. A decoction of the leaves is effectual againſt the jaundice, itch, fetid ulcers, and the quinſey. The whole plant is of ſervice in obſtructions of the kidneys, bladder, and liver. *Boerhaave.*

Theſe plants are ſome of the greateſt beauties of the ſpring: their flowers are produced in February and March in great plenty, before the green leaves appear, and make a very beautiful figure in the borders of the pleaſure-garden; eſpecially the double ſorts, which commonly continue a fortnight longer in flower than the ſingle kinds, and the flowers are much fairer. I have ſeen the double white kind often mentioned in books, but could never ſee it growing; though I do not know but ſuch a flower might be obtained from the ſeeds of the ſingle white, or blue kinds. I have ſometimes known the double blue ſort produce ſome flowers in autumn which were inclining to white; and thereby ſome people have been deceived, who have procured the roots at that ſeaſon, and planted them in their gardens; but the ſpring following their flowers were blue, as before: and this is a common thing, when the autumn is ſo mild as to cauſe them to flower. But, whether the double white ſort, mentioned in the books, was only this accidental alteration in the colour of the flower, I cannot ſay; though it ſeems very probable it was, ſince I never could hear of any perſon who ever ſaw the double white ſort flower in the ſpring. *Miller's Gard. Dict.*

HEPTA'NDRIA, in botany, a claſs of plants with hermaphrodite flowers, and ſeven male parts or ſtamina in each.

> * The word is formed of the Greek, ἑπτὰ, ſeven, and ἀνὴρ, male.

Of this claſs are the horſe cheſnut, finitelis, &c.

HE'RBA *paris*, *herb paris*, in botany, a genus of plants, whoſe characters are:

The calyx conſiſts of four leaves, which expand in rays. The flower is tetrapetalous; the petals diſpoſed in the form of a croſs, furniſhed with four ſtamina. The fruit is ſoft, globular, furniſhed with four tubes, divided into four cells, and full of oblong ſeeds.

The roots of this herb run creeping along on the ſurface of the earth, being ſlender and of a brown colour, ſhooting up here and there, being long round ſtalks half a foot high; having uſually four, though, ſometimes, five or ſix leaves, which are pretty broad and roundiſh, narroweſt next the ſtalk, and ending in a ſharp point. From among theſe ariſes a ſlender ſtalk, two or three inches high, bearing one ſingle flower, compoſed of four long green leaves, with as many very narrow ones under them, of the ſame colour, having ſeveral ſtamina among them; in the middle of theſe grows a roundiſh blackberry, about as big as a grape, of an inſipid taſte. It is found in moiſt ſhady woods, which have a good ſoil; the neareſt place to London, that I know of, where it grows, is Chiſelhurſt in Kent, in a wood by the bog, at the entrance of it next the town. It flowers in April and May, and the berry is ripe in July.

Though this plant was formerly accounted of a poiſonous nature, being reckoned among the aconites, Fuchſius calling it aconitum pardalianches; yet authors, who have wrote ſince, attribute to it quite contrary effects, eſteeming it to be a counterpoiſon, and an alexipharmic, and good in malignant and peſtilential fevers.

Parkinſon ſays, the roots, boiled in wine, help the cholic; and the leaves, applied outwardly, repreſs tumors and inflammations, eſpecially in the ſcrotum and teſticles, and ripen peſtilential tumors.

HERNA'NDIA, in botany, the name of a diſtinct genus of plants, the characters of which are theſe: the petals of the flower are multifid, and placed in a circular order; the male and female flowers ſtand on diſtinct plants. There is no pericarpium, but the cup of the flower is very large, ſwelled, and roundiſh; containing a plicated oval nut, with only one cell, and a globoſe nucleus. *Linnæi Gen. Plant.*

We know only one ſpecies of this genus, which is the Hernandia, with a large umbilicated ivy-like leaf, commonly called, in the Weſt-Indies, Jack in a box.

HE'RON, *ardea*, in zoology, the name of a large genus of birds, the diſtinguiſhing character of which is, by Mr. Ray, fixed in their inteſtines; they having only one inteſtinum cæcum, or blind gut, as is the cuſtom of nature in quadrupeds, moſt other birds having two.

This bird is a great devourer of fiſh, and is of more miſchief to a pond than even an otter: ſome ſay, that a Heron will deſtroy more fiſh in a week, than an otter will in three months; but that ſeems carrying it too far. People who have kept Herons, have had the curioſity to number out the fiſh they fed them with into a tub of water, and counting them again afterwards, it has been found that they will eat fifty moderate-ſized dace and roaches in a day. It has been found that in carp ponds, viſited by this bird, one Heron will eat up a thouſand ſtore carp in a year, and will hunt them ſo cloſe as to let very few eſcape. The readieſt method of deſtroying this miſchievous bird, is by fiſhing for him in the manner of pike, with a baited hook. When the haunt of the Heron is found out, three or four ſmall roach or dace are to be procured, and each of them is to be baited on a wire, with a ſtrong hook at the end, entering the wire juſt under the gills, and letting it run juſt under the ſkin to the tail; the fiſh will live in this manner five or ſix days, which is a very eſſential thing; for, if it be dead, the Heron will not touch it. A ſtrong line is then to be prepared of ſilk and wire twiſted together, and is to be about two yards long; tie this to the wire that holds the hook, and to the other end of it there is to be tied a ſtone of about a pound weight; let three or four of theſe baits be ſunk in different ſhallow parts of the pond, and, in a night or two's time, the Heron will not fail of being taken by one or other of them.

HE'SPERIS, in botany, a genus of plants, whoſe characters are:

It has a long, ſmooth, cylindrical, bivalve pod, divided into two capſules or cells, which are ſeparated by an intermediate partition, and furniſhed with cylindrical or globular ſeeds.

Boerhaave mentions four and twenty ſpecies of this plant.

This plant is antiſcorbutic and diaphoretic, and very ſerviceable in the aſthma, coughs, and convulſions. The outward uſe of it is recommended againſt inflammations, cancers, a gangrene, ſphacelus, and contagious diſeaſes. Bruiſed, it very potently reſiſts putrefaction; and, applied to peſtilential buboes under the arm-pits, ripens and ſoftens them. It is highly commended by Hildanus, in his treatiſe of Inflammations, Sphacelus, and Gangrene; and I myſelf have had experience of its virtues, in the following inſtance: there was a ſtudent, who, being on a journey, had the misfortune, not only to break, but very much bruiſe, both the tibia and fibula; and, before the ſurgeons could be ready with their aſſiſtance, the parts were ſeized with a gangrene. When the ſurgeons were come, and had viewed the place, they ſent for me, becauſe they deſpaired of a cure: I bruiſed this herb in wine, and applied it to the leg, which perfectly cured the patient of his gangrene. *Hiſtoria Plantarum, aſcribed to Boerhaave.*

HETERO'STROPHE, an epithet applied to certain ſhells, the wreaths of which turn a contrary way from thoſe of other ſhells of the ſame genera.

HEXAEDRO'STYLA *, in natural hiſtory, the name of a genus of ſpars.

> * The word is derived of the Greek ἓξ, ſix, ἕδρα, ſide, and ϛύλος, a column.

The bodies of this genus are ſpars of a columnar form, adhering to ſome ſolid body at the baſe, and terminated at the point by a pyramid; the pyramid and column being both hexahedral, or compoſed each of ſix ſides. Of this genus there are three known ſpecies: 1. A ſlender one with a long pyramid; this is compoſed of ſo pure and clear a ſpar, that it reſembles cryſtal, and is found in Ockey hole, on Mendip hills, and in ſome other parts of England. 2. A ſomewhat thick one, with a long irregular pyramid, found in the mines of Cornwall and Devonſhire, and common alſo in thoſe of Germany. 3. One with a very ſhort pyramid; this is found in the Derbyſhire lead mines, and in great plenty on thoſe of the Hartz foreſt in Germany. *Hill's Hiſt. of Foſſ.*

HEXA'NDRIA*, in botany, a claſs of plants with hermaphrodite flowers, and ſix ſtamina or male parts in each, which are in ſome plants all of the ſame length, and in others are alternately one ſhorter and another longer.

> * The word is derived from the Greek ἓξ, ſix, and ἀνὴρ male.

The plants of this claſs are garlic, hyacinth, meadow ſaffron, &c. See *Plate* XXVIII. *fig.* 1.

HEXAPYRAMI'DES *, in natural hiſtory, the name of a genus of ſpars.

> * The word is derived from the Greek ἓξ, ſix, and πυραμὶς, a pyramid.

The bodies of this genus are ſpars formed into pyramids, compoſed of ſix ſides or planes, and affixed to no column, but adhering to ſome ſolid body by their baſes. Of this genus there are only two known ſpecies. 1. A ſhort one with a broad baſe; this is a very rare ſpecies, and found only, ſo far as is yet known, in the great mine at Goſſelar in Saxony. And, 2. A long pointed one, with a narrow baſe; this is found in the figures of the alabaſter quarries of the Hartz foreſt. *Hill's Hiſt. of Foſſ.*

HILLS are of great uſe in a garden.

1. They ſerve as ſcreens to keep off the cold and nipping blaſts of the northern and eaſtern winds.

2. The long ridges and chains of lofty mountains, being generally found to run from eaſt to weſt, ſerve to ſtop the evagation of thoſe vapours towards the poles, without which they would all run from the hot countries, and leave them deſtitute of rain.

3. They condenſe thoſe vapours, like alembic heads, into clouds; and ſo, by a kind of external diſtillation, give origin to ſprings and rivers; and, by amaſſing, cooling, and conſtipating them, turn them into rain, and by that means renders the fervid regions of the torrid zone habitable.

4. They ſerve for the production of a great number of vegetables and minerals, which are not found in other places.

It hath been found by experiment and calculation, that Hills, though they meaſure twice as much as the plain ground they ſtand upon, yet the produce of the one can be no more than the other; and, therefore, in purchaſing land, the Hills ought not to be bought for more than their ſuperficial meaſure; i. e. to pay no more for two acres upon the ſide of an hill, than for one upon the plain, if the ſoil be equally rich.

It is true, that thoſe lands that are hilly and mountainous, are very different, as to their valuable contents, from what are found in flat and plain ground, whether they be planted, ſown, or built upon; as for example:

Suppoſe an Hill contains four equal ſides, which meet in a point at the top; yet the contents of theſe four ſides can produce no more grain, or bear no more trees, than the plain ground on which the Hill ſtands, or than the baſe of it; and yet by the meaſure of the ſides there may be double the number of acres, rods, and poles, which they meaſure on the baſe or ground-plot.

For, as long as all plants preſerve their upright method of growing, hilly ground can bear no more plants in number than the plain at the baſe.

Again, as to building on an Hill, the two ſides of an Hill will bear no more than the ſame number of houſes that can ſtand in the line at the baſe.

And as to rails, or park-pailing over an Hill, though the meaſure be near double over the Hill to the line at the bottom, yet both may be incloſed by the ſame number of pales of the ſame breadth. *Miller's Gard. Dict.*

HIPPOPO´TAMUS, in zoology, the name of a very ſingular quadruped, called in Engliſh the river horſe, and by ſome, though leſs properly, the ſea-horſe. It approaches in figure partly to the buffalo, and partly to the bear. It is larger than the buffalo, and its legs are very much like the bear's. The full grown animal is thirteen feet long from its head to its tail, and four feet and an half in the diameter of its body, and its belly is rather flat than ridged; the circumference of its body is uſually equal to its whole length; and its legs three feet and a half long, and three feet round; and its feet a foot broad; its head is very large in proportion to its body, and its mouth is capable of opening a foot wide; its eyes are ſmall, its ears alſo ſmall and thin; its teeth are as hard as flint, and will readily give fire with ſteel; it is uſually very fat; its hoofs are black, much like thoſe of the common cloven-footed beaſts, but divided into four claws inſtead of two; its upper jaw is moveable in the manner of the crocodile's. Its tail is more like that of a bear or tortoiſe, than a hog's, to which it has uſually been compared; it is very thick at its inſertion, and tapers away to the end; it is not above ſix inches long, and ſo thick that it cannot twiſt about. Its ſkin is extremely hard and tough, and in colour black; and its noſe is furniſhed with ſtiff hairs or whiſkers, in the manner of a cat's, ſeveral ſtiff hairs growing from the ſame hole; and theſe are the only hairs the creature has, its whole body being naked. It has two large teeth in the lower jaw, ſomewhat reſembling the tuſks of the boar, and a little crooked, but not ſtanding out of the mouth like the boar's tuſks; theſe are much larger than the other teeth, and ſometimes grow to a foot in length.

It is found in the Nile and Niger, and many other great rivers; it comes out of the water to bring forth its young, and feeds upon rice, herbs, and the roots of the colocaſia. Its feet, being not webbed, ſhew that it is not intended for ſwimming, and probably it ſpends its time in walking about at the bottom of the rivers. It is very plainly proved by Bochart, that this is the creature mentioned under the name of the behemoth in the book of Job. *Ray's Syn. Quad.*

HIRU´DO, *the leech.*—Theſe are ſmall black animals, deſtitute of legs, variegated with lines and points, and living in watery places. The ſmall leeches are preferred to the large, as being leſs hurtful; and, among the ſmall ones, ſuch as are marked with lines on the back.

Leeches are a ſpecies of aquatic worms or inſects, which, being applied to the body, bite through the ſkin, extract blood out of the veins, and are very conducive to health; for which reaſon they were uſed, in very early times, by the Greek and Roman phyſicians. Since there are various kinds of them, it will be proper to give ſome direction for the choice. Thoſe, then, taken out of clear rivers and brooks are beſt; for the others from lakes, fiſh-ponds, and ſtagnating waters, are impure and malignant, exciting ſometimes violent pains, inflammations, and tumors. The moſt experienced ſurgeons likewiſe prefer thoſe with ſlender pointed heads, and greeniſh or yellowiſh ſtreaks on their backs, with their bellies of a reddiſh yellow; for, when their heads are large, and from a blue they incline to a black colour all over their bodies, we look upon them to be the moſt malignant ſort. But one obſervation more ſeems abſolutely neceſſary, never to apply leeches lately caught in rivers, or foul waters; but let them be firſt put into a glaſs full of clean water, and often ſhifted, that they may purge themſelves of their filth and venom. After keeping them ſome months in this manner, they may be uſed ſafely.

Before the leech is applied, it ſhould be taken out of the water, and put into an empty cup, or glaſs, that, being thirſty, it may the more ſpeedily inſinuate itſelf into the ſkin, and draw off a greater quantity of blood. And, as for the part, it may be put to the temples, or behind the ears, if there is any diſorder in the head or eyes, from a redundance of blood, and eſpecially if the patient is delirious in a fever. They may be ſometimes conveniently applied to the veins of the rectum, in the blind and painful piles; nor will this application be of leſs ſervice, in hæmorrhages of the noſe, and in ſpitting or vomiting blood; for their efficacy in promoting a revulſion, eſpecially when an obſtruction of the hæmorrhoids occaſions this profuſion, is very extraordinary. But, before the leech is uſed, the part ſhould be rubbed, till it is hot and red; then the tail is to be taken hold of with a dry cloth, or it muſt be laid half over the edge of a glaſs, and then directed to the proper place, where, when it is once fixed, it ſucks very greedily. If ſeveral are neceſſary, apply each ſucceſſively in the ſame manner. When they will not adhere, as it ſometimes happens, it is proper to moiſten the ſkin with warm water, or the blood of a pigeon, or chicken; if that will not entice them, others muſt be ſubſtituted in their ſtead. The application of leeches to the caruncle in the greater canthus of the eye, after phlebotomy, has been found very ſerviceable, in all inflammatory diſorders of that organ. Cream and ſugar, rubbed upon the part, will invite leeches to bite, when other things fail.

As ſoon as the leeches are diſtended with blood, they generally fall off ſpontaneouſly; but, if a larger quantity of blood is requiſite, new ones muſt be applied, or the tails of thoſe already fixed muſt be cut off; for then, the blood running through them, they will be induced to draw more. If, after a ſufficient evacuation, they do not ſpontaneouſly ſeparate themſelves from the ſkin, upon ſprinkling a little ſalt or aſhes, they immediately drop off; and this method is beſt; becauſe pulling them away often cauſes an inflammation or tumor. The leech which is whole, may be put again into the clean water, and kept for future uſe; but that which is cut, certainly dies. The wound may be waſhed with warm water, and dreſſed with a vulnerary plaiſter, though it uſually heals without.

When leeches fall off, the hæmorrhage generally continues for ſome time, as twelve hours, and frequently longer. Upon this occaſion, as the blood cannot be received in veſſels, but is abſorbed by linen, it makes a great appearance, and ſeems much more than it really is: this alarms the patient and puts the attendants into an unneceſſary conſternation, upon a ſuppoſition, that the hæmorrhage will be ſo profuſe, as to occaſion faintings and death, neither of which is likely to enſue; for the bleeding may, at any time, be ſtopped by compreſſure, or the application of ſtyptics; as brandy, with a little powdered colcothar. But it is more frequently neceſſary to bathe the part wounded, with warm water, in order to encourage a diſcharge of blood, when it does not flow in quantities ſufficient to anſwer the end propoſed.

HIS´TRIX, *the porcupine*, an animal well known in many parts of the world, and ſo common in the mountainous parts of Italy, that it is brought to market at Rome, and ſells but at a very low price, the fleſh not being greatly eſteemed.

It reſembles the badger in ſhape, but in its nature more reſembles the hare, and is properly of the leporine kind. It uſually weighs between twenty and thirty pounds. Its body is often two feet long, and is all over covered with a very ſingular and remarkable kind of briſtles. Its ſhoulders, legs, ſides, and belly, are wholly black; and its back variegated with black and white. Its briſtles more reſemble thoſe of the hog than of any other animal; its neck is ſhort and thick; its head alſo ſhort, and its noſe obtuſe; its noſtrils very large, opening tranſverſly, and its upper lip ſplit, as in the hare. All about and over its noſtrils, it has a number of black hairs, by way of whiſkers, as the rat and mouſe have; and it has, in each jaw, two large and long fore teeth, like thoſe of the hare. The eyes are ſmall and blue, and the ears of a very ſingular ſhape, repreſenting thoſe of the human ſpecies; and about theſe there is a grey down, very different from the covering of the reſt of the creature. It has the like down upon the lower jaw; and all along the head and neck, quite to the ſhoulders, it has a ſort of creſt of very long briſtles, ſometimes eight inches long; this looks like an erect mane, and the briſtles it is compoſed of are ſome white, ſome black, and others variegated with both theſe colours. Its legs are ſhort, and the fore feet have each five toes, the hinder ones only four, of which the outer one is the largeſt, as in the bear. The briſtles of the whole body are very thick, flatted at the bottom, and pointed at the extremity, and ſtanding each on a ſhort pedicle. Its briſtles are of very different kinds; ſome of them are very ſharp, rigid, and ſhort; others longer, flexible, and flatted at the end; thoſe of the firſt ſort are white at the bottom, and cheſnut-coloured at the top; the longer ones are white at both ends, and variegated with black and white in the middle.

The tail is a little more than a hand's breadth long, and is beſet with ſpines, in ſeveral annular ranges; and at the extremity, inſtead of ſpines, it has ten or twelve tubular bodies, of the thickneſs of the ſpines, but of not more than half their length, very thin and tranſparent, open at the end, and placed on ſhort pedicles. *Ray's Syn. Quad.*

HI´VING, the placing a ſwarm of bees in a hive, in order to have the profit of their labours. When the ſwarm of bees has left an old hive, and is placed in form of a cluſter hanging down from the branches of ſome ſhrub or looſe buſh, the Hiving is extremely eaſy, and may be done in half an hour after the time of their being ſtill, and calm in the cluſter; or it may be let alone till an hour or two before ſun-ſet, provided that the ſun do not ſhine too vehemently upon the place where they are, for that would diſquiet them, and force them to riſe; and in that caſe they uſually take a long flight before they ſettle again, and are very often loſt; this however may at any time be prevented, by placing an artificial ſcreen before them, compoſed either of a coarſe cloth, or of a few branches of trees well covered with leaves.

Thoſe authors who ſpeak largely of the œconomy of bees, give the new queen a ſet of officers, whoſe buſineſs it is to ſettle the proper places of reſort; and they pretend that theſe bees go out of the hive a day or two before the ſwarm iſſues out, in order to fix upon a proper place. This however appears but a romantic conjecture, and we uſually find the bees buſied in ſearch of a place, while the whole ſwarm is in the air; nor is it much to their credit, that they chuſe ſuch places as they do, for they uſually fix in ſuch as they can by no means ſubſiſt in.

It is commonly the branch of ſome ſhrub or tree that they ſettle upon, and we always find that they mean this as their ſettled habitation; for, however ſoon they are hived, the rudiments and beginning of combs are found on it. It is true, they always leave theſe places, if left to themſelves, in five or ſix days; but this is not till they find them ſo inconvenient that they cannot keep them, either from their being too much ſcorched by the ſun, or expoſed to winds and rain. The quantity of wax and honey left in theſe places, when they have quitted them, abundantly proves however that they meant them for fixed abodes.

When they are placed in a hive, they very ſoon find themſelves much better lodged than in the place they had provided for themſelves, and they uſually ſtay in it, and begin to work the next morning.

It might appear a very difficult taſk to get ſo large a number of bees into a hive, but it is much leſs ſo than it appears to be. They will often take poſſeſſion of the hive of their own accord, when it is hung over them; but the ſhorteſt way is to hold the hive under the branch where they are, and then ſweep them down into it. This may be done with the branch of a tree with leaves on it, or with the hand armed with a ſtrong glove, and the face covered. But there are country fellows who will go without any ſort of defence, and with their naked hand ſweep them carefully off the bough into the hive, which they hold in the other hand underneath.

It is not to be expected that the whole ſwarm will be thus ſwept peaceably into the hive; many will fly away, and many cluſters will fall beſide the hive to the ground. All this however creates no difficulty, for, the hive being turned bottom upwards, and ſet on the ground near the tree, with its edges a little raiſed above the ſurface, thoſe bees which fell in cluſters to the ground, will ſoon ſcrawl to their companions in the hive, and ſoon after thoſe which flew off, will deſcend and follow their example. If it happen however that ſome bees will obſtinately keep to the place where they at firſt fixed themſelves, the branch is to be rubbed over with the juice of ſuch plants as theſe creatures hate the ſmell of; ſuch are elder, rue, and ſome others. And, if this does not ſucceed, there muſt be linen rags burnt under them, the ſmoke of which will ſoon drive them off, and make them join their companions, who find themſelves more at eaſe in the hive.

As it is neceſſary to render the places diſagreeable to the bees from which they are to be taken into the hive, ſo many people think it very proper to prepare the hive for their reception, by ſcenting it with ſuch things as they love the ſmell of. To this purpoſe they rub the inſide of it with baum and bean flowers, and daub a little honey in ſome parts of it. This however does not ſeem neceſſary, thoſe hives having been found to ſucceed full as well, where it was not done, as thoſe where it was.

If it be about noon that the ſwarm is taken into the hive, it muſt not be removed from the place before evening; and in the mean time it muſt be ſheltered from the two violent heat of the ſun, by the ſhade of the trees; or, if that be not ſufficient, a ſort of ſcreen muſt be made for it, either of a coarſe cloth properly ſupported, or of branches of trees with their leaves on. In this manner it muſt remain till ſun-ſet, and then the hive muſt be gently lifted up, and carried to the place where it is to remain, and the next morning the bees will be ſeen as buſy at their work in it, as the old ſwarm in their hive.

It ſometimes happens that the ſwarm is not placed ſo favourably as in the inſtance before-mentioned; they often hang themſelves in a long cluſter from the young ſhoots, or ſmall branches of high trees; and in this caſe many different expedients are to be uſed to hive them, according to the circumſtances of their poſition. The common method is for one man to climb the tree with a long ſtaff in his hand, and another to mount a ladder placed againſt the tree, and hold the hive under the ſwarm, while the other ſweeps them into it with his ſtaff; and, when the bough on which they hang is ſo far from the body of the tree, that this is impracticable by the ladder, the hive is to be fixed to the end of a long pole, and by that means ſuſpended under the ſwarm while they are ſwept into it. When all this is impracticable, by reaſon of the great height of the branch on which the ſwarm hangs, a large cloth is to be ſpread on ſome of the lower branches, and the whole ſwarm ſwept down in a cluſter upon it: this is then to be thrown carefully to the ground, and another perſon is to be ready there, to whelm the hive over the greater part of the cluſter, and the reſt will uſually ſoon creep into it, and join them. If they are ſlow in doing this, they are to be driven in by burning linen rags about the places where they fly, the diſagreeable ſmell of which will ſend them towards the hive, where finding their companions not incommoded with it, they will naturally remain.

Another method of getting a ſwarm from a branch of a high tree, is to cut off the branch with a ſaw, as gently and with as little diſturbance to the bees as poſſible. In this caſe, when the branch is off, a man may carefully deſcend with it, and the bees will not quit their hold, but will be all carried where he pleaſes with it, and may by that means be very eaſily put into the hive.

Sometimes the bees which go out in a ſwarm, fix upon a hole in a wall, or a hollow trunk of a tree, for the aſſembling themſelves in.

This is a much better choice for them than the branch of a tree, but it is much worſe for the perſon who is to hive them, for they are very difficult to be got out of theſe places. The common way of the country people is to attack theſe ſwarms in the middle of a cold night, and they then enlarge the opening from without, and, placing the hive under it, ſcoop the bees out of their neſt with a ladle, and put them into the hive.

It uſually happens that there are more than one young female in the hive, at the time when the ſwarm goes out; and it is not uncommon for two of them to go out with the ſwarm. In this caſe the ſwarm conſtantly divides into two bodies, and, on whatever branch it fixes, there are ſeen two cluſters of bees, one placed near the other. Each of theſe is a complete ſwarm and has its female, but one of them is often much more numerous than the other; and, as the bees always love to live in large communities, the bees of the ſmaller cluſter become tired of their condition, and by degrees join the larger; ſo that this is ſeen to increaſe, and the other to decreaſe in ſize every moment, till at length there remains no more of the ſmaller ſwarm than a few faithful creatures, forming a ſort of guard about the female. In this caſe it is in vain for them to think of forming a community by themſelves; and they finally, with the female, join the other ſwarm; ſo that the new ſwarm has two females. *Reaumur's Hiſt. Inſ.*

HOACHE, in natural hiſtory, a name given by the Chineſe to a peculiar kind of earth, which they have found out lately, very uſeful in the manufacture of their China ware.

It is called Hoache from the word hoa, which ſignifies ſoft and glutinous, and is deſcribed to us as being an earth approaching to chalk, but harder, and feeling like ſoap to the touch. There is great reaſon to believe that this is either the ſame earth with our ſoap-rock of Cornwall, or ſomething very like it. Ours has very much the appearance of French chalk, with which they take out ſpots of cloaths, and which marks white in the ſame manner as chalk.

The word chalk is ſo little determinate in its general ſenſe, and the white ſubſtance we commonly call by that name is ſo little likely ever to be uſed in earthen-ware of any kind, that there is great reaſon to believe French chalk is the ſubſtance to which the Hoache is compared; and, if ſo, all the characters agree ſo well, that it is probably the very ſame thing with our ſteatites. We have often attempted to make a porcelane ware with this, and that with good proſpect of ſucceſs. But we are to learn, in regard to the Chineſe way of uſing it, that it is only one of the ingredients of their fine ware, not the whole matter of which it is made.

The Chineſe phyſicians had long uſed this earth as a medicine, giving it in diſorders of the lungs; but it is only of late times that the workmen in porcelane attempted to uſe it inſtead of kaolin. It ſucceeds, however, ſo well, that the porcelane made of it ſells dearer in the Indies than any other kind. The grain of this porcelane is remarkably fine and even, ſo that it is fitter for receiving the fineſt pencilling than any other, and it may be made ſurprizingly light. But there is this diſadvantage, that the whole is more brittle than the ordinary China, and the juſt degree of baking it is very difficult to hit; without which it is never ſtrong. The Chineſe ſometimes make the body of their veſſels of the common China ware, and dip them when dry into a thick liquor like cream in which the Hoache is diſſolved. This gives a new and beautiful coat to the veſſel. They give the common varniſhing over this, and it ſucceeds to a very great perfection. *Obſer. ſur les Coutumes de l'Aſie.*

Suppoſing we could not, for want of the petunſe, or ſomething analogous to it, ever arrive at making the true porcelane in England, there is yet room to hope for great advantage in making the varniſh or coating of other veſſels with this ſteatites or ſoap-rock. The manner in which the Chineſe uſe it is this: they firſt waſh it clean with river water to ſeparate a yellow ſort of earth, which lies near it in the mine where they dig it, and is often brought up with it. When it is thus cleanſed, they beat it to powder, and mix it in large quantities of water; they ſtir the mixture well, and then, letting the coarſer part ſettle, they pour off the thick liquor, and let it ſtand till a ſubſtance like cream ſubſides, which they keep moiſt and uſe, as before-mentioned, to dip the veſſels in; or elſe they dry it, and uſe it with the petunſe inſtead of the kaolin in the common manufactures.

It is ſaid that a very good porcelane ware may be made with this earth alone, without any other mixture; but the workmen themſelves are unwilling to do this, and always chuſe, if they do not work in the common way, to add at leaſt two parts of the petunſe to eight of the Hoache, and with this mixture they make a very good ware, working it in the ſame manner as they do the petunſe and kaolin. *Id. Ib.*

The Hoache, though ever ſo proper to ſupply the place of the kaolin, could not be uſed in the common works, becauſe it coſts three times the price, it being much ſcarcer, and brought much farther.

There is another very elegant ſort of China-ware, which depends entirely on the Hoache for its beauty. It is all white; but, though the ſurface is perfectly ſmooth and poliſhed, there are ſeen flowers and other ornaments on it in a very delicate manner. The method of making this is as follows: they make the veſſels of the common matter of the porcelane ware; they then diſſolve, in a ſufficient quantity of clear water, as much of the refined Hoache as will give it the conſiſtence of a ſyrup. With this they pencil out the figures they intend on the ſurface of the veſſel, while yet not quite dry. This penetrates the ſurface, and the lines and ſtrokes all appear very determinate. They let this dry thoroughly, and then cover the whole veſſel with the common varniſh of the porcelane. When it has been baked, the whole appears white, but the figures are very diſtinctly ſeen, and appear extremely beautiful. They are of a brighter white than any of the reſt, and ſeem formed of a thick white vapour, running with a regularity juſt under the ſurface of the veſſel. They have a way of doing this with another ſort of earth, which they call chekao; but this requires more trouble, as it muſt be roaſted and powdered before it is fit for uſe. The white of this alſo is not ſo fine when done as the other. *Obſ. ſur les Cout. de l'Aſie.*

HO'BBY, in zoology, the Engliſh name of a hawk, of the long-winged kind, called, by many authors, by the name ſubbuteo, the name by which others expreſs the ringtail and hen-harrier. The Hobby has a prominent and crooked beak, covered at the baſe with a yellow ſkin; the beak is white near this membrane; elſewhere it is blue. Its tongue is a little bifid, and the iris of its eyes hazel-coloured. It has a reddiſh brown line, mixed with white over the eyes, and its head feathers are black and brown; its neck feathers are of a whitiſh brown; its back and wings are of a blackiſh grey; its chin, and the upper part of its throat, are of a yellowiſh white, with a black ſpot on each ſide; its belly is brown; its tail is long, and pointed and variegated with brown and white. The legs and feet are yellow. It builds with us in high trees, but does not ſtay the winter with us; it feeds principally upon larks.

HOE'ING, according to Tull, is the breaking or dividing the ſoil by tillage, while the corn, or other plants, are growing thereon. It differs from common tillage, which is always performed before the corn or plants are ſown or planted, or in the time of performing it; and it is much more beneficial to the crops than any other tillage. This ſort of tillage is performed various ways, and by means of different inſtruments. Land which, before the tillage, would have yielded little, tho' the more it is tilled before ſowing, the more plenty of corn it yields, yet, if tilled only before the ſowing, will always have ſome weeds, and they will partake of the advantage of the tillage as well as the corn. This is one reaſon for an after tillage, ſuch as that by Hoeing. But there is another conſideration that yet more requires it; this is, that as ſoon as the ploughman has done his buſineſs, by ploughing and Hoeing the land, after ſowing, the ſoil, of its own accord, begins to undo it all again by tending towards its original texture and ſpecific gravity again; the altering of which was the only buſineſs of all the former tillage. The breaking the particles of the earth, and making in it new pores, and new particles, or new ſuperficies, is the great buſineſs of the plough and harrow; but, as ſoon as their uſe is over, the earth begins to coaleſce again into its own form, the particles unite together, and the artificial pores in a great meaſure cloſe up. The ſeed is nouriſhed in a worſe ground than it was firſt put into, and the more the plant grows up, and requires a larger ſupply of food, the worſe the paſture becomes. While nouriſhment is thus denied the growing plants, they are at the ſame time choaked with weeds, which, being of a hardier nature than they, will grow with leſs ſupplies, and therefore thrive more vigorouſly, and rob them of a great part of the little food the land before allowed them.

Farmers in all ages have been acquainted, in ſome degree, with the uſe of tillage and dung to crops of uſeful plants; but they have ſo ill managed the time of giving theſe aſſiſtances to nature, that there is no doubt but one third part of the nouriſhment raiſed by dung and tillage, if it were given to plants and corn at many proper ſeaſons, and proportioned to the different times of their exigencies, would be of more benefit to the crop, than the whole is, when applied all together at the time of ſowing.

Nature, by what ſhe does in the animal œconomy, ſeems to point out to us ſomething like the remedying this by Hoeing; for when the teeth, as the plough, have tilled that ſoil or maſs which is earth-altered; and when the ſaliva and the juices of the ſtomach have ſerved to divide and attenuate it, as the ſalts of dung and other manure do land; after all this, the bile and pancreatic juices are ordained to farther attenuate it, at the very time when it is ready to be exhauſted by the numerous mouths of the lacteals, ſituate in the inteſtines. This laſt operation of theſe juices ſeems analogous to the meliorating the ſoil by Hoeing, after the plants are grown, and are becoming fit for uſe.

Tranſplanting is nearly allied in its nature to Hoeing, but it is much inferior. The nature of this will not admit of its being a general thing; and, even if it would, Hoeing is better. For, by tranſplanting, the plants can only be kept up to a certain period, after which they will not bear it; but Hoeing may be uſed to them with advantage, to their utmoſt ſtanding, and make them vigorous all the while.

The roots of a plant are all neceſſarily broken off in tranſplanting, and it requires ſome time for it to ſtrike a whole ſet of new ones; and, if the earth about it is not kept thoroughly moiſtened all this time, the new formed roots will not be able to ſhoot, and the plant will ſtarve in the midſt of plenty. But, on the contrary, in Hoeing, the ſame advantage of a new paſture for the plant is obtained, by the breaking the particles of the earth, and at the ſame time no more of the roots are broken off than can eaſily be ſupplied, and, the reſt remaining in their places, the plant continues growing without that ſtop or decay, which muſt happen on tranſplanting, and which it recovers only by degrees. It is obſerved, that ſome plants are the worſe for tranſplanting: lucerne and ſaintfoin are never ſo good after tranſplanting, as when they are left in their native places, at the ſame diſtances; and finochia, removed, is never ſo good and tender as when it is not. This laſt plant receives ſuch a check from tranſplanting in its infancy, that it has afterwards a diſeaſe like the rickets, which cauſes knots and ſwellings in it, that ſpoil it as a delicacy. All the tap-rooted plants ſuffer by tranſplanting, for it is neceſſary in this to cut off the long-main root, which afterwards, however good the ſoil may be, never arrives at the length it otherwiſe would have had, and which was neceſſary for the ſucceſs of the plant.

One great benefit of Hoeing is, that it keeps plants moiſt in dry weather, the advantage of which to their growth is eaſily ſeen. This good office it performs on a double account. Firſt, as they are better nouriſhed by Hoeing, they require leſs moiſture, and conſequently carry off leſs; for thoſe plants which receive the greateſt increaſe, having moſt terreſtrial nouriſhment, carry off the leaſt water, in proportion to their augment, as is proved by Woodward's experiments. Thus barley or oats, being ſown on a piece of ground well divided by tillage and dung, will come up and grow well without rains, when the ſame grains ſown on another part of the ſame land, not thus dunged or tilled, will ſcarce come up at all without rains, or, if they do, will wait wholly for the rains for their growth and increaſe.

The hoe alſo, particularly the horſe-hoe, for the other does not go deep enough, procures moiſture for the roots from the dews which fall moſt in dry weather; and theſe dews ſeem to be the moſt enriching of all moiſture, as it contains in it a fine black earth, which will ſubſide from it in ſtanding, and which ſeems fine enough to be the proper pabulum, or food for plants.

A demonſtration that the tilled earth receives an advantage from theſe dews, which the untilled does not, is this: dig a hole in any piece of land, of ſuch a depth as the plough uſually goes to; fill this with powdered earth, and, after a day or two, examine the place, and the bottom part of this earth, and bottom of the hole, will be found moiſt, while all the reſt of the ground, at the ſame depth, is dry. Or, if a field be tilled in lands, and one land be made fine by frequent deep ploughings, while another is left rough by inſufficient tillage, and the whole field be then ploughed a-croſs in dry weather, which has continued long, every fine land will be turned up moiſt, and every rough land as dry as powder from top to bottom.

Although hard ground, when thoroughly ſoaked with rain, will continue wet longer than fine tilled land adjoining to it, yet, this water ſerves rather to chill than to nouriſh the plants ſtanding in it, and to keep out the other benefits of the atmoſphere; it leaves the ground much harder alſo than before, when it is finally exhaled out of it; and when, at length, the earth is then hardened, it can receive no benefit from any thing leſs than a deluge of rain, which ſeldom falls till the ſeaſon of vegetation is over.

As fine hoed ground is not ſo long ſoaked with rain, ſo the dews never ſuffer it to become perfectly dry. This appears from the flouriſhing ſtate of plants in hoed ground, while others near them, but in ground not hoed, are ſtarved for want of nouriſhment. The common opinion is againſt this, but obſervation proves it to be true againſt the common opinion. The vulgar are guided by this, however, and will not hoe their ground in dry weather for fear of letting in the drought, as they call it; whereas Hoeing this is the only method of keeping away the drought, and without either this, or watering, they muſt periſh in theſe ſeaſons. *Tull's Horſe-Hoeing Huſbandry.*

HO'LLOWNESS *of trees.* This is one of the moſt miſchievous diſtemperatures to which trees are ſubject. It is generally occaſioned by the lopping of them in an improper manner, and leaving the wet to fall in upon them, eſpecially on their heads. When this miſchief is found out in its beginning, the only way is to cut the trunk off to the quick, ſacrificing the whole hollow part; it is, in this caſe, to be cut off ſloping, that the wet may run off from it. All ſoft woods are liable to this miſchief, after the lopping, particularly the elm; and, when it takes hold of any tree, it grows upon it daily, till the whole ſubſtance of the tree is at length eaten away, and only a coat of bark is left. The beſt way of preventing it, in the elm, is never to cut off the head or top of the tree at all, but only to lop the ſide branches; theſe will yield a very large quantity, and the body of the tree will thrive the better for their being often cut off, and will be good timber at laſt. *Mortimer's Huſbandry.*

HO'LLY, in botany. See the article AQUIFOLIUM.

HOLLY-*hedges*, are a very beautiful ever-green and ſtrong fence, but liable to periſh in hard winters. It has been ſuppoſed, that the ſeverity of the cold, in theſe ſeaſons, was the occaſion of this; but a cloſer obſervation has ſhewn, that the miſchief is owing to the field mice, which in very ſevere ſeaſons, when they can get at nothing elſe, diſbark the roots of theſe ſhrubs. The method of preſerving theſe hedges, in ſuch ſeaſons, is found to be by clearing away the weeds which are a harbour to theſe little animals, and placing traps and boxes in proper places, with a paſte made of butter and rats-bane, daubed over their inſides, and holes made in their ſides no bigger than what the mice or rats, if there be any there, can creep into; and thus the vermin are deſtroyed, and the miſchiefs which might attend rats-bane being expoſed, are prevented. *Moreton's Northampt.*

HO′LLYHOCK, or *holy-oak*, in botany.—We have many ſpecies of this plant cultivated in our gardens, for the beauty of their flowers. They are all propagated from ſeeds, which are to be ſown in March, upon a bed of light rich earth. When the plants are come up pretty ſtrong, they ſhould be tranſplanted out into nurſery beds at about eight inches diſtance from one another. They muſt be watered till they have taken root, and will then require no farther care for the ſummer, but being kept clear of weeds. At the latter end of the September following, they ſhould be tranſplanted into the places where they are to remain, and ſet in rows of two feet diſtance, and at a foot from each other in the rows where they may flower: and, when it is obſerved which roots produce the fineſt flowers, thoſe ſhould, the Michaelmas after, be tranſplanted into garden beds, where they will live four or five years; after which, they grow weak, and ſhould be replaced by new ones. When the ſtalks of the plants begin to decay, they ſhould be cut down cloſe to the ground, otherwiſe they are apt to rot and deſtroy the roots.

HOLT-*waters*. Theſe have been found by experience to be of admirable efficacy in all ſcorbutic and ſcrophulous caſes: an account of ſome very remarkable cures performed by them, in theſe caſes, was printed ſeveral years ago, and, though known to be fact in the place, was diſbelieved by almoſt every body beſides.

Mr. Lewis, the late miniſter of the place, confirms their efficacy from his own obſervation, and obſerves, that they are of an attenuating, aſtringent, and drying nature. The firſt of theſe properties they poſſeſs in common with all waters, which dilute, attenuate, and fit the juices for paſſing the proper veſſels; their aſtringency they owe to the alum and iron which they contain, and their drying, abſorbing, and healing qualities are probably owing to a quantity of ſulphur; and a fine light ochre, which they are impregnated with. *Philoſ. Tranſ.* N°. 408.

HO′NEY-*ſuckle*, *caprifolium*, in botany, the name of a genus of plants, the characters of which are theſe: the flowers are generally placed many on the ſame ſtalk, and diſpoſed in a circular form. The ſingle flowers are compoſed of one leaf each, of a tubulated form, and divided at the end into two lips, the upper of which is divided into many ſegments, the lower whole, and of the ſhape of a tongue. The cup finally becomes a ſoft fruit or berry, containing a flatted and round-ſhaped ſeed.

The Virginian ſcarlet Honey-ſuckle, called the trumpet Honey-ſuckle, is a very beautiful flowering kind, and in great eſteem. It is propagated by laying down the tender branches in ſpring, obſerving, in dry weather, to refreſh them with water; and, the ſpring following, they will be ready to tranſplant, when they are to be cut off from the old plants, and carefully removed without diſturbing their roots. The beſt time to remove them is in March, juſt before they ſhoot out; but, if the ſeaſon ſhould prove dry, they muſt be watered, and have a little mulch laid at their roots, to prevent the earth about them from drying too faſt. They ſhould be planted in a ſtrong ſoil, and expoſed to the ſouth-eaſt ſun; but they muſt have a wall or pale behind them to ſupport the branches, otherwiſe they will trail upon the ground. It is a native of Virginia, but will thrive very well with us, bearing all the cold of our winters, but does not ſucceed well near London, where the ſmoke commonly deſtroys it. *Miller's Gard. Dict.*

The propagation of all the ſeveral ſorts of Honey-ſuckles is by laying down their branches in the ſpring, which, if they are ſupplied with water, will by the Michaelmas following have taken root ſo well, as to be fit to remove. They ſhould at this time be tranſplanted into nurſery beds for a year or two, the better to train them up, either for headed plants, or for creepers, to plant againſt trees, walls, &c.

They may alſo be propagated by planting cuttings in September, or in ſpring; but they ſometimes fail this way, and always require much care and trouble. Their ſweetneſs, and long continuance in flower, make them of great value in ſmall quarters. Among flowering ſhrubs they are alſo very beautiful, when planted againſt the ſtems of old trees, where, if they are not too much ſhaded, they will flouriſh exceedingly.

The proper ſeaſon for cutting them, to keep them in a regular form, is about Michaelmas, ſoon after they have done flowering. This is to be done with a knife, obſerving always to cut behind a leaf bud; for, how much ſoever the ſhoot is left longer, it will always die down to that part. They are moſt of them very hardy. *Miller's Gard. Dict.*

HOOF (*Dict.*)—Brittle Hoof, a name of an infirmity to which horſes are ſubject. It comes ſometimes naturally, and ſometimes artificially. When it comes naturally, it is generally hereditary, the ſire or dam having had the ſame complaint. When it comes on accidentally, it is ſometimes owing to a diſtemper falling down into the feet; ſometimes to the creature's being much foundered.

The Hoof, in this diſtemper, is ſo friable and rotten, as it were, that it cracks and flakes off on every ſlight occaſion. The cure is to be attempted in this manner: take wax, turpentine, ſuet, and hog's lard, of each four ounces; ſallad oil a quarter of a pint by meaſure, and of dog's greaſe half a pound; let the whole be melted together, and ſtrained through a piece of canvas into a gally-pot. The Hoof is to be thoroughly anointed with this every day, morning and evening, eſpecially at the root; and, if there are any large cracks, they muſt be filled up at every dreſſing with a mixture of equal parts of cow dung and hog's lard.

HORI′ZON (*Dict.*)— One great inconvenience that mariners have to ſtruggle with at ſea, is the frequent want of an Horizon: for, though the atmoſphere may, at the height of ten or twelve degrees and upwards, be clear enough to give a view of the ſun and other objects, yet, all below that height is often ſo hazy, as to hinder a diſtinct ſight of the Horizon; and, conſequently, an obſervation made at ſuch a time cannot have the correctneſs wiſhed for: but this defect is quite removed by a kind of horizontal ſpeculum invented by Mr. Serſon, who was loſt with the Victory man of war, wherein he was ſent to make trial of his machine.

The principle whereon this ingenious author founded this inſtrument, was derived from the conſideration of a top, while ſpinning; for he obſerved that the top had a very conſiderable degree of ſteadineſs in, and force to acquire an upright motion, whether the body which ſupported it was in motion or at reſt, in an horizontal or an inclined ſituation: he therefore judged, that, if a circular machine, whoſe upper ſurface was a flat poliſhed ſpeculum, was to have a ſwift circular motion communicated to it, that ſpeculum, by acquiring an horizontal ſituation, would ſhew all objects which it reflected, as much below the Horizon, as they really are above it, in the ſame manner as in a common looking-glaſs; conſequently, if the image of the ſun, as ſeen reflected from the ſpeculum, was made to coincide with the ſun's image, ſeen in a Hadley's quadrant, the angle given by the quadrant would in all caſes be the double of the real altitude. Mr. Serſon alſo found, that, to confine the ſpeculum to one place, while it was ſpinning, it was neceſſary to let the point run in a hollow cup; for the horizontality of the ſpeculum would not be altered, whatever poſition might be given to the cup, provided it touched the top only at the point it ſpun on.

This curious and uſeful inſtrument, as it is now improved by Mr. John Smeaton, F. R. S. conſiſts in a well poliſhed metal ſpeculum of about three inches and a half in diameter, incloſed within a circular rim of braſs; ſo fitted, that the center of gravity of the whole ſhall fall near the point whereon it ſpins; that is, the end of a ſteel axis running through the center of the ſpeculum, above which it finiſhes in a ſquare, for the convenience of fitting a roller to it, when it is to be ſet a going by means of a piece of tape wound round the roller. The cup in which it ſpins, is made of poliſhed agate, flint, or other hard ſubſtance, and is placed on a ſmall pillar, which is fixed to the bottom of a box, whoſe pyramidal cover is compoſed of glaſs panes; whereby an obſervation can be made on the ſpeculum as well covered as uncovered, and thereby it will be prevented from tarniſhing by the moiſt air or ſpray of the ſea.

When the top is to be uſed in a meridian obſervation, it is convenient to know about what time it is proper to ſet it up; this may be had near enough by taking the ſun's bearing from the meridian with an azimuth compaſs, allowing for the variation; and, if it has about five degrees to run before it culminates, it is time to ſpin the top, which will generally run twelve or fifteen minutes fit for obſervation. But, if it is likely to go down, or ſpin too weak, before the obſervation can be finiſhed, the tape ſhould in the mean time be got ready wound about the roller, that the top may be ſet up again without loſs of time; and, if the box be held ſteady upon ſomething nearly level, when the tape is drawn away, the ſpeculum will be fit for obſervation commonly in leſs than two minutes.

As ſoon as the top is ſet up, put on the glaſs roof, if neceſſary; let an aſſiſtant hold the box as ſteady and level as he can, and in ſuch a poſition as the obſerver may look directly through the glaſs roof: then let the obſerver place himſelf as near the box as he can conveniently, and look down on the ſun's image in the horizontal ſpeculum, and bring the ſun's image ſeen in the quadrant to agree with it, ſo that their centers coincide; and the quadrant will give the double altitude, without any allowance for the height of the ſhip, or the ſun's ſemidiameter. And although there may appear in the horizontal image a kind of trembling, yet, when the centers of the ſolar images are brought to coincide, the obſervation may be taken as truly as if there was no ſuch trembling.

When the ſun is about forty-five degrees high, the obſerver muſt look through that ſight of the quadrant which is uſed for a back obſervation: but he muſt look down on the horizontal image, or that in the top, as it was the back Horizon; and then, making the ſolar images to agree, the quadrant, according as it is numbered, will give the double altitude, or double zenith diſtance.

As this latter obſervation is ſometimes found at firſt more difficult to make than the former, the obſerver would do well to exerciſe himſelf therein in good weather, when he has an opportunity of comparing his obſervations with thoſe taken from the Horizon properly corrected.

Theſe ſpeculum tops are as uſeful by night as by day; for, as the images of the ſmalleſt ſtars may be ſeen in the ſpeculum, conſequently, any object that can be ſeen reflected from the glaſſes of the quadrant, may be obſerved by the top; and theſe are all the ſtars of the firſt magnitude, the planets Venus, Mars, Jupiter, Saturn, and the Moon: ſo that, by having the declinations of theſe bodies in an ephemeris, they may be uſed in obſervations as well as the ſun.

As the great diſtreſſes to which ſhips are ſometimes drove in ſeveral parts of the world, for want of an Horizon to obſerve by, are by this moſt ingenious contrivance quite removed; it is to be hoped, that, when the uſe of this inſtrument is more generally known, few ſhips will be without one, although the expence ſhould amount to five guineas.

HORIZO'NTAL *Shelters*, have, by ſome perſons, been greatly recommended to preſerve fruit trees from blights; but, with how little reaſon, or upon what ſlight experiments, every one, who has ever made uſe of them, will eaſily judge; eſpecially thoſe which are contrived by placing tiles in the wall at certain diſtances; nothing being more obvious, than that vegetables, when prevented from receiving the advantage of dews, rains, &c. thoſe kindly benefits of heaven, grow weak, languid, and at laſt intirely decay: and ſince, from vaſt numbers of experiments, which have been lately made, we find that trees imbibe great quantities of nouriſhment through the pores of their leaves and branches, whereby they are rendered vigorous and healthy, even in ſuch ſeaſons, and upon ſuch ſoils, where one would think it impoſſible they ſhould receive much nouriſhment from the earth; to deprive them of this advantage is no leſs than deſtroying them; though, perhaps, if the trees are vigorous, it may not be effected ſuddenly; but there will be very viſible ſigns of decay on them daily, and a few years will put a period to their lives, as I have more than once obſerved, where ſuch walls were built.

The only ſort of theſe ſhelters which I have obſerved for fruit trees, was made with two leaves of ſlit deal, joined over each other, and painted; this being fixed on the top of the wall with pullies, to draw up and down at pleaſure, formed a ſort of pent-houſe; which being let down in great rains, or cold nights, during the time that the trees were in flower, or the fruit was ſetting, proved ſerviceable; but theſe ſhelters were removed away ſoon after the fruit was ſet; ſo that the trees might enjoy all the advantages of rain, dew, &c. in the ſummer; which is abſolutely neceſſary, if we would have healthy trees, or good fruit. *Miller's Gard. Dict.*

HORMI'NUM, *clary*, in botany, a genus of plants whoſe characters are:

It hath a labiated flower, conſiſting of one leaf, whoſe upper lip is ſhort and creſted; but the under one is divided into three parts: the middle diviſion is hollowed like a ſpoon; out of the flower-cup ariſes the pointal, fixed like a nail to the hinder-part of the flower, and attended with four embryo's, which afterwards turn to ſo many roundiſh ſeeds, incloſed in the cup of the flower.

HORN.— The Horns of many animals, particularly of the deer kind, are caſt every year, and new ones grow up in their places. With us the deer drop them in March, and the new Horns are full grown by the July following. Voſſius very juſtly ranks this among the moſt wonderful phænomena of nature; he ſays, that we have nothing analogous to the growth of ſuch hard and ſolid bodies of ſo great a bulk, in ſo ſhort a time.

Many idle opinions have been formed of the cauſe of the falling of theſe parts of the animal; and worms in the head, and many other things, have been ſuppoſed inſtrumental to it, which have no ſhare in it. The true reaſon ſeems, that theſe are a ſort of vegetables growing on the animal, as our nails and hair have by many been ſaid alſo to be; and there appears a great analogy between them and the ſprouting of the leaves and branches in trees and plants. Trees commonly caſt their ripe fruit in ſummer, and drop their leaves in autumn, becauſe the ſap, or nouriſhing juice, flows into them no longer; and in the ſame manner, at certain ſtated periods, the blood and juices ceaſe to flow into theſe parts of the animal, and they drop off. The cavernous part, at the root of the Horns, probably grows hard, and the pores through which the veſſels paſs, grow up at this time; and then, as no juices can be carried through them to the Horn, it is not at all wonderful that it decays, and falls off, for want of nouriſhment.

It is probable that this ſtoppage of the pores, and denying of the paſſage of any juices, happen in the Horns, as ſoon as they are arrived at their full growth in July; but they are ſo firmly fixed to the head, that it takes a long time for them to looſen and fall, whereas in the leaves of plants the pedicles are ſo tender, that they wither and fall immediately on the juices ceaſing to flow into them. This analogy between the operations of nature, in the caſting the Horns of deer, and the falling off of the ripe fruits and leaves from vegetables, will gather great ſtrength from obſervation of the orange and other trees. If the ſtalk, from which a ripe orange has fallen, be compared with that part of the forehead of a deer from which a horn is juſt fallen, there will be ſeen ſuch a ſimilarity between the one and the other, that it will appear very obvious, that nature has operated by the ſame laws in both. *Philoſophical Tranſactions.* N°. 227.

HORN-*fiſh*, an Engliſh name for the fiſh which we alſo call the gar-fiſh It is by ſome accounted a ſpecies of the acus or tobacco-pipe fiſh; but the only reaſon for this opinion ſeems to have been, that it is as long and ſlender as that fiſh.

HORN-*owl*, in zoology, the name of a ſort of owl diſtinguiſhed by two cluſters of feathers ſtanding up over its ears, and reſembling Horns. There are two kinds of this bird, a larger and a ſmaller; the firſt diſtinguiſhed by the name of the bubo, the great Horn-owl, or eagle-owl; and the other called the otus, or noctua aurita. *Ray's Ornithol.*

HOR'NET, *crabro*, in zoology; this inſect is very bold and venomous, and wholly reſembles the waſp, only it is twice as large, and the head is of a longer and ſlenderer ſhape, and the eyes are formed ſomewhat like a half-moon. They build under ground, and in winter hide themſelves in hollow-trees. They feed on fleſh, and, when very hungry, will ſeize upon a ſmall bird. Moffet relates, that they have been ſeen ſingly to purſue and kill a ſparrow, and afterwards feed on its fleſh.

HORNET-*fly*, in natural hiſtory, a very large two-winged fly, which has the ſhape and colours of the Hornet, and is, at firſt ſight, ſcarce to be diſtinguiſhed from it. The principal colour of the body of this fly is yellow; but it has two long and large black lines placed tranſverſly on its wings, and has a black corſlet, and a yellow head. *Reaumur, Hiſt. Inſ.*

HORSE, in zoology, a noble animal, too well known to need a deſcription.

Backing of HORSES. The firſt backing of a Horſe is a thing of great conſequence, as his value afterwards very much depends on it. After a colt has been exerciſed ſome time morning and evening, and becomes ſomewhat obedient, he is to be taken to ſome ploughed lands, the lighter the better; he muſt be made to trot over theſe in the hand, by that means to tire him and abate his wantonneſs. When this is done, care muſt be taken that all the tackling be good and firm, and every thing in its due and proper place; then a perſon is to hold his head, and another to mount him; but this muſt not be done ſuddenly, or at a jerk, but very gradually and ſlowly, by ſeveral half riſings and heavings. If he bears this patiently, the perſon is to ſeat himſelf firmly on his back; but, if he be troubleſome, and not tamed enough, the perſon is to forbear the attempt to mount, and he is to be trotted hard in the hand over the ſame ploughed lands again, till he is willing to receive the rider quietly on his back. When this is done, the perſon who is on his back muſt cheriſh him, and the man who has his head muſt lead him a few paces forward; then he is to be cheriſhed again. The feet are to be fitted well in the ſtirrups, and the toes turned out; afterwards the rider is to ſhrink and move himſelf in the ſaddle, and the perſon who holds his head, is to withdraw his hand a little farther from the mouth. As the rider moves his toes forward, the holder muſt move him forward with the rein, till he is made to apprehend the rider's motion of body and foot, which muſt always go together, and with ſpirit, and will go forward without the other's aſſiſtance, and ſtay upon the reſtraint of the rider's hands.

When this is accompliſhed, let him be cheriſhed, and have graſs and bread to eat; and then let the rider mount and alight ſeveral times, cheriſhing him between each time; and thus he is to be managed till he will go on, or ſtand ſtill, at pleaſure. This being done, the long rein may be laid aſide, and the band about the neck, which are always uſed on this occaſion, and nothing will be neceſſary but the trenches and caveſon, with the martingal. A groom muſt lead the way before; or another Horſe going only ſtraight forwards, and making him ſtand ſtill, when deſired. In this manner, by ſometimes following, and ſometimes going before another Horſe on the trot, the creature will by degrees be brought to know that it is his buſineſs to be quiet and governable.

Breeding of HORSES. In order to have a good and beautiful race of Horſes, it is neceſſary to chuſe for a ſtallion a fine barb, free from hereditary infirmities, ſuch as weak eyes, bad feet, ſpavins, purſineſs, or the like: diſorders that ariſe from accidents are of no conſequence, nor is the Horſe to be at all the leſs valued for them as a ſtallion. Three months before this Horſe is to cover a mare, he ſhould be fed with ſound oats, peaſe, or beans, or with coarſe bread, and a little hay, but a good quantity of wheat ſtraw; he ſhould be led out twice a day to water all this time, and after every watering walked about an hour, but not over-heated. If he be not prepared and put in heart in this manner, the colts will be weakly, and the horſe himſelf will be ſpoiled, growing purſy and broken-winded.

If he is put to too many mares, he will not laſt long; his mane and tail will begin to fall off through weakneſs, and it will be difficult to get up his fleſh again by the next year. The number of mares ſhould be proportioned to his ſtrength, and twelve, fifteen, or at the moſt twenty, are as many as a Horſe will well ſerve for in a ſeaſon. Mares go with foal eleven months, and as many days over as they are years old. This being certainly known, it is eaſy to contrive ſo that all the foals may be brought forth at a time, when there is plenty of graſs. About the end of May the mares are to be put into an incloſure capable of feeding them, as long as the ſtallion is to be with them, or that they are in ſeaſon. In this incloſure all the mares are to be put together, as well thoſe which are barren as others. The ſtallion's hind-ſhoes are to be taken off, but the fore-ſhoes ſhould be left on to preſerve his feet; then lead him forth, and let him cover a mare twice in hand, to render him more tame and gentle. After this take off the bridle, and turn him looſe among the reſt, where he will become familiar with them, and not one of them will be horſed but when they are in ſeaſon. There ſhould be a little lodge built up in ſome part of the incloſure, and peaſe, beans, oats, bread, and other good food, put into the manger in it, that the Horſe may retire into it in the ſcorching heats, and eat what he likes beſt. He muſt be thus entertained during the whole time he is with the mares, which is to be about ſix or ſeven weeks.

Mares that are very fat and groſs do not hold well, but thoſe which are moderately fat conceive with the greateſt ſucceſs and eaſe. To bring a mare in ſeaſon, it is a common thing to give her a quart of hempſeed, or twice that quantity, night and morning, for eight days before ſhe is brought to the Horſe. If ſhe refuſe it alone, it may be mixed with beans or oats, and will go down; and, if the ſtallion eat of it alſo, it will make him the better.

The ſtallion ſhould not cover before he is ſix years old, nor after he is fifteen. A mare ſhould never be covered before ſhe is three years old; they ſhould be always ſound and healthful, and of a good breed; ſuch as theſe will bring forth better and finer foals than any others. The colts produced from theſe are not to be uſed for ſtallions, for they will degenerate, and the race will ſoon become exactly our own country breed. If a barb is not to be had, a Spaniſh Horſe is to be choſen.

For the method of fattening Horſes; ſee FATTENING.

Horse-*mackarel*, in ichthyology, a name given by us to a peculiar ſpecies of mackarel, called alſo in Cornwall a ſcad. It is the trachurus of authors in general. Bellonius calls it the lacertus, and the old Greek writers, as Ariſtotle and the reſt, the ſaurus. Artedi diſtinguiſhes it by the name of the ſcomber, or mackarel, with the lateral lines aculeated, and with thirty rays in the pinna ani.

Horse-*mill*, a machine for grinding corn, &c. turned by a Horſe.

A deſcription of a Horse-*mill.—Plate* XXIV. *fig.* 1. exhibits the draught of a Horſe-mill compoſed of the great wheel A which is ſuppoſed to contain 100 cogs which catch in the trundle-head B of 20 wallowers, the axis of which correſponds to the trundle-head D, which has ſix wallowers. According to this diſpoſition, a horſe harneſſed at the bar H making one turn-the mill-ſtone will make forty; but, to avoid needleſs pieces of machinery, the mill repreſented, *fig.* 2, is much more ſimple, and conſequently preferrable.

In order to ſhew the beſt manner of building a mill, we muſt be determined by reaſon and experience concerning the proportion of its ſeveral parts.

The firſt point is to make the machine as ſimple as poſſible; yet it ſeems neceſſary to make a wheel and trundle-head, to give the mill-ſtone ſufficient velocity to turn round its axis 40 times in a minute. The reſiſtance to be overcome muſt therefore be in proportion to the main ſtrength of a Horſe, which is equal to a lever of 180 pounds weight, when it acts in a horizontal direction, and the Horſe goes about 2000 fathoms an hour.

I allow eight feet for the radius of the wheel, and make 112 cogs in the periphery, which catching in a trundle-head of ſeven wallowers, the mill-ſtone will make ſixteen turns for one of the wheel; and as the ſame proportion ought to be between the number of cogs and that of the wallowers, as of the radius of the wheel to that of the trundle-head, the radius of the trundle-head ought to be ſix inches.

As to the arm of the lever, at which the Horſe is to be harneſſed, if it be too long, the Horſe, having a large circumference to deſcribe, will make fewer turns in a minute, and the mill-Houſe muſt be larger: wherefore I ſhould chuſe to fix it at twelve feet, which is moſt convenient, in which caſe, the Horſe at every turn will deſcribe a circumference of twelve fathoms four-ſevenths; and as he can perform 2000 of theſe in an hour, he will perform 160 turns in the ſame time, which, being multiplied by ſixteen, is equal to 2560, the number of turns which the mill-ſtone makes in an hour at the rate of 42 per minute.

Horse-*worm*, in natural hiſtory, a ſpecies of fly-worm produced of eggs depoſited, by a two-winged fly of the ſhape and ſize of the humble-bee, in the inteſtines of Horſes.

It is indeed a very ſtrange place this little creature chuſes for the depoſiting its eggs; but as noble a creature as the Horſe ſeems, and as much as we may ſuppoſe him created for our uſe, we are to conſider, that the ſame great hand made both him and this little fly, and that he ſeems indeed more created for the fly than for us; he is uſeful to us, but to the fly he is abſolutely neceſſary, ſince without him ſhe could not propagate her ſpecies.

The worms of the human bowels have not been longer known to the world than thoſe of the Horſe; and the farriers in all ages, who have undertaken the care of theſe valuable animals, have had their remedies for the long worms bred in their inteſtines, and alſo for the ſhort ones. The ſhort ones are the creatures mentioned in this article. But, though the world has ſo long been acquainted with their exiſtence, it never knew their origin till Mr. Valliſnieri diſcovered of late, that they were produced from one of the humble-bee flies. *Reamur's Hiſt. Inſ.*

HOSE *in* Hose, a term uſed in gardening, to ſignify one long huſk within another, as in the polyanthus.

Hose-*huſk*, is a long round huſk, as in pinks, gillyflowers, &c.

HO'SPITAL (*Dict.*)—Camp Hoſpitals are either general or regimental.

The general Hoſpitals are of two kinds, viz. the flying Hoſpital, attending the camp at ſome convenient diſtance, and the ſtationary Hoſpital, which is fixed to one place. In the choice of both, it will be better to have them in towns than villages, as the former will afford larger wards, beſides more of other conveniencies: theſe wards ſhould be as airy as poſſible.

As to the diſpoſition of Hoſpitals, in regard to preſerving the purity of the air, the beſt rule is to admit but few patients into each ward. It will alſo be found a good expedient, when the cielings are low, to remove ſome part of them, and to open the garret ſtory. The doors and windows may likewiſe be opened, and ventilators uſed to purify the air of every ward. In winter Hoſpitals, the wards are to be warmed with chimneys, and never by ſtoves; for, though the latter may warm a large ward better, and at a leſs expence, yet, by ſcarce making any draught of air, they will be apt to increaſe its putrid quality; whereas a fire, kept up in a chimney, acts like a conſtant ventilator.

The general Hoſpital ſhould receive only ſuch ſick as the regimental ones cannot conveniently contain, together with thoſe who cannot be moved with the army. Without this diſperſion of the ſick, the general Hoſpital, in bad ſeaſons, would have a greater number, than could be well attended; and what is equally, if not more pernicious, it would be too much crouded, by which means the contagion would ſpread, and the mortality be rendered more general.

Regimental Hoſpitals are of the greateſt importance, and therefore ſhould be ſupplied with blankets and medicines from the public ſtores, with an allowance alſo for nurſes and other neceſſaries. Nor are they to be maintained in the field only, but alſo in winter-quarters, as there will always be a great many more ſick, than can be taken care of in the general Hoſpital.

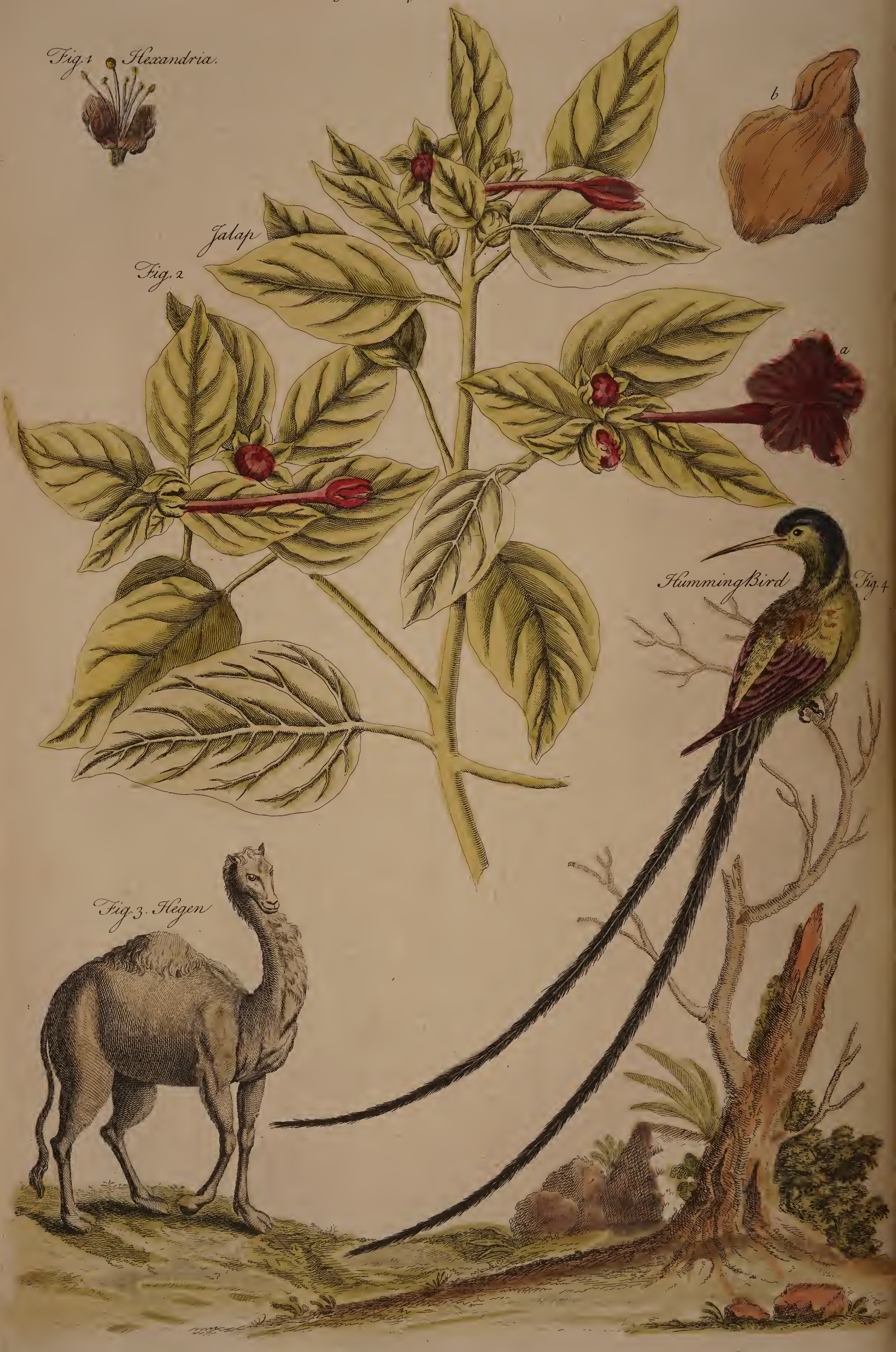
Barns, ſtables, granaries, and other out-houſes, but, above all, churches, make the beſt Hoſpitals, from the beginning of June to October: for, as the greateſt danger ariſes from foul air, which cannot be compenſated by diet or medicine, we may lay it down as a rule, that, the more airy and large the Hoſpitals are, the leſs danger there is of the ſickneſs ſpreading. *Pringle's Obſervations on the Diſeaſes of the Army.*

Hospital *fever*, a name given to the malignant catarrhal fever, as being frequent in Hoſpitals.

Dr. Pringle has given us an elaborate account of the riſe, ſymptoms, and cure of this terrible diſeaſe in his Obſervations on the Diſeaſes of the Army. It may be owing to a great many concurring cauſes, but the principal are foul and putrid air, occaſioned by filth and impurity of any kind. Hence it is no wonder that it prevails in marſhy countries after hot ſeaſons, and in populous cities; eſpecially if low, and ill-aired, unprovided with common-ſhores, or where the ſtreets are narrow and foul, the houſes dirty, water ſcarce, and where jails or Hoſpitals are crouded, and not ventilated and kept clean; when in ſickly times the burials are within the towns, and the bodies not laid deep; when ſlaughter-houſes are alſo within the walls; or when dead animals are left to rot in the channels, or on dunghils; when drains are not provided to carry off any large body of the ſtagnating or corrupted water, in the neighbourhood; when fleſh-meats make the greateſt part of the diet, without a proper mixture of bread, greens, wine, or other fermented liquors; from the uſe of old and muſty grain, or what has been damaged by a wet ſeaſon; or, laſtly, when the fibres are relaxed by immoderate warm bathing.

When the diſeaſe comes on ſlowly, the ſymptoms are ſmall interchanges of heats and cold, trembling of the hands, interrupted ſleep, &c. But, when it advances faſt, the above ſymptoms are all in a higher degree; and beſides theſe, the patient is afflicted with great laſſitude, a nauſea, pains in the back, a conſtant pain and confuſion in the head, a dejection of ſpirits, and an uncommon tremor of the hands. If the ſick lie warm, and have no preceding flux, the body is generally coſtive; but, when they lie cold, as they often do in field-Hoſpitals, the pores of the ſkin being ſhut, a diarrhœa is a common ſymptom: in the worſt caſes, a flux appears in the laſt ſtage; when the ſtools are involuntary, colliquative, ichorous, or bloody, and of a cadaverous ſmell; which are the effects of a mortification of the bowels, and the ſigns of approaching death: ſome are never delirious, but all are under a great ſtupor or confuſion. The petechiæ are the frequent, but not inſeparable attendants of the fever; they are ſometimes of a brighter or paler red, at other times of a livid colour, but are never raiſed above the ſkin. For the moſt part, theſe ſpots are ſo little conſpicuous, that, unleſs looked for at-

PLATE XXVIII. *Engraved for the Supplement.* *Facing* Humming Bird



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tentively, they may eſcape notice. They are thickeſt on the breaſt and back, leſs on the legs and arms, and the Doctor never remembers to have ſeen any upon the face. This fever, though of the continued kind, has often exacerbations at night, with remiſſions and partial ſweats next day; and, after a long continuance, is apt to change into a hectic, a remitting, or intermitting form.

Prognoſtics in it. To have a little delirium, the ſtrength a little impaired, turbid urine in the decline of the diſeaſe, and at the ſame time a gentle ſweat or moiſture diffuſed over the body, are reckoned good ſigns; and it ſeems peculiar to malignant fevers, that deafneſs is rather a good ſign.

Method of cure. This varies according to the ſtate of the diſeaſe, which may be diſtinguiſhed into three periods; the firſt continuing as long as the perſon is able to go about; the ſecond beginning with his confinement; and the third when the pulſe ſinks, and a ſtupor comes on.

In the firſt, as well as in the other periods, the cure is principally to be aimed at by removing the patient out of the foul air. When this cannot be done, the ward or room ſhould be purified by making a ſucceſſion of air by means of fires, or letting it in by doors and windows, or diffuſing the ſteams of vinegar.

The next thing to be done, is to promote a diaphoreſis, which, in this period, ſhould only be attempted by mild ſudorifics, as the ſpiritus Mindereri.

When the fever is confirmed, contrayerva-powders, with nitre, camphor, the common ptiſan acidulated, and ſuch medicines as are good in inflammatory caſes, ought to be given. Coſtiveneſs is to be prevented by emollient clyſters. But opiates are dangerous, both in this and the third ſtage, in which the pulſe ſinks, and ſtupor is greater, a delirium impends, and petechiæ often appear. When this is obſerved to be the caſe, the nitre and diaphoretic medicines are to make room for a decoction of ſnake-root, to which a ſmall quantity of ſtrong water may be added. It may alſo be given in ſubſtance from two to four ſcruples a day, with ſenſible good effects. Towards the decline of the fever, an equal quantity of Peruvian bark may be joined with the root. Wine is alſo an excellent cordial at this period, and may be given either made into whey, or added to the panado, which was the only food allowed to the ſick. It may be taken from a half pint to a quart a day, according to the ſtrength of the patient. Perhaps there is no rule of more importance, than to give ſtrict charge to the attendants of the ſick, never to let the patient, when low, remain above two or three hours without taking ſomething cordial and nouriſhing. But, however neceſſary wine, volatiles, and other cordials are in this low ſtate of the fever, it ought to be remembered, that they muſt never be given with an intention to force a ſweat, but only as antiſeptics, and to ſupport the vis vitæ. If there be danger of a phrenites coming on, it will be proper to call in the aſſiſtance of epiſpaſtics. Sinapiſms too may be uſed when the pulſe is greatly ſunk. If a diarrhœa comes on in the decline of the fever, it is to be moderated by adding a few drops of the tinctura Thebaica, to the full quantity of the alexipharmic decoction; or by giving a ſpoonful or two of an aſtringent mixture. In proportion, however, to the putrid nature of the ſtools, aſtringents are to be uſed with the more caution. When the fever is over, there are few but complain of a vertigo; and want of reſt, a continuation of the deafneſs, and other nervous ſymptoms, are frequently the conſequence of great lowneſs; in which caſe the pillulæ Matthæi are to be given at night, with analeptics and medicines of the ſtrengthening kind. *Vid. Pringle's Obſerv. on Diſ. of the Army.*

HOTTO'NIA, *water-violet*, in botany, a genus of plants, whoſe characters are:

It hath a roſe-ſhaped flower, conſiſting of one leaf, which is divided into five parts, almoſt to the bottom; in the center of the flower ariſes the pointal, which afterwards becomes a cylindrical fruit, in which are contained ſeveral ſpherical ſeeds. This plant is very common in deep ſtanding waters and ditches, in ſeveral parts of England. The leaves of this plant appear on the ſurface of the water the beginning of April; and, in May, the flowers appear on pretty long naked ſtalks, growing in a ſpike. Theſe flowers are of a fine roſe colour; which, together with their fine cut leaves, make a beautiful appearance on the water. *Miller's Dictionary.*

HOU'GHING, in gardening, is neceſſary and beneficial to plants, for two things: 1. For deſtroying of weeds. 2. Becauſe it diſpoſes the ground the better to imbibe the night dews, keeps it in a conſtant freſhneſs, and adds a vigour to the trees, whoſe fruit, by that means, becomes better-conditioned than otherwiſe it would be. See Hoeing.

HOWLE, *in ſhip-building.*— When the foot-hooks of a ſhip are ſcarfed into the ground timbers, and bolted, and then the plank laid on them up to the orlop, the carpenters ſay, they begin to make the ſhip Howle.

HU'MBLE-*Bee*, in the hiſtory of inſects. See the article Bombylius.

Humble-*Bee flies*, in natural hiſtory, the name of a claſs of flies of different ſizes, but all agreeing in the great reſemblance they bear to the Humble-bees, of the ſmaller or middle-ſized ſpecies. Theſe might, at firſt ſight, very naturally paſs for real Humble-bees; but a cloſer examination will ſhew them not to be ſuch, as they have not the trunk of the Humble-bee, and have only two wings. The ſpecies of the Humble-bee fly are many of them of abſolutely different genera one from another, ſome of them having trunks, and others having a diſtinguiſhable mouth.

If the figure of theſe flies, in their winged ſtate, attracts our curioſity and attention, their prior ſtate, that of the fly worm of moſt of them, ought ſurely much more to do ſo. The place nature has aſſigned the worms of theſe flies for their habitation, is indeed a moſt ſtrange one; there is no other place for them to live in under this form, to begin their deſtined growth, and be fitted for their transformation, but in the inteſtines of horſes, or under the thick and firm ſkin of oxen. In the latter caſe, the worm hatched from the egg of its parent fly, depoſited there, makes a tumor in the place, which alone furniſhes it with food and habitation. and in the middle of which it has a place to breathe. *Reaumur's Hiſt. Inſ.*

Luxated HU'MERUS.— The Humerus, from the length and laxity of its ligaments, the largeneſs of its motion, and the ſhallowneſs of its cavity in the ſcapula, into which it is articulated, is rendered, of all the bones, the moſt ſubject and eaſy to be luxated. The head of this bone may often be diſlocated, under the arm-pit; ſometimes forward, and ſometimes backward, and even below the ſcapula; but ſeldom perpendicularly downwards, and never directly upwards, unleſs the acromion and corocoide proceſſes of the ſcapula ſhould chance to be fractured at the ſame time; beſide, as long as the ſtrong deltoide and bicipital muſcles of the Humerus remain entire, they greatly reſiſt and keep down the Humerus from being luxated upwards. As ſoon as a luxation is diſcovered in the Humerus, the ſafeſt way to attempt the reduction of it, is to place the patient on the floor, or on a low ſtool; two ſtrong aſſiſtants are then to be placed on each ſide of him, one to keep firmly hold of his body, that it may not give way to the extenſion, while the other lays hold of the luxated arm with both his hands, a little above the cubitus, gradually and ſtrongly extending it. But, before that extenſion be made, the ſurgeon himſelf ſhould have a large and ſtrong napkin, of a ſufficient length, tied at the ends, and hung about his neck, ſo that the knot may hang behind, but the other part of the napkin over his breaſt. The patient's arm muſt then be put through this napkin, up to the ſhoulder, and the ſurgeon muſt lay hold of the head of the Humerus with both his hands. This done, the aſſiſtant, who has hold of the arm, is to extend it ſufficiently, and the ſurgeon is to elevate the head of the Humerus, by means of the napkin through which the arm is put, directing it with his hands, till it ſlips into its former cavity in the ſcapula.

This ſeems the moſt ſafe, ready, and commodious of all methods, for reducing luxations of the Humerus; but it is to be acknowledged, that the extenſion cannot, by this means, be made ſufficiently ſtrong, in ſome caſes, particularly when the patient is very robuſt, or when the caſe has been delayed a conſiderable time without aſſiſtance. When one or two aſſiſtants therefore are not ſufficient to make a proper extenſion, it is eaſy to employ more, by means of napkins tied about the limb, and a proper number of aſſiſtants to hold the patient's body ſteady againſt that force. And, when all this is not ſufficient, the ſurgeon is forced to have recourſe to machines with ropes and pullies; which, though the patient is uſually terrified a little at them, yet make an eaſier, and a more equal and regular extenſion, than can be done by the hands of ever ſo many aſſiſtants. *Heiſter's Surgery.*

HU'MMING-*bird, guainumbi*, in ornithology, a large genus of birds, many ſpecies of it having been deſcribed by authors, and many, which they have not deſcribed, having been ſent into Europe by the curious. It is the ſmalleſt of all birds, but of the moſt beautiful and lively colours of all others. It flies very ſwiftly, and in flying makes a noiſe exactly like the Humming of a bee, and ſome of the ſpecies are not much larger than the humble-bee. It can ſuſtain itſelf a long time on the wing, and in that poſture thruſts his little beak into flowers, the juices of which it ſucks and feeds on. As it has no other food but this, there is no keeping it alive, but all die that are taken; and they are preſerved and ſent over as curioſities to us. Many have reported ſtrange ſtories of their ſleeping all the winter months, and reviving at the approach of ſpring; but Marcgrave ſaw them in great plenty, in the woods, in all ſeaſons. The Indians make pictures with the feathers of theſe birds, which are ſo brightly coloured, as to vie with the fineſt paint, and ſo thin as to be as cloſe as colours on canvas. *Ray's Ornithol.*

Plate XXVIII. *fig.* 4. repreſents one of the ſpecies of this beautiful bird, which Mr. Edwards calls,

The long-tailed black-cap Humming-*bird.*—This bird is engraved of its natural bigneſs; it hath a very long tail, of a looſe, ſoft texture, eaſily ruffled, and flowing with the leaſt breath of air; what is remarkable in the tail is, that theſe two fine feathers are the outermoſt but one on each ſide, having a leſſer ſtiff feather under them, as well as above, the better to ſupport them, which is ſingular. So far as my obſervation reaches, all birds, whoſe tail-feathers differ in length, have either the two middlemoſt or the two outermoſt the longeſt, as in the ſwallow and magpye; the bill is thicker at the baſis than in moſt of this kind, pretty long, ending in a point, a little bowed downward, of a yellow colour, with a black point; the crown of the head, and beginning of the neck behind, is of a black colour, with ſomething of a bluiſh gloſs; the throat, breaſt, and belly, are covered with green feathers, inclining to blue, of a firm ſubſtance, lying cloſe and regular, like the ſcales of fiſhes, and of ſo fine a ſurface, that they reflect the light, as doth burniſhed gold; the feathers on the back are of a looſer make, of a yellower green, not having the bright luſtre of the breaſt; the wings are of a browniſh purple, having, in ſome lights, a brighter bluiſh-purple caſt; the ridge of the wing from the ſhoulder, a good way down, is white; the tail is black or duſky, the feathers increaſing in length from the middlemoſt to the outermoſt, ſave one, which is about five times longer than any of the reſt; the legs, feet, and claws, are black. *Edward's Natural Hiſt. of Birds.*

HU'NDRED. *Docimaſtic Hundred, or centner*, in metallurgy and aſſaying, is a weight diviſible, firſt into an Hundred, and thence into a great number of other ſmaller parts; but, though the word is the ſame, both with the aſſayers and metallurgiſts, yet it is to be underſtood as expreſſing a very different quantity in their different acceptation of it. The weights of the metallurgiſts are eaſily underſtood, as being of the common proportion; but thoſe of the aſſayers are a thouſand times ſmaller than theſe, as the portions of metals or ores examined by the aſſayers are uſually very ſmall.

The metallurgiſts, who extract metals out of their ores, uſe a weight divided into an Hundred equal parts, each part a pound; the whole they call a centner or Hundred weight; the pound is divided into thirty-two parts, or half ounces: and the half ounces into two quarters of ounces, and theſe, each, into two drachms.

Theſe diviſions and denominations of the metallurgiſts are eaſily underſtood; but the ſame words, though they are equally uſed by aſſayers, with them, expreſs very different quantities; for, as the centner of the metallurgiſts contains an Hundred pounds, the centner of the aſſayers is really no more than one drachm, to which the other parts are proportioned.

As the aſſayers weights are divided into ſuch an extreme degree of minuteneſs, and are ſo very different from all the common weights, the aſſayers uſually make them themſelves in the following manner, out of ſmall ſilver, or fine ſolder plates, of ſuch a ſize, that the mark of their weight, according to the diviſion of the drachm, which is the docimaſtic, or aſſaying centner, may be put upon them. They firſt take for a baſis one weight, being about two thirds of a common drachm: this they mark 64 lb. Then, having at hand ſome granulated lead, waſhed clean, well dried, and ſifted very fine, they put as much of it in one of the ſmall diſhes of a fine balance, as will equipoiſe the 64 lb. as it is called, juſt mentioned: then, dividing the granulated lead into very nice halves, in the two ſcales, after taking out the firſt ſilver weight, they obtain a perfect equilibrium between the two ſcales; they then pour the granulated lead out of one diſh of the ſcales, and inſtead of it put in another ſilver weight, which they make exactly equiponderant with the lead in the other ſcale, and mark it 32 lb. If this ſecond weight, when firſt put into the ſcale, exceed by much the weight of the lead, they take a little from it by a very fine file; but, when it comes very near, they uſe only a whetſtone to wear off an extremely ſmall portion at a time. When it is brought to be perfectly even and equal to the lead, they change the ſcales to ſee that no error has been committed, and then go on in the ſame manner till they have made all the diviſions, and all the ſmall weights. Then to have an entire centner, or Hundred weight, they add to the 64 lb. as they call it a 32 lb. and a 4 lb. and, weighing againſt them one ſmall weight, they make it equal to them, and mark it 100 lb. This is the docimaſtical or aſſaying centner, and is really one drachm. *Cramer, Art of Aſſay.*

HU'RA, *the ſand box-tree*, in botany, a genus of plants, whoſe characters are:

It hath male and female flowers on the ſame plant: the male flowers conſiſt of one leaf, which is funnel-ſhaped, having a long incurved tube; but is ſpread open at the brim, where it is ſlightly cut into twelve parts: in the bottom of the tube are placed ſeveral ſhort ſtamina, which are collected together. The female flowers have the ſame figure with the male, but have no ſtamina; the center of the flower being occupied by the ſhort round compreſſed pointal, which afterwards becomes a round fruit compreſſed at both ends, having twelve deep furrows, and as many different cells, each containing one round compreſſed ſeed: the fruit, when ripe, burſts open with great elaſticity, and caſts the ſeeds abroad.

It is propagated by ſeeds, which ſhould be ſown early in the ſpring, in pots filled with light rich earth, and plunged into an hot bed of tanner's bark. If the ſeeds are freſh, the plants will appear in about five weeks after the plants are ſown; when they ſhould be carefully cleared from weeds, and frequently refreſhed with water. As the plants will advance very faſt, when due care is taken of them, they ſhould have a large ſhare of freſh air admitted to them in warm weather, otherwiſe they will draw up too weak. When the plants are about four inches high, they ſhould be tranſplanted each into a ſeparate ſmall pot filled with light rich earth, and plunged again into the hot-bed of tanner's bark; being careful to ſhade them from the heat of the ſun, until they have taken new root; after which time they muſt have free air admitted to them, by raiſing of the glaſſes in proportion to the warmth of the ſeaſon; and they ſhould be frequently watered. When the plants have filled theſe ſmall pots with their roots, they muſt be ſhaken out of them, and their roots trimmed, and then placed in larger pots, which ſhould be filled with the like rich earth, and plunged again into the hot-bed; where they ſhould remain till Michaelmas, provided the plants have room, without touching of the glaſſes; at which time they muſt be removed into the bark ſtove, and plunged in the warmeſt part thereof: during the winter ſeaſon they muſt be often watered. but they muſt not have it in ſuch quantities then, as is given to them in ſummer; they muſt alſo be kept very warm, otherwiſe they will not live in this country. In ſummer they muſt have a large ſhare of freſh air, in warm weather; but they muſt not be removed into the open air; for they are too tender to live abroad in the warmeſt part of the year in this country.

HU'SBANDRY. The new method of Huſbandry, called by Tull the horſe-hoeing Huſbandry, has many evident advantages over the other, or old way; but the difference between them, in regard to the former, is beſt explained by a fair compariſon. In order to do this juſtly, there are four things to be carefully conſidered: 1. The expence of a crop. 2. The goodneſs of the crop. 3. The certainty of it. And, 4. The condition in which the land is left after the crop.

The profit or loſs, ariſing from land, is not to be computed only from the value of the crop it produces, but from its value after all expences of ſeed, tillage, &c. are deducted. Thus, when an acre of land produces a crop worth four pounds, and the expences of it amount to five pounds, the loſs of the farmer is one pound upon it; whereas, when as much land produces a crop only of the value of thirty ſhillings, and the expences are only ten ſhillings, the owner receives one pound advantage. The common expence of an acre of ſowed wheat, in the uſual way, is four pounds ten ſhillings; and the common expence of an acre of wheat, in the horſe-hoeing Huſbandry, is only ten ſhillings, including all the expences that can attend it. Thus this method of Huſbandry is but a ninth part of the charge of the common way; and as no ſheep are required, as there are in the other way, the leſs ſtock will do to begin with. The goodneſs of a crop conſiſts in the quality of it as well as in the quantity, and, wheat being the moſt uſeful of all grain, a crop of this is more valuable than a crop of any other corn. Add to this, that a crop of hoed wheat has always larger ears, and a fuller body, than a crop when ſown in the common way. More wheat may alſo be obtained this way than any other, becauſe the ſame lands will thus produce crops every year; and even the land which has been exhauſted by the common Huſbandry, will produce wheat in plenty this way, without fallowing or dunging, both which would otherwiſe be neceſſary. So that, in many places, this Huſbandry can raiſe ten acres of wheat for one that the old way could produce, becauſe, where land is poor, they ſow but a tenth part of it in wheat.

The largeſt produce of an acre of wheat land, ſo far as has yet been experienced, ſeems to be ten quarters, or eighty buſhels to an acre. This is leſs indeed than the produce of an acre in the common way, according to Houghton's computation: but, to compare the different profits to the farmer, we proceed thus: the rent and expences of a drilled acre being one pound, and that of a ſowed acre in the common way being five pounds; one quarter of corn produced by the drilled bears an equal proportion to one pound in profit, as five quarters produced in the common way do to five pounds. As, ſuppoſe it to be of wheat at two ſhillings and ſix pence a buſhel, there is neither gain nor loſs in the one nor the other acre, though the drilled produce only one quarter, and the other five.

But if the drilled acre yields two quarters, and the ſown acre yields only four quarters at the ſame price, the drilled acre brings the farmer one pound profit, while the other has one pound loſs. Likewiſe ſuppoſe the drilling farmer to have his five pounds laid out in five acres of wheat, and the other to have his five pounds laid out in one dunged acre, then, let the price be what it will for the wheat, if the five acres have an equal crop to the one acre, the gain and loſs muſt be equal. But, if the price of wheat be at two ſhillings and ſix-pence, the farmer in the common way, if he have five quarters on his acre, he muſt ſell it all to pay his rent; whereas, if he who drills the land have five quarters on each acre, the produce of one acre will pay for all five. Or ſuppoſe a drilled acre to produce no more than one-third of the ſown acre, which is rating it very low indeed, the expence of the ſown acre being five times as much as that of the drilled one, it is much more profitable to the owner to have the drilled acres; becauſe a third part of five pounds is one pound thirteen ſhillings and four-pence, and, a fifth of the rent and expence, which is all his charge, being only one pound, ſuch a drilled acre brings the owner thirteen ſhillings and four-pence profit more than the ſown acre, though that brings three times as great a crop.

The certainty of a crop is greater this way than in the old way of ſowing; for moſt of the accidents, attending wheat crops, are owing to their being late ſown, which is neceſſary to the farmer in the old way; but in the horſe-hoeing method the farmer may plough two furrows whereon the next crop is to ſtand, immediately after the firſt crop is off. In this manner of Huſbandry the land may be plowed dry and drilled wet, without any inconvenience; and the ſeed is never planted under the furrow, but placed juſt at the depth which is moſt proper, that is, at about two inches, in which caſe it is eaſy to preſerve it, and there is no danger of burying it. Thus the ſeed has all the advantages of early ſowing, and none of the diſadvantages that may attend it in the other way; and the crop is much more certain than by any other means that can be uſed.

The condition in which the land is left after the crop, is no leſs in favour of the horſe-hoeing Huſbandry, than all the other articles. The number of plants is the great principle of the exhauſting of land. In the common Huſbandry, the number is vaſtly greater than in the drilling way, and three plants in four often come to nothing, after having exhauſted the ground as much as profitable plants; and the weeds which live to the time of harveſt in the common way, exhauſt the land no leſs than ſo many plants of corn, often much more. The horſe-hoeing method deſtroys all the weeds in the far greater part of the land, and leaves that part unexhauſted and perfectly freſh for another crop. The wheat plants being alſo but a third part of the number at the utmoſt of thoſe in the ſowing way, the land is ſo much the leſs exhauſted by them; and it is very evident from the whole, that it muſt be, as experience proves that it is, left in a much better condition after this than after the common Huſbandry.

The farmers who are againſt this method, object that it makes the plants too ſtrong, and that they are more liable to the blacks, or blights of inſects, for that ſeaſon; but, as this allows that the hoeing can, without the uſe of dung, give too much nouriſhment, it is very plain that it can give enough; and it is the farmer's fault, if he do not proportion his pains ſo as to have the advantages of the nouriſhment without the diſadvantages. It is alſo objected, that, as hoeing can make poor land rich enough to bear good crops of wheat, it may make good land too rich for it. But, if this ſhould happen, the ſowing of wheat on it may be let alone a while, and in the place of it the farmer may have a crop of turnips, carrots, cabbages, and the like, which are excellent food for cattle, and cannot be over nouriſhed: or, if this is not choſen, the land, when thus made too rich, may ſoon be ſufficiently impoveriſhed by ſowing corn upon it in the common old way. See Hoeing.

HYA'CINTHUS, *hyacinth, or jacinth*, in botany, a genus of plants, whoſe characters are:

It hath a bulbous root: the leaves are long and narrow: the ſtalk is upright and naked, the flowers growing on the upper part in a panicle: the flowers conſiſt each in one leaf, are naked, tubuloſe, and cut into ſix diviſions at the brim, which are reflexed: the ovary becomes a roundiſh fruit with three angles, which is divided into three cells that are filled with roundiſh ſeeds.

All the different ſorts of hyacinths are propagated by ſeeds or offſets from the old bulbs: the former method has been but little practiſed in England till very lately; but in Holland and Flanders it hath been followed for many years, whereby they have obtained a very great variety of the moſt beautiful flowers of this kind; and it is owing to the induſtry of the floriſts in thoſe countries, that the lovers and delighters in gardening are ſo agreeably entertained, not only with the curious variety of this, but of moſt other bulbous-rooted flowers; few other floriſts thinking it worth their trouble to wait four or five years for the flower of a plant, which when produced, perhaps there might not be one in forty that may deſerve to be preſerved: but they did not conſider, that it was only the loſs of the three or four firſt years after ſowing; for, if they continued ſowing every year after they began, there would be a ſucceſſion of flowers annually, which would conſtantly produce ſome ſorts that might be different from what they had before ſeen; and new flowers being always the moſt valuable to ſkilful floriſts, provided they have good properties to recommend them, it would always be a ſufficient recompence for their trouble and loſs of time.

The method of raiſing theſe flowers from ſeed is as follows: having provided yourſelf with ſome good ſeed (which ſhould be ſaved from either ſemi-double, or ſuch ſingle flowers as are large, and have good properties) you muſt have a parcel of ſquare ſhallow boxes or pots, which muſt be filled with freſh light ſandy ſoil, laying the ſurface very level: then ſow your ſeeds thereon, as equally as poſſible, covering it about half an inch thick with the ſame light earth: the time for this work is about the beginning of Auguſt. Theſe boxes or pots ſhould be placed where they may enjoy the morning ſun only until the middle or latter end of September; at which time they ſhould be moved into a warmer ſituation; and, towards the end of October, they ſhould be placed under a common hot-bed frame; where they may remain during the winter and ſpring months, that they may be protected from hard froſts; though they ſhould be expoſed to the open air, when the weather is mild, by taking off the glaſſes. In February the young plants will begin to appear above ground; at which time they muſt be carefully ſcreened from froſts, otherwiſe they will prove very injurious to them: but you muſt never cover them at that ſeaſon but in the night, or in very bad weather; for when the plants are come up, if they are cloſe covered, they will draw up very tall and ſlender, and thereby prevent the growth of their roots. In the middle of March, if the weather proves good, you may remove the boxes out of the frame, placing them in a warm ſituation; obſerving, if the ſeaſon be dry, to refreſh them now and then with a little water, as alſo to keep them very clear from weeds; which would ſoon overſpread the tender plants, and deſtroy them, if permitted to remain. *Miller's Gard. Dict.*

HYGRO'METER (*Dict.*)—*Plate* I. *fig.* 9, in the Dictionary, repreſents a double Hygrometer. It is made of a ſtring either of hemp or cat's-gut, and ſhews the increaſing moiſture of the air by its twiſting and ſhortening, and the dryneſs by untwiſting and lengthening.

Thus, let A B C be the lower part of a twiſted line or cord, hanging from the height of the room againſt one ſide thereof on the wall or wainſcot; let there be deſcribed a large circle, graduated into an 100 equal parts, ſuch as K L M N; in the center of which is a pin, with a ſmall pulley I B, carrying an index O P. If now a cord be put round the pulley, and a ſmall weight or ball D be ſuſpended at the lower end to keep it ſtraight, then, as the cord gathers moiſture from the air, it will twiſt and become ſhorter; the conſequence of which will be, that in contracting it will turn the pulley I B, and this by its index will point to the numbers on the graduated circle, which will ſhew the degree of moiſture or dryneſs by the contraction or relaxation of the cord.

Again: if the ball D hang over the center E of another graduated circle C G H placed horizontally, carrying an index E upon its diviſions, it will ſhew the ſame thing by the twiſting and untwiſting of the cord B C, as in the circle above.

I.

JA'CEA, *knapweed, or matfellon,* in botany, a genus of plants whoſe characters are:

The leaves and ſtalks are deſtitute of ſpines, and the leaves have their margins equal, not ſerrated. *Boerhaave, Index alter.*

Tabernæmontanus recommends the decoction of it for ruptures: there are ſome that give it in powder in pottage. By the chymical analyſis it yields hardly any thing but a ſubſtance loaded with acrid ſalt. *Martyn's Tournefort.*

It is too frequent in paſture grounds, and flowers in July and Auguſt. The herb, which is uſed, is effectual againſt tumors of the tonſils, and in hernias and wounds. *Dale from Schroder.*

I'CACO, *American plum,* in botany, a genus of plants whoſe characters are:

It hath a roſe-ſhaped flower conſiſting of ſeveral petals, which are placed in a circular order, from whoſe flower cup ariſes the pointal, which afterwards becomes an oval, ſoft, fleſhy fruit, incloſing a rough ſtone of the ſame form, in which is contained a round kernel.

JACOBÆ'A, *ragwort,* in botany, a genus of plants whoſe characters are:

It hath a radiated flower, the tube of which is almoſt of a cylindrical figure, and the ſeeds are faſtened to down; to which may be added, the leaves are deeply laciniated or jagged.

JA'LAP (*Dict.*)—The characters of this genus are:

It hath a long thick fleſhy ſucculent root: the leaves, which reſemble thoſe of nightſhade, grow by pairs oppoſite on the branches: the ſtalks and branches are very full of knots: the flower conſiſts of one leaf, and is ſhaped like a funnel: in the center of the flower is placed the ovary, inwrapped in one of the flower cups, which becomes an oblong five-cornered umbilicated fruit, conſiſting of a mealy nut. See *Plate* XXVIII. *fig.* 2. where *a* is the flower, *b,* the Jalap root of the ſhops.

Theſe plants are always propagated by ſeeds, which ſhould be ſown upon a moderate hot-bed in March; and, when they come up, they ſhould be tranſplanted into another hot-bed, at ſix inches diſtance from each other; and, when they have taken root, the glaſſes muſt be raiſed every day, that the plants may have a great deal of air, otherwiſe they are very ſubject to be drawn up tall and weak; nor can they be recovered to a ſufficient ſtrength again in a month's time, if once they are thus drawn. When the plants are grown to be a foot high, they ſhould be put into pots filled with rich light earth, which ſhould be plunged into a very moderate hot-bed, to facilitate their taking root: and, in removing them, you muſt be very careful to preſerve as much earth to their roots as you can; for their roots have but few fibres to retain it in a ball, as many other plants will do; and it ſometimes happens, when the root is left bare, it ſeldom takes freſh hold of the ground, at leaſt not in a conſiderable time; ſo that the plants will make but a poor figure that ſeaſon. When they are tranſplanted into the pots, and have taken root again, they ſhould be hardened to endure the open air, for they are not very tender; but, on the contrary, they will not thrive well, if too much drawn or forced in the hot-bed. In the middle of May the pots may be removed into the places where they are deſigned to be continued for that ſeaſon; obſerving to ſupport the branches with a ſtrong ſtake, and to water them as often as they require it. You may alſo in May plant ſome of them into the middle of the large borders of the pleaſure-garden, doing it carefully; and obſerve to ſhade and water them until they have taken root; after which, they will require no farther care but to ſupport them from being broken down by the winds, which they are very ſubject to be, eſpecially when their heads are large.

The plants, thus raiſed, will grow to the height of three or four feet, and ſpread their branches very wide (eſpecially if the roots have room in the pots;) and their flowers will begin to appear in June, and they will continue conſtantly flowering until the froſt prevents them; which, together with the great diverſity of colours in the flowers upon the ſame plant, renders them valuable to every curious perſon. The flowers of theſe plants never expand in the day time, while the ſun is hot; but in the evening, when the ſun declines, they begin to open, and continue expanded till the ſun ſhines warm upon them the next day; ſo that, when it happens to be cloudy weather, as alſo late in autumn, when the weather is cool, the flowers will remain open moſt part of the day.

As the flowers are produced ſucceſſively almoſt every day, ſo the ſeeds are in a ſhort time after ripe, and do ſoon fall to the ground; ſo that, when your ſeeds begin to ripen, you muſt carefully look for them upon the ground twice a week: otherwiſe, if they lie too long upon the ground, and there ſhould fall ſome rain, they will ſprout, and be good for nothing. In ſowing theſe ſeeds, you ſhould be careful to take them from ſuch plants as produced the greateſt variety of flowers; for, if you ſave them from ſuch as produce only plain-coloured flowers, the ſeeds will always produce the ſame ſort; and thoſe with yellow and red variegated flowers will conſtantly produce the ſame; theſe never varying from the red and yellow to the purple and white, though they will ſometimes degenerate into plain yellow or red flowers, as will they into plain purple or white; but they will conſtantly retain one or both of their original colours.

JA'NSENISM, the tenets and opinions of Cornelius Janſenius (D. D. of the univerſity of Lovain and Ypres, born at Leerdam, 1585) with relation to grace and free-will, as follows: 1. Some precepts of God are impoſſible to juſt men, though willing and endeavouring according to their preſent power; grace being wanting, whereby it might be poſſible for them to keep God's commands. 2. In the ſtate of the fallen nature there is no reſiſtance made to inferior grace. 3. To merit or demerit in the ſtate of lapſed nature, there is not required in a man liberty from neceſſity, but liberty from coaction is ſufficient. 4. The Semipelagians did admit the neceſſity of inferior preventing grace to every act, even to the beginning of faith; and in this they were heretics, becauſe they would have that grace to be ſuch as the will of man might reſiſt or obey. 5. It is a Semipelagianiſm, to ſay that Chriſt died or ſhed his blood for all men. Theſe propoſitions, though much defended in France and Flanders, were condemned by pope Innocent the Tenth in the calends of June, 1633; as likewiſe by Alexander the Seventh, and Clement the Ninth. Janſeniſm conſiſts in maintaining this doctrine two ways, 1. By aſſerting that theſe propoſitions are ſound and orthodox. 2. In affirming that they are evil and heretical, in the ſenſe wherein the church had condemned them, but that this ſenſe is not the true. *P. Simon. Sup. and Leo. de Mod.*

JAPA'NNING (*Dict.*)—The varniſh, made and uſed in China and Japan, is compoſed of turpentine and a curious ſort of oil they have. This they mix and boil up to a proper conſiſtence, and this never cauſes any ſwelling in the hand or face of the people who uſe it. The ſwellings in theſe parts which often happen to thoſe who work the lackered ware, and ſometimes to thoſe who only paſs by the ſhops of theſe people, is from the lack and not the varniſh. This lack is the ſap or juice of a tree, which runs ſlowly out on cutting the lower part of the trunk of the tree, and is received in pots ſet on purpoſe under the inciſions. This juice, as it flows from the tree, is of the colour and conſiſtence of cream, and, as it comes in contact with the external air, its ſurface becomes black. As they only uſe it when black, their method of preparing it is to ſet it out in the open air, in large flat bowls, in which it looks all ſurface; but, that the whole may be of the ſame uniform colour, they continually ſtir it for twenty-four hours together, with a ſmooth piece of iron: by this means the whole becomes thicker than it was before, and of a fine deep black. When it is in this ſtate, they powder ſome burnt boughs of trees, and mix them thoroughly with it, and then, ſpreading it thin over any board which they intend to japan, it is ſoon dried in the ſun, and is then abſolutely harder than the board it is laid on. When this is thoroughly dry, they poliſh it over with a ſmooth ſtone and water, till it is as ſmooth as glaſs; and then, wiping it very dry, they lay on the varniſh made of oil and turpentine, and boiled to a proper conſiſtence for this kind of work.

If the work is to be of any other colour than black, that colour is to be mixed with the varniſh, and then the whole ſpread on very thinly and evenly; for in this laying it on depends the principal art of varniſhing. When there are to be figures in gold or ſilver, theſe muſt be traced out with a pencil in the varniſh over the reſt of the work, and, when the varniſh is almoſt dry, the leaf gold or leaf ſilver is to be laid on, and poliſhed afterwards with any ſmooth ſubſtance.

JA'SHER, a book mentioned in ſcripture, and ſaid by ſome to be loſt. But ſome of the moſt celebrated Hebrew doctors ſay they have found it; telling us, that it is the book of Geneſis, wherein are contained the acts of Abraham, Jſaac, Jacob, and the other patriarchs, who were, by way of excellence, called jaſherim the juſt. But, that man muſt be eaſily ſatisfied, who can acquieſce with this interpretation. Dr. Lightfoot thinks the book of Jaſher is the ſame with the book of the Wars of God; but there is little foundation for it. This book, according to Grotius, was a triumphal poem; but Joſephus ſeems to bid faireſt for the truth, who ſays, that by this book are to be underſtood certain records kept in ſome place on purpoſe, and afterwards in the temple, giving an account of what happened among the Hebrews from year to year, and particularly the prodigy of the ſun's ſtanding ſtill, and directions and laws about the uſe of the bow, that is, the ſetting up of archery, and maintaining military exerciſes. If it be enquired why the title given to theſe Hebrew annals was the book of Jaſher, that is, the upright, this may be given as a reaſon, becauſe it was by all perſons reckoned as a very juſt and authentic account of all thoſe events and occurrences which it recorded; it was compoſed with great uprightneſs and truth, thence it was commonly known by the name of Jaſher's book, or chronicle. It was not the work of any inſpired perſon, but was of the nature of common civil annals; and, conſequently, we cannot infer from hence, that any book properly belonging to holy ſcripture, that is, that was written by inſpiration of the Holy Ghoſt, is at this day miſſing. *Lewis's Antiq.*

JASMI'NUM, *the jaſmine, or jeſſamine tree*, in botany, a genus of plants, whoſe characters are:

The leaves are in many ſpecies pinnated; the cup of the flower conſiſts of one leaf, but is divided at the top into five ſegments: the flower conſiſts of one leaf, is funnel-ſhaped, and divided into five ſegments: the flowers are ſucceeded by berries, which ſplit in the middle, each ſide, for the moſt part, containing a ſeparate ſeed.

The common white jaſmine is eaſily propagated by laying down the tender branches in the ſpring, which, by the ſucceeding ſpring, will be rooted ſtrong enough to be tranſplanted. They may alſo be raiſed by cuttings, which ſhould be planted in autumn in a moiſt border, where they may have the morning ſun: but they muſt be ſcreened from the violence of the ſun in the heat of the day, and frequently watered in dry weather. The cuttings, thus managed, will many of them live, and have roots fit to be removed in the following ſpring: but this method is ſeldom practiſed, the layers always making the beſt plants.

When theſe plants are removed, they ſhould be planted where they are deſigned to be continued, which ſhould be either againſt ſome wall, pale, or other fence, where the flexible branches may be ſupported; for, although it is ſometimes planted as a ſtandard, and formed into an head, yet it will be very difficult to keep it in any handſome order; or, if you do, you muſt cut off all the flowering branches; for the flowers are always produced at the extremity of the ſame year's ſhoots, which, if ſhortened before the flowers are blown, will intirely deprive the trees of flowers. Theſe plants ſhould be permitted to grow rude in the ſummer, for the reaſon before given: nor ſhould you prune and nail them until the middle or latter end of March, when the froſty weather is paſt; for, if it ſhould prove ſharp froſty weather after their rude branches are pruned off, and the ſtrong ones expoſed thereto, they are very often deſtroyed; and, this plant being very backward in ſhooting, there will be no danger of hurting them by late pruning.

The two ſtriped ſorts ſhould be planted in a warm ſituation, eſpecially the white ſtriped; for they are much more tender than the plain, and are very ſubject to be deſtroyed by great froſts, if they are expoſed thereto: therefore it will be proper to preſerve a plant of each kind in pots, which may be removed into the green-houſe in winter, leſt, by expoſing them to the cold, they ſhould all be deſtroyed, and the variety loſt.

The common yellow jaſmine was formerly in greater plenty in England than at preſent, and was planted againſt arbors, &c. to cover them, though it is not near ſo proper for that purpoſe as the white ſort, it being of much ſlower growth, nor will it ever extend its branches ſo far as that; but, however, it may have a place among the flowering ſhrubs of low growth, where it may be with more eaſe reduced to a ſtandard than the other. This plant flowers in May and June; but they have very little ſcent, which has occaſioned its being leſs regarded. It may be propagated by ſuckers, which it generally produces in great numbers; or by layers, as was directed for the common ſort; and are full as hardy. This ſort ſeldom riſes above five or ſix feet high.

The dwarf yellow jaſmine is ſomewhat tenderer than the former; yet will it endure the cold of our ordinary winters, if it be planted in a warm ſituation. The flowers of this kind are generally larger than thoſe of the common ſort, and better-ſcented; but are ſeldom produced ſo early in the ſeaſon. It may be propagated by laying down the tender branches, as was directed for the common white ſort; or by budding or inarching it upon the common yellow jaſmine; the latter of which is preferable, as making the plants hardier than thoſe which are obtained from layers; they ſhould be planted againſt a warm wall, and in very ſevere winters will require to be ſheltered with mats, or ſome other covering, otherwiſe they are ſubject to be deſtroyed. *Miller's Gard. Dict.*

The flowers only are uſed, and that but ſeldom in our ſhops; though Schroder commends them, as good to warm and relax the womb, to heal any ſcirrhi therein, and to facilitate the birth; as well as to be uſeful for a cough, difficulty of breathing, pleuriſy, and pains of the ſtomach, inteſtines, and womb. The oil, made by infuſions of the flowers, is made uſe of in perfumes.

The oil prepared of the flowers diſcuſſes crude humours, and is ſerviceable to thoſe who are ſubject to colds and catarrhs, and uſeful in the winter ſeaſon: in perſons of an hot temperature, it excites the head-ach; and, if long ſmelled to, endangers an hæmorrhage from the noſe. It is principally ſerviceable in contractions and hardneſſes of the limbs; for it heats, mollifies, and relaxes the joints, tendons, and nerves. It cures diſorders of the uterus, not only when applied to the hypogaſtrium and the pudenda, but alſo drank, or adminiſtered in a clyſter. It is no leſs effectual in the cholic proceeding from cold and viſcid humours. The flowers are principally uſed in diapaſms, and perfumes for gloves and linen. *Raii Hiſt. Plant.*

IBE'RIS, *ſciatica-creſs*, in botany, a genus of plants whoſe characters are:

The empalement of the flower conſiſts of four leaves, which are vertically oval: the flower has four leaves, which are unequal, two of them being longer, and ſpread broader, than the other; in the center of the flower is ſituated the pointal, attended by ſix ſtamina, two of which are ſhorter than the other: the pointal afterwards changes to a roundiſh compreſſed pod, having two cells, each containing one oval ſeed.

Theſe plants were commonly ſown to make edgings to large borders in the flower gardens, and are as proper for that purpoſe as any of the low annual plants: but they make a much better appearance when they are ſown in patches, intermixed with the dwarf lychnis, Venus's looking-glaſs, and other low annuals. If the ſeeds of theſe are ſown in the autumn, the plants will grow much ſtronger, and flower earlier in the year, than thoſe which are ſown in the ſpring; but, by ſowing them at different ſeaſons, they will flower at ſo many different times; by which means there will be a ſucceſſion of them in flower until the froſt puts a ſtop to them.

All the culture theſe require, is, to ſow their ſeeds in the places where they are to remain; for they do not bear removing well, unleſs it is done while the plants are young, and taken up with balls of earth to their roots: afterwards, if they are kept clear from weeds, they will thrive and flower very well. All theſe low annual flowers are very proper ornaments for the borders, or vacant ſpaces, between flowering ſhrubs; where, by the different ſorts being blended together, they will add much to the beauty.

ICE-*houſe*, a building deſigned to preſerve Ice, for the uſe of families in the ſummer ſeaſon. Theſe are more generally uſed in warm countries, than with us; particularly in Italy, where the meaneſt perſon, who rents a houſe, is not without his vault or cellar for keeping of Ice.

Ice-houſes being much more uſed with us than formerly, it may not be amiſs to give ſome general directions for the choice of the ſituation, and ſtructure of them, as alſo for the management of the Ice.

The ſituation, then, ſhould be upon a dry ſpot of ground: becauſe, wherever there is moiſture, the Ice will melt; for which reaſon, too much care cannot be taken to make drains all round them. The place ſhould likewiſe be elevated, and as much expoſed to the ſun and air as poſſible.

As to the figure of the building itſelf, the proprietor may chuſe ſuch as pleaſes his own fancy; but a circular form is the beſt for the well where the Ice is to be preſerved, which ſhould be large in proportion to the quantity to be kept.—It is beſt to have as much as may ſerve two or three years, in caſe of a mild winter, when little or no Ice is to be got. At the bottom of the well, there ſhould be a ſpace of about two feet deep left to receive any moiſture which may drain from the Ice, and a ſmall drain under ground ſhould be laid from this to carry off the wet. Over this ſpace of two feet ſhould be placed a ſtrong grate of wood; and the ſides of the well ſhould be built of brick, at leaſt two bricks thick; for, the thicker it is, the leſs danger there will be of the well's being affected by any external cauſe.

When the well is brought up within three feet of the ſurface, there muſt be another outer arch or wall begun, which muſt be carried up to the height of the intended arch of the well; and, if there is another arch turned over from this wall, it will add to the goodneſs of the houſe. The roof muſt be high enough above the inner arch, to admit of a door-way to get out the Ice. If the building is to be covered with ſlates, or tiles, reeds ſhould be placed conſiderably thick under them, to keep out the ſun and external air; the thickneſs of ſix or eight inches, with a plaiſtering of hair and lime, will be ſufficient to prevent all danger.

The external wall need not be built circular, but of what figure the proprietor pleaſes. Sometimes, the Ice-houſe is ſo contrived as to have an handſome alcove ſeat in its front.

Two feet diameter is ſufficient for the aperture of the mouth of the well; which ſhould have a ſtone, ſo contrived, as to ſtop it up in the exacteſt manner; and all the vacant ſpace, between this aperture and the outer door, ſhould be filled up with barley ſtraw; and this laſt is to be always ſhut, before the inner door is opened. The building, thus finiſhed, ſhould have time to dry, before the Ice is put into it.

If a layer of reeds be placed ſmooth over the grate at the bottom of the well, on which to lay the Ice, it will do better than ſtraw, which is commonly uſed; and, as to the choice of the Ice, the thinner it is, the eaſier it may be broken to powder: for, the ſmaller it is broken, the better it will unite, when put in the well. In putting it in, care muſt be taken to ram it as cloſe as poſſible; as alſo to allow a vacancy of about two inches all round next the ſide of the well, to give paſſage to any moiſture occaſioned by the melting of ſome of the Ice.

When the Ice is put into the well, if a little ſalt-petre be mixed with it at every ten inches, or foot thickneſs, it will cauſe the Ice to join more cloſely into a ſolid maſs. *Miller's Gard. Dict.*

ICHNEU'MON, in zoology, the name of an animal, of which there have been a multitude of idle and fabulous things aſſerted. It is a creature of the weaſel kind, with a longer and narrower body than a cat, and ſomething approaching both in ſhape and colour to the badger. Its noſe is black and ſharp, like that of a ferret. It has no beard, or whiſkers: its noſe is prominent, and its ears ſhort and round. Its colour is a yellowiſh grey, much like that of ſome of the monkey claſs. This is its appearance when in a good humour; but, when frighted or provoked, it raiſes its hairs upright, and ſhews them variegated at intervals with grey and yellow in diſtinct portions. Its legs are ſhort, and its feet have all five toes. Its tail is very long, and thick at the inſertion; its teeth, and its tongue, like thoſe of the cat. And, what is very ſingular, is, that in both ſexes it has a large aperture ſituated below the anus, which it dilates and contracts at pleaſure. Hence came the old opinion, that both male and female conceived, and brought forth young, in this animal. It is naturally a very cleanly animal, and is very briſk and nimble, and of great courage. It will engage a large dog, and, if it have a quarrel with a cat, will deſtroy that creature by three bites on the throat. Its noſe is ſo ſharp and narrow, that it can very hardly lay hold of any thing large with its teeth, and ſcarce can bite a man's clenched fiſt. It is very expert in ſeizing its prey; it ſtands erect on its hinder-legs, to deſcry where it is; then, throwing itſelf flat on its belly, crawls very ſlowly towards it, and, when within reach, darts violently upon it. It feeds indifferently on all animals that it can get at. Its common food are the ſnail, the lizard, the chameleon, ſuch ſerpents as it can manage, and frogs and mice; it is alſo very fond of birds, and of none ſo much as the hen and chicken. *Ray's Syn. Quad.*

ICHNEUMON-*fly*. Theſe flies ſometimes are at great pains to deſtroy and carry the caterpillars, in whoſe bodies they intend to lay their eggs, to places where it is proper thoſe eggs ſhould be hatched. There is one ſpecies whoſe worm produced from the egg can never ſucceed, unleſs it be both bred in the body of a caterpillar, and alſo have that habitation buried under ground. To this purpoſe the parent-fly, when the time of her laying her eggs is come, forms a hole in the ground, which ſhe covers with a little clod of earth, that no duſt may fall in to fill it up; when this is prepared, ſhe goes out in ſearch of a caterpillar, proper for her purpoſe. Dr. Liſter aſſures us, that he has often ſeen one of theſe flies ſeize a caterpillar much larger than herſelf for this intent, and, though this has been at a conſiderable diſtance from her hole, ſhe has with great labour dragged the creature to it; as ſoon as ſhe arrives with this load, ſhe takes off the little pellet of earth from the mouth of the hole, and, going down into it to ſee that all is right and ready for the reception of the new gueſt, ſhe returns out of it and draws in the caterpillar, which ſhe leaves there, after giving it ſuch wounds as, though they will not cauſe immediate death, yet will diſable the creature ſo far as to make an eſcape impracticable. When the creature is thus lodged, ſhe depoſits her eggs in its fleſh. And, this great buſineſs being done, ſhe ſtops up the orifice of the hole very firmly with ſeveral pellets of dirt, and with duſt carefully rammed in between, and will even fly up into gummy and reſinous trees to get a cement to hold all firmly together. When the whole is thus filled up, even to the ſurface of the reſt of the ground, ſhe draws a leaf or two to the place, and, laying them over the mouth, flies away. There is after this no more care taken, but the young worms are hatched from the eggs, and feed on the fleſh of the caterpillar till they are fully grown. They then change into the nymph ſtate, and come out of that in form of their parent flies, in which ſtate they eaſily make their way out of the ground. Some of theſe Ichneumons make the bodies of other ſmaller flies the places of hatching their eggs. They may be often met with flying with one of theſe ſmall flies in their legs, the head of it being held cloſe to their bellies. If they be watched on this occaſion, they will be found uſually to carry theſe flies to certain holes in the ground reſembling worm holes. The firſt that they carry ſerves as the nidus for their eggs; the reſt are for food for their young while in the ſtate of worms; theſe being too voracious to be long ſubſiſted on the body of one fly, and therefore their parents carry them more every day. The old ones on this occaſion crawl backwards into the hole, dragging in the flies after them. When their young worms have fed ſufficiently, they are converted into nymphæ; the caſes of which are made up of the wings, legs, and other hard parts of the flies they had been feeding on. *Philoſ. Tranſ.* N°. 76.

ICHTHYO'LOGY, the ſcience which treats of fiſhes.

The general diviſion of fiſhes is into three claſſes; the cetaceous, the cartilaginous, and the ſpinoſe. The cetaceous fiſhes are thoſe whoſe tail is ſo placed that, when the fiſh is in its natural poſture, it ſtands parallel to the horizon. The cartilaginous fiſhes are thoſe whoſe fins ſerving for ſwimming are ſuſtained by cartilages in the place of the bony rays which ſupport them in the other, and which have alſo cartilages in the whole body, inſtead of bones. Theſe are the characters of the two firſt claſſes; and all thoſe fiſh which have their fins ſupported by bony rays, which have their tail placed perpendicularly, not horizontally, and which have bones, not cartilages, in their bodies, are called the ſpinoſe fiſhes.

Theſe are the diviſion of the fiſh in general among authors.

The cetaceous fiſhes are arranged together, by the later writers on natural hiſtory, under the name of plagiuri. Theſe agree in many things with the land animals, and are diſtinguiſhed from one another by the ſame characters which ſerve for the diſtinction of the quadrupeds, particularly by the teeth. The general ſtructure of theſe fiſhes is alike in all; and their only differences are in the teeth, and the number of fins. From the teeth and fins alone, therefore, are to be properly taken the generical characters of the plagiuri.

The cartilaginous fiſhes differ from each other only in the form of their body, and in the number of the foramina of the bronchia. For the number of the fins, and figure and poſition of the teeth, which in the former claſs make the only characters of generical diſtinctions, in theſe are ſo variable, that they frequently differ in the different ſpecies of the ſame genus. The characters for the diſtinction of the cartilaginous fiſhes into genera can therefore only be taken from the ſhape and foramina. Thus all the rays have flat or depreſſed bodies, and five foramina at the bronchia. All the petromyzæ have, on the contrary, rounded bodies, and ſeven foramina at the bronchia. The chonepterus and mola have roundiſh bodies, and only one foramen or hole for the bronchia; and ſo of the reſt. The ſeveral ſpecies of the rays, though all properly belonging to the ſame natural genus, yet differ greatly in their number of fins, and in the ſhape and diſpoſition of their teeth.

The true characters of theſe two great claſſes of fiſhes, the cetaceous and cartilaginous, are thus eaſily found; but the characters of the ſpinoſe kinds are to be ſought for deeper, and do not offer themſelves ſo readily. The multitude of theſe, and the great likeneſs between ſeveral of the different genera, render it no eaſy taſk to diſtinguiſh them one from another. Though it be a general rule, that the generical characters of fiſhes are to be taken from their external parts; yet, in caſes where theſe external parts differ in themſelves, in number, figure, and proportion, it is neceſſary that the primary characters of the genus ſhould be taken from thoſe parts which are the leaſt variable of all others, and which are the moſt peculiar to the fiſh under conſideration, and the leaſt common to other genera. The utmoſt care and ſkill of the ichthyologiſt is neceſſary to the diſtinguiſhing theſe characters; and on a ſtrict enquiry he will find, that thoſe parts which ſeem at firſt moſt proper to found diſtinctions on, are in reality leaſt of all ſo. The figure of the fins and tail in fiſh might ſeem one of the moſt eſſential characters for a generical diſtinction, yet, a farther ſearch into their nature will ſhew that they can be of no uſe at all in this ſenſe. Almoſt all the ſpecies of the cyprini, a genus conſtituted on eſſential and invariable characters, and a truly natural one, have fins acute at the end, and have forked tails; yet, had theſe been made characters of the genus, they would have excluded fiſh that are properly of it. Thus the the tench and the caraſſius have both obtuſe fins, and tails ſtraight or plain, not forked at the end. There are, indeed, many natural genera of fiſhes, in which the fins and tails are alike in all, as the pearch, the mackarel, the conger. Theſe allow the fins and tail as very good collateral circumſtances of the diſtinction, but even theſe could not well be diſtinguiſhed by ſuch marks alone, as they are common to many other genera beſides.

IDO'LATRY (*Dict.*)—Dr. Owen divides the whole of idolatrous worſhip into Sabaiſm and Helleniſm. Dr. Prideaux imagines the planets, as mediators, to be the firſt objects of Idolatrous worſhip: though Helleniſm conſiſts principally in the worſhip of dead men and dæmons, yet the Grecians at firſt adored the ſun, moon, and ſtars, as even Plato owns; for, perceiving all things to run in a continual courſe, they called them Θεοὺς, Gods, from θέειν, to run. The Greek and Roman idolatry took its riſe from that of the Egyptians, Phœnicians, and Syrians. It is a certain maxim, that religion, as well as learning, and mankind itſelf, had its firſt original in the Eaſt. We ſhall therefore conſider that country firſt. Tho' the Egyptians were reputed the wiſeſt of the Gentiles, yet they appear, in their religious worſhip of beaſts, to have acted contrary to common ſenſe. It is alledged, the worſhip of brutes was the vail, under which were concealed the myſteries of their religion, as their morals were hid under hieroglyphics. But it is abominable to adore ſheep, cats, bulls, dogs, cows, ſtorks, apes, birds of prey, wolves, and ſeveral ſorts of oxen, as the Egyptians did, under any pretence whatever, ; the very heathens ridiculed this kind of Idolatry ; each province and diſtrict in Egypt entertained a peculiar devotion for ſome beaſt or other. What was ſignified by this monſtrous Egyptian Idolatry is not eaſy to conceive ; many fables have been invented to palliate its enormities. This Idolatry had footing in Egypt, in the time of Moſes and the Patriarchs. Thus much for the Egyptian Idolatry. The Phœnicians were among the moſt antient nations and firſt Idolaters ; but all the account we have of their theology is in a little fragment preſerved by Euſebius little to be depended on.

It appears that the ſun, moon, and hoſt of heaven were worſhipped by the Jews, when they turned to Idolatry, after the example of neighbouring heathens, without images, by an humble proſtration before them, or their emblems, light or fire : we muſt farther remark, though the Jews were guilty of ſeveral kinds of Idolatry, eſpecially before the Babyloniſh captivity, yet the heathens very unjuſtly charged them with ſeveral acts of Idolatry of which they were innocent.

However, the long abode of the Iſraelites in Egypt left in them a ſtrange propenſity to Idolatry, which neither the miracles of Moſes, nor the rigour of his laws againſt the worſhip of idols, nor the ſplendid marks of God's preſence in the Iſraelitiſh camp, were ſufficient to overcome ; they had contracted ſuch an invincible proneneſs to Idolatry, that they not only perſiſted in the worſhip of the Egyptian deities, but adopted moreover every new one which came in their way, as they became acquainted with other nations. Moſes has recorded many inſtances of their Idolatry ; but they were guilty of many more, which have been preſerved by other inſpired writers, who ſeverally upbraid them with ſetting up and carrying about the idols of Remphan, Malkom, and many others of the like nature.

Saul and David, with all their authority, were not able to root out Idolatry from among this people ; they ſacrificed upon high places, they conſulted divines and magicians. Solomon himſelf, whom God had choſen to build his temple, erected altars to the falſe gods of the Phœnicians, Moabites, and Ammonites, &c. and there were few of the kings his ſucceſſors who did not in this reſpect ſhew alike weakneſs; thus Jeroboam, the ſon of Nebat, king of Iſrael, introduced the worſhip of the golden calves, which took ſo deep root in the kingdom of Iſrael, that it never was intirely extirpated.

Leaving the Eaſtern nations, it is now proper to remove to the Weſt, and conſider the Idolatry of the Greeks and Romans, and other Weſtern nations, before Chriſt. Nothing can be more monſtrous than the Idolatry of the Greeks and Romans, contained in their poets and claſſics in the hands of every child, where we meet with an incredible number of them.

The ancient Britons had abundance of magical rites, and adored a multiplicity of idols. The Germans had the ſame idols as the Britons. For, from the heathen Saxons, the Engliſh learned their Idolatry.

Sozomen, with Origen, and others affirm, that, when our Saviour was carried into Egypt, to avoid the perſecution of Herod, the idols of this country, which were very numerous, and worſhipped to the greateſt degree of ſtupidity and exceſs, were moſt of them ſhaken off their baſis ; however, though Idolatry was not perfectly ſuppreſſed, but was ſtill kept on foot in the ſame meaſure even in Rome, this is certain, that it began to be laid aſide after our Saviour's birth ; the emperor Theodoſius, jun. deſirous to put a final end to the great work of aboliſhing Idolatry, publiſhed very ſevere edicts, wherein he ordered all things belonging to Idolatry to be deſtroyed throughout the Roman empire. At preſent Idolatry flouriſhes moſt in China.

I'LEX, *the ever-green oak*, in botany, a genus of trees, whoſe characters are :

The leaves are, for the moſt part, indented or ſinuated (and in ſome the edges of the leaves are prickly) and are ever-green ; it hath amentaceous flowers, which are produced at remote diſtances from the fruit, on the ſame tree : the fruit is an acorn, like the common oak.

Theſe trees are propagated by ſowing their ſeeds : the beſt ſeaſon for this work is in the beginning of March : but then, as the acorns are ripe in autumn, they ſhould be preſerved either in ſand, or dry earth, until the ſpring, otherwiſe they will loſe their growing faculty ; which is commonly the caſe with thoſe brought annually from Genoa, ſcarce one ſeed in fifty of them ever riſing ; however, ſince we have many large trees now in England, which produce good ſeeds, we need not ſend to Italy for them : but, were I to adviſe, I ſhould much rather have them from Portugal than Italy ; for, the voyage being much ſhorter, they are generally brought from thence in very good condition ; eſpecially, if they are brought over in the packet-boat to Plymouth.

The manner in which I would adviſe their being ſown is, for large quantities, in drills at about four feet diſtance ; but, for a ſmall parcel, they muſt be ſown in rows on a bed much nearer.

The ground on which theſe ſeeds are ſown, ſhould be well dug, and cleanſed from the roots of all noxious weeds, &c. and leveled even, and the great clods broken ; then draw the rills with an hoe in a ſtraight line (as is practiſed in the ſowing of kidney beans) about two inches deep, laying the acorns therein three or four inches aſunder ; then draw the earth over them with a head of a rake, obſerving that none of them are left uncovered ; which would intice the vermin to attack your acorns, eſpecially the mice, whereby your ſeminary will be greatly injured, if not wholly deſtroyed.

Theſe trees are by many greatly eſteemed for hedges to ſurround wilderneſs quarters ; but they are ſubject to grow too large for that purpoſe, becauſe we ſhould never hide the tops of the trees in ſuch places from the ſight ; for they are, if rightly diſpoſed in the quarters, vaſtly more agreeable to the eye, than the fineſt ſheared hedge in the world ; but they may do well enough for a large fence, to obſtruct the ſight, or to defend a new plantation of tender trees ; for which purpoſe the acorns ſhould be ſown in the place where the hedge is deſigned ; and, when the plants are come up, they ſhould be thinned, where they are too cloſe ; and, if the ground is kept clear from weeds, and, every ſpring, dug about the plants, they will ſoon form a good hedge : but you ſhould obſerve, not to let them grow too much in height before the lower part of the hedge is well ſtrengthened, which would occaſion its bending, and the branches would be ſubject to be diſperſed with ſtrong winds, or great ſnows, and thereby become very unſightly : but, if they are regularly trained up, they will make a good thick hedge from the ground to the height of thirty-feet, and that in leſs time than any other ever-green tree whatever.

The ſoil in which theſe trees thrive beſt, is a hazelly loam, not too ſtrong, nor over light, in which they will grow to a large ſize, and reſiſt the ſevereſt cold of our climate ; and, retaining their leaves all the winter, afford an agreeable proſpect in that ſeaſon : but they ſhould by no means be planted near ſuch walks, or other parts of the garden, as are intended to be kept clean ; for in the month of April, when they caſt their old leaves, they make a great litter, and are apt to blow about with the wind, and become very troubleſome ; and in June, when their male flowers fall off, they occaſion no leſs trouble to clean them up daily in ſuch places ; and, in the pleaſanteſt ſeaſon of the year, they are the moſt unſightly trees in a garden, the old leaves decaying at that ſeaſon, and falling off ; and the male flowers, which are generally in great plenty, are then produced ; which renders it not ſo valuable in places much frequented : but, for larger plantations, at a remote diſtance from the habitation, ſo as to be juſt within the view, they make a very handſome appearance, eſpecially in the winter ſeaſon.

The wood of this tree is accounted very good for many ſorts of tools and utenſils, as mallet-heads, mall-balls, chairs, wedges ; beetles, pins, &c. as alſo for palliſadoes ; and affords the moſt durable charcoal in the world, and is the common fuel in the ſouthern parts of France and Italy. *Miller's Gard. Dict.*

Ilex *coccigera*, or holm-oak, is of much lower ſtature than the former ſorts, and ſeldom grows to the height of a tree : this, though a native of the warmeſt parts of France, yet will endure the cold of our climate in the open air. It may be propagated in the ſame manner as the former, and deſerves a place amongſt other ſhrubs of low growth, for its curioſity, as being the plant on which the kermes are bred. See *plate* XXV. *fig.* 1. where *a* is fruit, *b* the cup, *c* the kermes, *d* the catkin ſeparate. See Kermes in the Dictionary.

I'LIAC *Paſſion* (*Dict.*) — With reſpect to the Iliac paſſion, we are carefully to remember, that it is highly unſafe to exhibit draſtic purgatives, in order to render the body ſoluble ; becauſe they never fail to increaſe the pains, ſpaſms, and all the other ſymptoms ; nor is it expedient to uſe clyſters, prepared of exceſſively hot and carminative ſubſtances : much leſs are carminative and ſtomachic eſſences, or medicated wines, to be exhibited internally ; ſince, though theſe may prove beneficial in a flatulent cholic, ariſing from a cold cauſe, as the ancients uſed to ſpeak, they are yet by no means to be exhibited, when the diſeaſe is of the acute kind, and all the fluids are in a violent and preternatural motion.

But, when the ſtrength begins to fail, and deliquiums to ſeize the patient, mild analeptics may be ſafely and advantageouſly uſed ; ſuch as thoſe, for inſtance, prepared of the waters of black cherries, Turkiſh baum, lilies of the valley, and cinnamon, without wine, or a ſpoonful of generous wine, may be now and then exhibited, with ſingular advantage.

If the patient is plethoric, veneſection is forthwith to be inſtituted, and even repeated, if the caſe requires it. Great regard is, alſo, to be had to the judicious obſervations of the learned Paſcoli, who in Tom. II. uſes the following words : 'When a fever, and the ſigns of an approaching inflammation of the viſcera, are preſent, a vein is to be forthwith opened, rather in the inferior than in the ſuperior parts : hence, we almoſt always obſerve, that leeches, eſpecially when applied to the inteſtinum rectum, have been of ſingular uſe in the cure of an Iliac paſſion ; ſince the blood, diſcharged from the hæmorrhoidal vein, relieves the part affected, in the moſt immediate manner of all others'.

When the uſe of quickſilver is indicated as proper and neceſſary, it is previouſly to be depurated, waſhed, and paſſed through leather : when thus prepared, it is not adviſable to exhibit more than a pound, or half a pound; which is moſt commodiouſly taken in fat broth. Immediately after it is taken, it is expedient the patient ſhould lie for ſome time on his right ſide, that it may the more quickly paſs through the right orifice of the ſtomach: beſides, if his ſtrength permits, he is to walk, or uſe geſtation, that it may the better reach the inferior parts. But, when the inflammation is already preſent, and the ſtrength much impaired, we are to abſtain from the uſe of this medicine, leſt the by-ſtanders, and ſuch as are not capable of forming a right judgment, ſhould be of opinion, that the patient is deſtroyed by this remedy, which has the bad fortune to be ſuſpected almoſt by every one.

In this diſorder, great hopes of ſafety and recovery are juſtly placed in clyſters, provided they are only uſed at proper times, and in due quantities; for theſe, when the large inteſtines are conſtricted by violent ſpaſms, by relaxing their fibres, and rendering them flaccid, greatly allay the inverſion of the periſtaltic motion. It is moſt expedient, if the ſtrength of the patient permits it, to inject a clyſter of warm water, mixed with Fernelius's ſyrup of marſhmallows, every two hours, and that during the firſt day of the diſorder, that, by this means, the fæces may be rendered more liquid.

As for topics, I cannot help approving of the caution of Cælius Aurelianus, who adviſes us to abſtain from heavy cataplaſms, which, by their weight and roughneſs, increaſe the diſorder, and the pains with which it is accompanied; for, ſometimes, the inflation and diſtenſion of the abdomen are ſo great, that the patient cannot bear it to be moderately touched with the hand.

When the anus, in conſequence of the ſpaſmodic ſtrictures, is ſo braced up, that it cannot admit a clyſter-pipe, much leſs the noſe of a pair of bellows, it is then expedient to apply to it a moderately warm fomentation, and, with a ſmall pipe, to attempt the injection of pure tepid oil, that the ſpaſmodically conſtricted coats of the inteſtinum rectum, being, by this means, ſoftened, may be, afterwards, capable of receiving a larger quantity of liquor.

When the diſeaſe is upon the decline, baths are highly commodious; and may be, alſo, uſed in the firſt days of the diſorder, when their propriety is indicated by proper circumſtances; for theſe contribute greatly to the termination of the diſeaſe, and the expulſion of the peccant matter, by relaxing the fibres: thus baths were by the methodiſts, with great ſucceſs, recommended in the decline of diſeaſes, as we learn from Cælius Aurelianus.

In order to mitigate the pains which are, almoſt, the only cauſe of ſo many violent ſymptoms, and of the inverted periſtaltic motion of the inteſtines, we are not to be afraid of uſing opiates, provided they are exhibited in the beginning of the diſeaſe, when the ſtrength is as yet intire, a plethora removed, and no ſigns of a ſpacelus to be diſcovered. With reſpect to the great efficacy of opiates in this diſorder, the reader may conſult the ſentiments of Wedelius, found in the *Miſcell. Nat. Curioſ. Dec.* 1. *An.* 2. *Obſ. Hoffman.*

I'MAN (*Dict.*) — The Mahometans are not perfectly agreed concerning the dignity, and ſome other circumſtances of this office. Some hold the imanate to be ſettled by divine right, and to be fixed, like the Aaronical prieſthood, on one family: others affirm it to be of divine inſtitution, in a qualified ſenſe: but that it is not ſo unalterably tied to genealogy and deſcent as to hinder its paſſing from one family to another; the ſecond party maintaining farther, that the Iman ought not only to be innocent of enormous crimes, ſuch as infidelity, but alſo to be unblemiſhed in leſſer imputations, with which, if his character is ſullied, he may be lawfully depoſed, and the dignity conferred upon another: but this is denied by thoſe who paſs for good Mahometans, who affirm, that, after an Iman has been owned in his character by the muſſulmen, it is reckoned downright impiety to deny he is God's immediate vicegerent; and therefore he that refuſes to obey him, is reckoned as a rebel, and he that is ſo hardy as only to contradict him, is reproached as a very ignorant mortal. The Schiites, or the diſciples of Ali, though they are not agreed among themſelves concerning the perſon to whom this dignity belongs, yet they all maintain this privilege belongs to the family of Ali, excluſive of all others, and that it ought to be governed by laws of ſucceſſion and proximity of blood, Ali being ſole and apparent heir to Mahomet. This principle of the Schiites makes them not own any perſon for the head of religion, who cannot prove his deſcent in a direct line from their firſt Iman. The Schiites proceed farther, and maintain that the principal point of their religion, upon which all the reſt is ſuperſtructed, conſiſts in abſolute and entire ſubmiſſion to this Iman, and an implicit belief of what he delivers. The Imans belonging to particular moſques are of the nature of our pariſh prieſts: they officiate in their public liturgy, in which they pray for the prince, and make a ſort of harangue to the people. One of the principal functions of the caliph was to execute the Iman's office every Friday in the chief moſque where he reſided; and, when he did not officiate himſelf, he uſed to delegate ſome perſon of condition.

IMPERATO'RIA, *maſterwort*, in botany, a genus of plants whoſe characters are:

The leaves are not very ramous, but divided into three ſegments, each of which is divided into three others. The ſeeds are flat, oval, ſlightly ſtriated, and marginated.

The roots of maſterwort are long, and full of knots or joints, about a finger thick, running obliquely into the ground, ſhooting out many fibres from the joints, of a ſtrong aromatic ſmell, and a pretty hot taſte; the lower leaves are hardly a ſpan high, ſomewhat like angelica, but much leſs, and divided into three ſegments of roundiſh leaves, crenated about the edges; the ſtalks ſeldom grow above a foot high, with but few leaves on them, and have, on their tops, umbels of ſmall, white, five-leaved flowers, each of which is ſucceeded by two round, whitiſh, ſomewhat flat ſeeds. It is cultivated with us in gardens, its native place being the Auſtrian and Stirian mountains, and other Alpine countries, flowering in July.

The roots, which are the only part uſed, are cordial, ſudorific, and alexipharmic, of great uſe in putrid malignant fevers, and all contagious peſtilential diſtempers; they reſiſt poiſon, and the bites of venomous creatures. They help pains of the ſtomach, and the cholic; in all nervine affections, and diſorders of the head, they are uſed with good ſucceſs. *Miller's Bot. Off.*

The roots are oblong, about an inch thick, wrinkled, and geniculated, brown without, white within, of an aromatic acrid taſte, and fragrant ſmell.

The Hiſtoria Plantarum, aſcribed to Boerhaave, aſcribes the following virtues to theſe roots: they are attenuating, he ſays, and aperitive; provoke ſaliva, if held in the mouth, and are, carthartic, if taken inwardly, whence the root Imperatoria is called the countryman's purge. Taken in a leſſer quantity, it proves ſudorific and diuretic. In the hyſteric and convulſive cholic, and the tympanitis, it often works with ſuch violence as to require correctors, ſuch as leviſticum, meum, or ſome other ſweet and viſcid root. In intermittent fevers, eſpecially tertians and quartans, it is a ſpecific remedy, as well as in comatous diſorders. It has the ſame aromatic, hot, and igneous taſte and ſmell in every part of it; and whether it be uſed in infuſion or decoction, is inferior to no medicine for ſpeed in giving relief under the effects of poiſons of a volatile kind, working by gentle ſweat, and, if exhibited in a larger quantity, by ſtool. It is recommended alſo in the dropſy, being taken to the weight of an ounce in honey, provided the viſcera be ſound: it is, alſo, an antiſcorbutic. It is highly recommended in caſes where any one of the viſcera requires to be ſpeedily freed from viſcid matter. Baglivi very much recommends it for diſeaſes of the breaſt, for the pleuriſy and peripneumony, in caſes where the matter is connected, but the expulſive faculty deficient: for theſe purpoſes the root is infuſed in water, which is afterwards ſweetened with honey, and proves an excellent promoter of expectoration, to the relief of the patient from the diſeaſe. It is one of the principal ingredients in the ſame antidotes as angelica: being heating and aperitive, it is effectual for diſcuſſing of tumors, where there is no inflammation, or in thoſe of the ſcorbutic kind. If the root be divided in the middle, you diſcover a multitude of veſicles full of an oily and balſamic ſubſtance, indued with an igneous quality, which renders the root more heating than angelica, and as good a corrector of a fœtid breath. The root is to be taken up in the middle of winter, in its ſecond year. The leaves bruiſed are good to diſcuſs cold tumors. The diſtilled oils, as well as the ſpirits, are carminative and ſtomachic. The root is juſtly accounted one of the beſt antiſcorbutics, and, boiled in water, affords an excellent remedy for the gravel in the kidnies, and a ſtoppage of urine.

I'NCENSE (*Dict.*) — Pure frankincenſe is what is gathered in autumn, and is much the fineſt, and of the whiteſt colour; the ingredients it was made of were pounded ſeverally, and, being mingled, were with great care made ready for divine ſervice, and a quantity of it burnt every day upon the altar of Incenſe that was placed before the ark. It was intirely ſet apart for divine worſhip, and not to be applied to any private uſe, nor to be touched by any but the prieſts, and that only when they miniſtered in the ſanctuary before the mercy-ſeat: if any man preſumed to make this compoſition with the ſame ſpices and the ſame weight, with a deſign to burn it as a perfume, he was cut off; and it is not impoſſible but this exciſion extended not only to the trangreſſor, but to his whole race, that none of them ſhould remain to keep up his name. Incenſe was burned every morning when the lamps were dreſſed, and every evening when they were lighted; and therefore it was called a perpetual Incenſe, becauſe it was never intermitted twice a day. One reaſon why it was thus continually burnt, was, becauſe of the vaſt number of beaſts that were ſlain there and cut to pieces, and waſhed and burned every day at the ſanctuary, which would have made it ſmell like a ſhamble, and, conſequently, rather have inſpired the comers with diſguſt and averſion than awe and reverence, if this ſweet odour had not perfumed it and the garments of the prieſt. The odour of this Incenſe, the rabbins ſay, might be ſmelt as far as Jericho, and by this means the reverence due to the houſe of God was preſerved, which would have been contemptible, if any ill ſmell had been conſtantly about it. *Lewis's Heb. Antiq.*

INDU'LGENCE (*Dict.*)—Clement VI, in his decretal, generally received by the Romiſh church, declares, that our Saviour has left an infinite treaſure of merits and ſuperogatory ſatisfaction ariſing from his own ſufferings, together with thoſe of the Bleſſed Virgin and the reſt of the ſaints; and that the paſtors and guides of the church, and more eſpecially the popes, who are the ſovereign diſpoſers of this treaſure, have authority given them to apply it to the living by virtue of the keys, and to the dead by way of ſuffrage, to diſcharge them from their reſpective proportions of puniſhments, by taking as much merit out of this general treaſure as they conceive the debt requires, offering it to God almighty. Indulgences themſelves, and the abominable abuſes committed on their account, are ſufficiently expoſed by St. Cyprian, Tertullian, and many others. Spanheim gives us this account of the origin of Indulgences, viz. that the primitive church being very rigid in exacting penance for offences, as, firſt, Πρόκλαυσις, ſtanding and mourning before the church door. Secondly, Ἀκρόασις, admitting them to hear the word, but not to prayers. Thirdly, Ὑπώπτωσις, or proteſtation, when they were admitted to the word and ſome prayers. Fourthly, Σύστασις, when they were admitted to all the prayers, but not to the ſacraments; which various ſteps ſometimes took up a penitent's whole life, upon which many were driven to deſpair, or apoſtatiſed to gentiliſm. Hereupon a temperament was found out to remit the hardneſs of this canonical penance, which was afterwards abuſed and degenerated into thoſe now called Indulgences, though they were but of late riſe in the church of Rome.

INFLA′MMATORY *Fevers.*--Theſe may be diſtinguiſhed into two ſtages; the firſt, whilſt the pulſe continues hard, in which it is proper to bleed; and the ſecond, when, the Inflammatory ſymptoms ſtill remaining, the pulſe is too low for that evacuation. In this laſt ſtate, bliſters are the chief remedy, and which, except in a few ſingular caſes, are not to be uſed ſooner. If the bliſters are large, it is better to apply them gradually, than many at a time. It is uſual to begin with the back, and, if neceſſary, to apply them next to the legs or thighs, reſerving the arms laſt, that the patient may be ſo much the longer conveniently moved. In great lowneſs, attended with a delirium, ſinapiſms, applied to the ſoles of the feet, have frequently more efficacy than bliſters, in raiſing the pulſe, and relieving the head.

If the body has been coſtive before the diſeaſe, it is proper to open it by a laxative, after bleeding; and, after recovery, ſome lenient phyſic is generally requiſite, for preventing a too haſty repletion incident to convaleſcents, upon indulging their appetites. There is no caution more neceſſary to a young phyſician, than to abſtain from all opiates throughout theſe fevers, however much the patient may complain of pain or watchfulneſs. Indeed, if the fever be accompanied with a diarrhœa, which is not critical, the looſeneſs is to be gradually checked by diaſcordium, after giving rhubarb, and endeavouring to turn the humours to the ſkin by the uſe of diaphoretics (omitting the nitre) with the uſe of the white decoction for common drink. *Pringle's Obſerv. on the Diſ. of the Army.*

INK (*Dict.*)—Writing ink is commonly made of copperas and galls; but other aſtringent plants may ſerve the ſame purpoſe, ſuch as oak-bark, red-roſes, log-wood, or ſumach. Mr. Boyle ſeems to doubt whether all aſtringent vegetables will do the ſame. *Boyle's Works abr.* Vol. I.

Filings of iron put into ſeveral of the common vegetable juices turn them inſtantly as black as Ink; and hence it ſhould ſeem that vitriol only acts in the making Ink as a ſubſtance containing iron; which always gives a black colour to an infuſion of galls, or the like vegetable ſubſtances, and that the more deep, as it is more divided in its particles by acids. According to this rule, all thoſe vitriols which have iron for their baſis, and all ſolutions of iron in vitriolic, ſulphureous, or aluminous acids, muſt make Ink with galls, or a like infuſion; and the blue vitriol of Cyprus, and ſuch others as have copper for their baſis, muſt have no ſuch effect on theſe infuſions; and both theſe deductions are confirmed by experience.

In examining ſeparately the two principles of which the atramentitious vitriols are compoſed, that is, their vitriolic acid, and their baſis of the matter of iron, it appears, that the acid alone, being mixed with an infuſion of galls, will never make Ink; whereas the baſis alone, that is, filings of iron, will always do it in a little time. Hence it appears, that the acid has no ſhare in the effect, and that the whole is owing to the ferrugineous matter in the vitriol reviving again into iron. The manner in which this revivification of iron is ſo ſuddenly performed, on the mixing vitriol and the infuſion of galls, ſeems to be, that this infuſion acts as an abſorbent on the acid which had before reduced the iron to vitriol, and the ferrugineous particles, being thus freed from the acid by which they were transformed into vitriol, appear again in their native form, and have the ſame effect upon the infuſion that ſimple or pure iron would have. *Mem. Acad. Par.*

INSCRI′PTION (*Dict.*)—The cuſtomary manner of preſerving the memory of conſiderable actions, among the ancients, was monumental remains; at firſt, they went no farther than erecting pillars or ſtones, to continue the notice of ſome memorable event. Thus Jacob, having had a ſupernatural dream at Bethel, and being aſſured of God almighty's protection, took the ſtone which had been his pillow, and ſet it up for a pillar, and poured oil upon it, as a token of a promiſe for divine protection; and that, in caſe of a proſperous return, the ſtone might put him in mind of the holy place, where he might offer the firſt of his ſubſtance. Theſe ſtones at firſt conveyed but little intelligence, excepting what could be gueſſed by the bulk and ſituation. It is true, ſomething was hinted at, but nothing explained without the help of memory; for this purpoſe they cut the ſtones in figures, gods, men, and battles, with the inſtructive ornaments of baſs relievo, where the hiſtory was farther deſcribed; they likewiſe cut letters with names, Inſcriptions, laws, and arts. This cuſtom of cutting ſtones was very ancient among the Phœnicians and Egyptians. The Inſcriptions, reported by Herodotus and Diodorus Siculus, ſhew ſufficiently that the firſt way of inſtructing people, and tranſmitting hiſtories and ſciences to poſterity, was by Inſcriptions; and this particularly appears by Plato's dialogue, intitled Hipparchus, wherein he ſays that the ſon of Piſiſtratus, called by the ſame name, engraved, on ſtone pillars, precepts uſeful to huſbandmen. Pliny aſſures us that the firſt public monuments were made with plates of lead; and the treaties of confederacy between the Romans and the Jews were written upon plates of braſs, that, ſays he, the Jews might have ſomething to put them in mind of the peace and confederacy concluded with the Romans.

Porphyrius mentions Inſcriptions kept by the inhabitants of Crete, wherein the ceremonies of the ſacrifices of the Corybantes were deſcribed. Euhemerus, as Lactantius reports, had written an hiſtory of Jupiter and the other gods, collected out of the titles and Inſcriptions, which were in the temples, and principally in the temple of Jupiter Triphilianus, where, on the Inſcription of a golden column, it was declared, that that pillar was erected by the god himſelf. Pliny aſſures us, that the Babylonian aſtrologers made uſe of bricks to keep their obſervations, and hard and ſolid matters to preſerve arts and ſciences. This was for a long time practiſed; for Arimneſtus, Pythagoras's ſon, as Porphyrius relates, dedicated in Juno's temple a plate, whereon were engraved the ſciences that were improved by him: Arimneſtus, ſays Malchus, being returned home, fixed in the temple of Juno a braſs table, as an offering conſecrated by him to poſterity; this monument was two cubits diameter, and there were ſeven ſciences writ upon it.

Pythagoras and Plato, according to the opinion of the learned, ſtudied philoſophy from the Inſcriptions of Egypt, engraven on Mercury's pillars.

Livy tells us, that Hannibal dedicated an altar with a long diſcourſe engraven in the Greek and Punic languages, wherein he deſcribed his fortunate atchievements.

INTE′GRANT *Parts*, in philoſophy, the ſimilar parts of a body, or parts the ſame and of the ſame nature with the whole; as filings of iron are the Integrant parts of iron, and have the ſame nature and properties with the bar they were filed off from. The chemiſts diſtinguiſh, in their reſolutions of bodies, between the dividing or reſolving them into Integrant parts like theſe, and what they call conſtituent parts, that is, diſſimilar parts, or the principles of the bodies they work upon. Thus, when crude mercury is diſſolved in aqua fortis, though held imperceptibly in the menſtruum, yet, when that menſtruum is diluted with water, and a copper-plate is ſuſpended in it, the menſtruum leaves the mercury to work upon the copper, and the mercury ſubſides unaltered and in its own natural form; the mercury, therefore, in this operation, was only divided into its Integrant parts, or ſmall parcels of the ſame nature and properties of the whole; but, when artificial cinnabar is reſolved or divided into crude mercury and ſulphur, neither of theſe are of the ſame nature and properties with the cinnabar, and are not its Integrant but its conſtituent parts. This therefore is the dividing a body into its conſtituent parts or principles. *Shaw's Lectures.*

I′NTERVAL, in muſic (*Dict.*)—The learned Mr. Euler defines an Interval, the meaſure of the difference of an acute and grave ſound.

Suppoſe three ſounds a, b, c, of which c is the moſt acute, a the moſt grave, and b the intermediate ſound. From the preceding definition, it appears that the Interval between the ſounds a and c is the aggregate of the Intervals between a and b, and between b and c. Therefore, if the Interval between a and b be equal to that between b and c, which happens when $a : b :: c : d$, the Interval between a to c will be double the Interval a to b, or b to c. This being conſidered, it will appear that Intervals ought to be expreſſed by the meaſures of the ratio's, conſtituting the ſounds forming thoſe Intervals: but ratio's are meaſured by the logarithms of fractions, the numerators of which denote the acute ſounds, and the denominators the grave. Hence the Interval between the ſounds a and b will be expreſſed by the logarithm of the fraction $\frac{b}{a}$, which is uſually denoted by $l\frac{b}{a}$, or, which comes to the ſame, $lb - la$. The Interval therefore of equal ſounds, a to a, will be null, as $la - la = o$. The Interval, called an octave or diapaſon, will be expreſſed by the logarithm of 2; and the Interval of the fifth, or diapente, will be $l\,\frac{3}{2} = l\,3 - l\,2$. From whence it appears, that theſe Intervals are incommenſurable: ſo that no Interval, however ſmall, can be an aliquot part, both in the octave and fifth. The like may be ſaid of the Intervals $l\,\frac{3}{2}$ and $l\,\frac{5}{4}$, and others whoſe logarithms are diſſimilar. But Intervals expounded by logarithms of numbers, which are powers of the ſame root, may be compared.—Thus, the Interval of the ſounds 27 : 8, will be to the Interval of the ſounds 9 : 4, as 3 is to 2: for $l\,\frac{27}{8} = 3\,l\,\frac{3}{2}$, and $l\,\frac{9}{4} = 2\,l\,\frac{3}{2}$.

But, though the logarithms of numbers, which are not powers of the ſame root, be incommenſurable, yet an approximating ratio of ſuch may be found. Thus the meaſure of the octave is $l\,2 = 0.3010300$, and the meaſure of the fifth is $l\,3 - l\,2 = 0.1760913$. Hence the Interval of the octave will be to that of the fifth, nearly as 3010300 to 1760913; which ratio, being reduced to ſmaller terms, will give us theſe ſimpler expreſſions for the ratio of the octave and fifth, 2 : 1, 3 : 2, 5 : 3, 7 : 4, 12 : 7, 17 : 10, 29 : 17, 41 : 24, 53 : 31, which laſt is very near the truth. *Euler. Tentam. Nov. Theor. Muſ.*

INTERVALS, in huſbandry, a term uſed to expreſs the ſpaces left between the ſeveral rows of plants ſown or ſet in a garden or field. The method of horſe-hoeing huſbandry, ſo ſtrongly recommended by Mr. Tull, is objected to by many, on account of the largeneſs of the intervals which are to be left between the rows of corn. Theſe are required to be about five feet wide, and it is thought ſuch wide ſpaces are ſo much loſt earth, and that the crop is to be ſo much the leſs for it. But it is to be obſerved, that the rows of corn ſeparated by theſe Intervals need not be ſingle; they may be double, triple, or quadruple, at the pleaſure of the farmer; and four rows, thus ſtanding as one, will have the five feet Interval but one fourth of its bigneſs as to the whole quantity, and it will be but as fifteen ſuch Intervals to plants in ſingle rows. Corn that is ſown irregularly in the common way, ſeems indeed to cover the ground better than that in rows; but this is a mere deceptio viſus, for the ſtalks of corn are never ſo thick as when they come out of one plant, or as when they ſtand in rows; and a horſe-hoed plant of corn will have twenty or thirty ſtalks in a piece of ground of the ſame quantity, where an unhoed plant will have only two or three ſtalks. If theſe ſtalks of the hoed plant were ſeparated and planted over the Intervals, the whole land would be better covered than it is in the common way; and the truth is, that, though theſe hoed fields ſeem to contain a much leſs crop than the common ſown fields, they yet, in reality do contain a much greater. It is only the different placing that makes the ſown crop ſeem the larger, and even this is only while both crops are young. *Tull's Horſe-hoeing Huſbandry.*

INTE'STINAL *Fever*, *febris inteſtinalis*, in medicine, a name given by Heiſter to a peculiar ſpecies of acute fever paſſed over in ſilence by the generality of authors, but by ſome called the meſenteric fever, and by our Sydenham the new fever, nova febris. This differs from other acute fevers, in that it is attended always with a diarrhœa, which however is ſalutary, and which it is very dangerous to ſtop; and in that it is not relieved by the attemperating or diaphoretic medicines uſeful in other fevers, much leſs by the hot ſudorifics; all theſe things exaſperate and make it worſe, and the only things that give relief in it, are gentle cathartics, and vomits that operate without violence. This fever, therefore, evidently ſhews the error of thoſe haſty reaſoners, who declare, that all acute fevers are to be cured by diaphoretics.

This peculiar ſpecies of fever, though unknown to many of the late writers, and called by Sydenham a new diſtemper, was not unknown to the antients. Hippocrates has left many things concerning it, as have alſo the later Greeks and Celſus: and, among the moderns, Duret, Sennertus, Foreſtus, Riverius, Etmuller, Baglivi, Stahl, Hoffman, and Lanſciſci, have all met with it, though they have given but very ſhort and imperfect deſcriptions of it in their writings.

The generality of thoſe who have written of this fever have referred it to the malignant kinds, from its being uſually attended with ſevere and uncommon ſymptoms from the beginning, or from ſuch being brought on in the courſe of an irregular treatment: the common method of curing fevers by diaphoretic medicines bringing on in this anxieties and ſtreightneſs of the precordia, with pains about the ſtomach, loſs of appetite and deliriums, with effloreſcences of various kinds, particularly petechial ſpots; and theſe ſymptoms are not unfrequently attended with death. But it is to be obſerved, that diſeaſes are to be carefully diſtinguiſhed in their own ſymptoms, thoſe which the phyſician brings on being often very different from what nature would offer.

Theſe fevers have their ſeat in the ſtomach and inteſtines; or, if they have it any where elſe, it appears at leaſt that their origin, which is in a putrid colluvies, is always much more eaſily reduced and evacuated by theſe, than by any other paſſages. Many of the diſtempers, mentioned by authors under peculiar names, are properly to be referred, as to their cauſes, to this ſpecies of fever. The dyſenteric fever is abſolutely of this kind, and many of the petechial ones. The catarrhal fevers alſo are referable to this kind; and the continual quotidian and tertian, with the fevers deſcribed by the antients under the names of hemitritæus, aſſodes, elodes, epiala, and lipyria, with the tritophyæ nearly allied to the hemitritæi, and by ſome authors confounded together, the words being uſed as ſynonymous.

The method of cure. All hot medicines muſt be avoided, and the diſcharge of the peccant matter by the diarrhœa promoted by clyſters and by purging medicines. Some adviſe aloes, and other medicines of that kind; others ſena and manna; ſome the purging ſalts; but moſt prefer rhubarb, given in often repeated ſmall doſes. Large draughts of the lubricating decoctions, ſuch as barley water and water gruel, are to be given, and emulſions of ſweet almonds and of the cold ſeeds. Small quantities of oil of ſweet almonds are alſo to be given at times, and juleps of the cooling waters and ſyrups moderately acidulated, and powders of nitre, cinnabar, and the common abſorbents, as crabs-eyes and the like, are to be given to take off the pains and ſpaſms, and to attemperate the acrid matter. Bleeding in this fever is not neceſſary, unleſs in plethoric habits; and in thoſe caſes it muſt be done on the acceſs of the diſeaſe, for, if done after the third or fourth day, it is uſually found to do more harm than good.

The diet in theſe fevers is not to be ſo very thin and weak, as in other acute fevers; but moderate nouriſhment is to be allowed, that the patient may hold his ſtrength ſufficiently to go through it; in the beginning of the diſeaſe however, the patient has uſually an averſion for food, and then it is not to be forced upon him; but, when the ſtomach begins to require it, then it is to be given in a moderate quantity; and great care is to be taken that nothing aſtringent or difficult of digeſtion be allowed, but light and innocent meats, and with theſe a little good wine to promote digeſtion. Some alſo have given frequent vomits, by ſmall doſes of ipecacunaha, in theſe fevers, and that with very good ſucceſs; and it is remarkable, that the purple fever mentioned by Stahl, and others, as particularly affecting lying-in women, and being very frequent in Saxony, for a long time, was by Dr. Wagner, and others, cured by this method: its origin being found to be a viſcous matter, putrifying in the ſtomach and inteſtines; and therefore the diſtemper, being properly one of theſe inteſtinal fevers, was curable by the ſame methods with them, that is, by emptying the primæ viæ. *Heiſter's Compend. Med.*

INTE'STINES (*Dict.*)—The inteſtinal canal, like all other parts of the body, may be ſeized with a true inflammation, the ſigns and effects of which are generally theſe following: a burning, fixed, and pungent pain in the ſtomach; an exacerbation of this pain, at the very time any thing is taken into the ſtomach; a painful vomiting immediately after eating or drinking, accompanied with a tormenting hiccup; a violent and perpetual uneaſineſs about the precordia, and an acute continual fever. The cauſes of this diſorder are either general inflammations, the contiguity of the ſtomach to the other parts inflamed, or the taking acrid ſubſtances into the ſtomach.

An inflammation of the ſtomach generally ſoon proves mortal, unleſs expeditiouſly cured, in conſequence to the injury done to the important function of this part, and the incredible number of nerves connected with it.

Like other inflammations, it terminates either in health, in ſuppuratory, ſcirrhous, cancerous, or gangrenous diſorders, or in the ſudden death of the patient, accelerated by convulſions.

As ſoon as the diſorder is, from its ſigns before enumerated, known to be preſent, we are forthwith, and with the greateſt care, to uſe liberal veneſection, which is to be repeated as neceſſity requires; highly mild, nutritive, emollient, and antiphlogiſtic liquors, of a quality oppoſite to the cauſes of the diſorder: as, alſo, clyſters and fomentations of a like nature. But all acrid ſubſtances, and eſpecially vomits, are carefully to be abſtained from.

A mild and lenitive drink.—Take, of the recent leaves of wood ſorrel, three ounces; of the leaves of mallows, an handful and an half; of entire oats, an ounce; boiled with a ſufficient quantity of whey; to every twelve ounces of which add two yolks of eggs, and one ounce of the rob of currants.

A clyſter.— Take of the recent leaves of endive, ſuccory, fumitory, mallows, and marſh-mallows, each an handful: boil with whey, and, after expreſſing the decoction, uſe ten ounces of it for a clyſter, twice or thrice a day.

If an inflammation of the ſtomach terminates in a ſuppuration, many ſeemingly misfortunes enſue; but eſpecially a nauſea, vomiting, and pain, which, when their cauſe is unknown, are rarely cured; but, when it is known, they are to be treated in the ſame manner with abſceſſes.

When an inflammation of the ſtomach produces a ſcirrhus, or a cancer, it then excites exceſſive vomitings, and intolerable pains, which are heightened and protracted by taking the leaſt thing into the ſtomach, of a fixed nature, and are generated by all acrid medicines.

By mild and lenient medicines alone, this ſpecies of the diſorder may be alleviated, but rarely cured. Medicinal waters are, however, in this caſe, the moſt efficacious means of relief.

From what has been ſaid above, and under the article LIVER, the origin, nature, effect, knowledge, prognoſtic, cure, and palliative cure of inflammations, ſuppurations, gangrenes, ſcirrhuſes, and cancers, of the ſpleen, pancreas, and omentum, may be deduced.

Inflammations of the INTESTINES.—Not only the ſtomach, but alſo the Inteſtines, eſpecially ſmall ones, are often ſubject to an acute inflammation in their membranes. This misfortune is produced by the common cauſes of an inflammation, conveyed to the inteſtines, either, for inſtance, by the acrid matter of liquor drank, of aliments, ſpices and pickles, medicines, or poiſons, taken into the ſtomach, conveyed thence into the Inteſtines, and there retained in their valvulous folds.

This misfortune may, alſo, be produced by an acrid, putrid, fetid, purulent, ichorous, gangrenous, bilious, or atrabilious matter conveyed from the œſophagus, ſtomach, liver, ſpleen, pancreas, and omentum, to the Inteſtines, where it remains and corrodes them. And, laſtly, an inflammation of the Inteſtines may be produced by violent previous convulſions, which create flatulences, ſtop the motion of the fluids, and by that means produce an inflammation.

This diſorder contracts the Inteſtines, cloſes up their cavities, prevents the paſſage of what is conveyed to them, produces highly acute, burning, and fixed pains; excites violent convulſions, when the inflamed part is irritated by the things conveyed to it; renders the patient coſtive, excites a vomiting of the aliments, and of things conveyed to the affected part, ſooner or later, according as the inflammation is near the ſuperior or inferior parts of the Inteſtines; produces painful flatulences, acute gripes accompanied with rumblings, the iliac paſſion, that diſorder called volvulus, an abſceſs, a gangrene, a ſcirrhus, a cancer, a highly acute fever, exceſſive weakneſs, in conſequence of the intenſe pain, and ſudden death.

So long as the diſorder continues in its inflammatory ſtate, it is, by the ignorant and unſkilful, taken for a twiſting of the Inteſtines; and, being, through a dangerous miſtake, aſcribed to cold, flatulences, and wind, is, for that reaſon, treated with hot medicines, a practice which proves fatal to the patient.

But a genuine inflammation of the Inteſtines is known from its concomitant continual acute fever, intenſe thirſt, exceſſive heat, a hard pulſe, a burning pain, high-coloured urine, and the induction of a ſudden weakneſs.

When an inflammation ſeizes the flexure of the colon, the diſorder reſembles the cholic; but, if it ſeizes the extremity of the inteſtinum rectum, it is generally taken for the blind hæmorrhoids; in which caſe, its moſt happy termination is by a mild, bloody, and bilious dyſentery.

As ſoon as an inflammation of the Inteſtines is known to be preſent, from the ſigns before enumerated, we are, in its firſt ſtage, with the greateſt expedition, to attempt its cure; which is to be obtained, firſt, by liberal and repeated venſection, as in a pleuriſy; ſecondly, by the careful injection of laxative, diluting, and antiphlogiſtic clyſters, repeated three, four, or more times a day; thirdly, by the frequent drinking of liquors of a laxative, diluting, and antiphlogiſtic nature, with a prudent addition of opium, and ſuch things as are oppoſite to the particular known cauſe of the diſorder; fourthly, by fomentations prepared of ſubſtances of like qualities applied to the whole abdomen, and eſpecially fomentations conſiſting of young, vigorous, and ſound animals; fifthly, by carefully abſtaining from all kinds of drink, aliments, or medicines which are of an acrid, hot nature, or capable of increaſing the impetus of the fluids; as, alſo, by avoiding exerciſe, and the exorbitancies of the paſſions: and, ſixthly, by perſiſting in the uſe of theſe things, till the intire diſorder is removed, and does not return in three days.

If this diſeaſe is not cured by proper remedies, and continues to rage with violence longer than three days, the pain, heat, and diſtraction, are ſucceeded by a ſhivering through the whole body, without any apparent cauſe, and by an obtuſe pain, with a ſenſation of weight in the part affected; theſe are ſigns, that the abſceſs is forming in it: within fourteen days after, the abſceſs breaking, the pus will be diſcharged: if this pus is diſcharged into the cavities of the abdomen, it produces many diſorders ſimilar to thoſe ariſing from the diſcharge of pus from the liver, and mentioned under the article LIVER: but, if this pus is diſcharged into the cavities of the Inteſtines, it produces a purulent dyſentery, ſmall or great, ſhort or long, according to the nature of the ulcer formed. In this caſe, intire membranes of the Inteſtines are frequently diſcharged, and a conſumption is often brought on.

As ſoon as an inflammation of the Inteſtines is known to be preſent, all ſuch aliments are carefully to be abſtained from, as are capable of generating a large quantity of hard and thick fæces: the patient is only to be nouriſhed with broths boiled with gently detergent roots; balſamic detergent decoctions are to be copiouſly drank, and injected by way of clyſters; or medicinal waters are to be copiouſly drank, and their uſe perſiſted in till a perfect cure is brought about.

The following aliment ſhould be uſed in this diſorder:--Take, of the roots of viper's graſs, goat's beard, ſkirret, parſley, and ſuccory, each two ounces: boil in fleſh broth, and, with every thirty ounces of the broth, mix two yolks of eggs, and a ſufficient quantity of ſalt.

The following decoction will be alſo of great ſervice:

Take, of the roots of garden valerian, two ounces; of the leaves of lovage, two handfuls; of the flowers of St. John's wort, one handful, and of the flowers of agrimony, two ounces: boil with two pints of water; of which let the patient drink two ounces every hour. This decoction is alſo to be uſed as a clyſter.

INVOLU'CRUM, among botaniſts, expreſſes that ſort of cup which ſurrounds a number of flowers together, every one of which, has, beſide this general cup, its own particular perianthium. The Involucrum conſiſts of a multitude of little leaves diſpoſed in a radiated manner. See the article CALYX.

JOINT, in anatomy; ſee ARTICULATION, in the Dictionary.

Pains in the JOINTS.— Thoſe pains of the Joints, which are accompanied with inflammation and tumor, have an affinity with the gout. The proper method of curing them is by bleeding, bliſtering the parts affected, and, unleſs the fever runs high, by purging. If there be no fever, or but a ſlight one, a mixture of equal parts of gum guaiacum and cinnabar of antimony will produce a very good medicine, both to open the body and correct the acrimony of the tumors. It ſhould be given ſo as to procure two ſtools at leaſt every day.

Of all theſe pains, the moſt ſevere is that which the Greeks name ἰσχιὰς (and we corruptly ſciatica) becauſe it ſeizeth the hips; and it is attended with the greater difficulty, becauſe it is moſt commonly the conſequence of chronical diſeaſes, by the morbid matter being thrown on this part. This diſeaſe, when grown inveterate, weakens the thigh and leg, and makes the patient lame; and ſometimes alſo the head of the thigh-bone ſlips out of the ſocket, and then the thigh ſoon waſtes away.

In this diſeaſe little is to be expected from cupping or bliſtering the part: for the acrid humour lies too deep fixed in the membrane ſurrounding the bone, to be drawn out by theſe means. More efficacious is the volatile epithem, or a plaiſter compoſed of Burgundy pitch, with about an eighth part of euphorbium, and a ſufficient quantity of Venice turpentine. But nothing gives ſo much relief, in an obſtinate caſe eſpecially, as a ſeton paſſed below the part affected, in order to give vent to the morbid humour. But, if this operation be thought too cruel and troubleſome for the neceſſity of it, it will be of uſe to make an iſſue with a cauſtic in the inſide of the thigh above the knee; which muſt be kept open till the diſorder is quite removed. Hippocrates adviſes to apply the actual cautery in three or four places upon the hip. And indeed no remedy would be more efficacious than this, if patients could be reconciled to it: for, how terrifying ſoever the ſight of red-hot iron may appear, the pain from the application of it would be much ſooner over, than that which is raiſed by the common cauſtics.

The fleſh-bruſh ought likewiſe to be uſed ſeveral times every day, in order to facilitate the digeſtion and diſſipation of the concreted humour; and more eſpecially on the very hips, if practicable. But fomenting the part affected with warm water is generally prejudicial: becauſe this brings on a relaxation of the fibres, whereby the pain is increaſed.

I now paſs to internal remedies, the chief of which are bleeding and purging. Of cathartics, the moſt efficacious are dulcified mercury ſix times ſublimed, and the electuary of ſcammony; either of which muſt be often repeated, according to the patient's ſtrength. And, in the intermediate days of purging, the proper medicines are ſuch as are diuretic and laxative at the ſame time. Of this claſs I give the preference to the volatile tincture of gum guaiacum, or the balſam of guaiacum. *Mead's Monita & Præcepta.*

JOINT *cartilage, or articulating cartilage.* An articulating cartilage is an elaſtic ſubſtance, uniformly compact, of a white colour and ſomewhat diaphanous, having a ſmooth poliſhed ſurface covered with a membrane, harder and more brittle than a ligament, but ſofter and more pliable than a bone. *Phil. Tranſ.* N°. 469.

IO PÆ'AN, among the ancients, an exclamation uſed on account of a victory, or ſome proſperous event. Hoffman thinks that Io Pæan is a contraction of the Hebrew Jao, from Jehovah, and פנה, reſpexit; and was the ſame with Jehovah penoch, i. e. Dominus reſpiciat in nos. Something like this exclamation ſtill remains among the Symerones, a people of the Weſt-Indies, who, on any joyful occaſion, frequently cry out Yo Peho. *Hoff. Lex. in voc.*

IO'TA, a letter in the Greek alphabet, which derives its name from the jod of the Hebrew, or rather of the joda of the Chaldeans. Our Saviour mentions it, by ſaying, there ſhould not be an Iota, or tittle in the law, but ſhould be accompliſhed: ſo that whatever was foretold by Moſes, and the prophets, ſhould be exactly fulfilled; meaning nothing ſhould be wanting, becauſe Iota was the ſmalleſt letter in the Greek alphabet, as jod is in the Hebrew: they both ſtand for 10, in numbering.

JOU'I. This is an alimentary and reſtorative liquor, prepared in Japan, and capable of being preſerved ten or a dozen years. It is fluid like broth, aqueous, black, of an agreeable ſmell, and good taſte, ſalt, and ſavoury. With reſpect to the manner of preparing it, no more is known, than that it is made of the gravy of beef, expreſſed when half roaſted: the Japoneſe keep the reſt a ſecret, and ſell it very dear. This liquor is very rare in Europe: ſome, however, is imported either on account of curioſity or luxury. It is thought to be a reſtorative after diſeaſes, and, on this account, is eſteemed greatly all over the Eaſt.

I'RIS (*Dict.*)—Mr. Sharp gives the following account of an operation upon this membrane, which he calls cutting the Iris.

There are two caſes, ſays he, where this operation may be of ſome ſervice; one, when the cataract is from its adheſion immoveable; and the other when the pupil of the eye is totally cloſed up by a diſorder of the muſcular fibres of the Iris, which, gradually contracting the orifice, at laſt leaves the membrane quite imperforate. This laſt diſtemper has hitherto been deemed incurable. The adheſion of the cataract I have conſidered as a ſpecies of blindneſs not to be relieved: but Mr. Cheſleden has invented a method of making an artificial pupil, by ſlitting the Iris, which may relieve in both the inſtances here ſtated.

In performing this operation, the patient muſt be placed as for couching, and the eye kept open, and fixed by the ſpeculum oculis, which is abſolutely neceſſary here, for the very reaſon I would diſcard it in the other, ſince the flaccidity of the membrane from the iſſue of the aqueous humour would take away its proper reſiſtance to the knife, and make it, inſtead of being cut through, tear from the ligamentum ciliare; then, introducing the knife in the ſame part of the conjunctiva you wound in couching, inſinuate it, with its blade held horizontally, and the back of it towards you, between the ligamentum ciliare and the circumference of the Iris, into the anterior chamber of the eye; and, after it is advanced into the farther ſide of it, make your inciſion quite through the membrane; and, if the operation ſucceeds, it will, upon wounding, fly open, and appear a large orifice, though not ſo wide as it becomes afterwards.

The place to be opened in the Iris will be according to the nature of the diſeaſe: if the membrane itſelf be only affected with a contraction, the middle part of it, which is the natural ſituation of the pupil, muſt be cut; but, if there be a cataract, the inciſion muſt be made above or below the cataract, though I think it more eligible to make it above.

The contracted Iris, from a paralytic diſorder, is ſo often complicated with an affection of the retina, that the ſucceſs is very precarious in this caſe. This operation, by what I have ſeen, has anſwered beſt in adheſions of the cryſtalline humour; though, to ſpeak truly, but very ſeldom even there. As I would not miſlead any one in an operation not yet much known in the world, I do confeſs, that either the danger of the Iris ſeparating from the ligamentum ciliare, or of the wound not inlarging ſufficiently, do, upon the whole, make the event very doubtful. I once performed it with tolerable good ſucceſs, but, a few months after, the very orifice I had made, contracted, and brought on blindneſs again.

I have not here once uſed the word uvea, but have made mention of the ligamentum ciliare; both which parts are little underſtood, for want of proper explanation; but which muſt be rightly conceived of, in order to underſtand what has been ſaid.

The generality of anatomiſts call that membrane, which I have ſpoke of under the name of Iris, the uvea, and its anterior lamina, the Iris: others, again, call the membrane uvea; and the colour of it, Iris: but both one and the other diſtinction confound learners exceedingly, and take their riſe from a want of proper attention to the hiſtory of anatomy. The antients, who have given moſt of the names we now employ in the deſcription of the eye, were verſed principally, if not altogether, in the diſſection of brutes; among which, thoſe of the graminivorous kind have a party-coloured choroides, one half of it being dark, and the other of a light ſhining green: this laſt, from its reſemblance to an unripe grape, was called the uvea; but the ſucceeding writers, among the moderns, applying themſelves to human diſſections only, and not duly conſidering the difference of the human choroides, which is nearly of an uniform colour, and of that above deſcribed, have retained the appellation, though we have not the thing. Hence has aroſe the great variety of miſapplications of this word, which ought no more to be ſpoke of in the anatomy of the human eye, than the tunica nictitans, which is proper to certain beaſts and birds.

The ligamentum ciliare is that circular line on the globe of the eye, where the ſclerotis, choroides, retina, cornea, proceſſus ciliares, and Iris, terminate and unite together, forming a whitiſh ring ſomewhat denſer than any other part of the coats; but, ſince the inſtitution of this term, the deſcription of the part it implies has been very much neglected, and the term itſelf confounded with the proceſſus ciliares: wherefore it was neceſſary to define it, that the proceſs of the operation of the Iris might be better underſtood. *Sharp's Surgery.*

Iris, in botany, a genus of plants, whoſe characters, according to Tournefort, are theſe: the flower is liliaceous, conſiſting of one leaf, and being of a tubular ſhape at the bottom: hence it is expanded and enlarged, and forms ſix parts, three of which point upwards, and three downwards. The piſtil ariſes from the bottom of the flower, and is furniſhed with three petals, which are arched, and ſo bent down upon the reflex leaves of the flower, that they reſemble a ſort of palate: the flower cup finally becomes an oblong fruit, which opens into three parts at the end, and is ſeen to be divided into three cells, which contain roundiſh and ſometimes flattiſh ſeeds. To this it is to be added, that the root is fleſhy, oblong, and of the creeping kind, and not covered with coats.

We have a great many ſpecies of this plant preſerved in gardens, and moſt of them very beautiful: their roots are tuberous, and increaſe very faſt, and all the ſpecies are eaſily propagated by parting them. The beſt ſeaſon for doing which is in Auguſt, when their flower leaves are decayed, and the whole plant begins to change colour; but this ſhould always be done when the weather is moiſt, ſo that, if the month of Auguſt ſhould prove very dry, it ſhould be deferred till September, though it is beſt to do it ſooner, if it can be. They all love a ſhady and moiſt place. If too much dung is uſed to the ground, it rots their roots; and, if they ſtand expoſed to the ſun, their flowers are but of very ſhort duration. They ſhould be taken up once in two years, to prevent their extending their roots too far; for they are very apt to ſpread, and to harbour all ſorts of vermin.

The curious may raiſe their ſeveral ſpecies from their ſeeds, which if taken from the choiceſt flowers, and cultivated with care, uſually afford a fine variety in the flowers of the plants thus produced: they ſhould be ſown, ſoon after they are ripe, on an eaſt border; they will come up in ſpring, and the year following will flower. *Miller's Gard. Dict.*

I'RON (*Dict.*)— Iron may be produced from its ore in a cloſe veſſel, in the following manner: roaſt, for a few minutes, in a teſt, placed under a muffel in a pretty ſtrong fire, two centners of iron ore groſly powdered, that the volatile particles may be in part diſſipated, and the ore ſoftened, in caſe it be too hard. When it is grown cold, beat it to a very fine powder, and roaſt it a ſecond time in a ſtronger fire till it emits no ſmell; then take it out of the fire.

Compoſe a flux of the parts of the common white flux, and one part of powdered glaſs; and add of ſandiver and coal-duſt of each one half part. Add of this flux three times the quantity of the roaſted ore, and mix the whole very well together; then take a good crucible well luted within, and put into it the ore mixed with flux; cover it with common ſalt, and ſhut it cloſe with a tile, and with the lute applied to the joints. Put the common wind furnace upon its bottom part, having a bed made of coal-duſt; introduce into the furnace a ſmall grate ſupported on its Iron bars, and a ſtone upon it whereon the crucible may ſtand; ſurround the whole with hard coals, not very large, and light them at top. Make the fire very ſtrong, and continue to add freſh fuel, that the veſſel may never be naked at top. When the fire has thus been continued in its full ſtrength for an hour, take out the veſſel, and ſtrike on the floor where it ſtands, to collect all the particles of Iron into a body; and, when cold, break the veſſel, and you will find the pure Iron. *Cramer's Art of Aſſaying.*

Several attempts have been made to run Iron ore with pit coal, but we meet with no account of the ſucceſs of ſuch attempts: however, Mr. Maſon informs us, that, at Colebrook-Dale in Shropſhire, Mr. Ford makes iron brittle or tough as he pleaſes, from Iron ore and coal, both got in the ſame dale; there being cannon, thus caſt, ſo ſoft as to bear turning like wrought Iron. *Phil. Tranſ.* N°. 482.

For the method of caſting Iron; ſee FORGE.

Iron *furnaces.*— Theſe furnaces, as they are employed in running the moſt difficult of all metals, ſo they are, of all others, contrived the largeſt, and capable of carrying heat to the greateſt degree. When they are to be uſed, they are firſt filled up to the top with coals; and, the lower part being lighted, the top, and all other parts of the furnace where the air could have paſſage, are cloſed firmly up with Iron-plates laid one over another. The conſequence of this is, that the fire is put out, and the whole is kept in this ſtate ten or twelve days. At the end of this time the furnace is opened, and the coals are found all black, without a ſingle ſpark of fire in any part, yet extremely hot, and reduced to a tenth part of their quantity. When the furnace has been thus opened about a quarter of an hour, the matter begins to take fire of itſelf by the mere contact of the air. The firſt appearance of this is very remarkable; there ariſes a very bright flame from ſome of the coals, which plays about their ſurface, and ſpreads itſelf from one to another, without the appearance of the leaſt ſpark of fire in any part of any of the coals. The ore of the Iron is, for the firſt day, put only in the middle of the furnace, and that but in ſmall quantity; the next day more, and every day afterwards more and more is put on, and by degrees it is ſpread over the whole ſurface of the furnace to the edges. This is the method of working the ore to the utmoſt advantage, and with the moſt diſpatch. The whole proceſs for one furnace of ore is finiſhed in about eight days from the time of opening the top; all the uſe of the firſt quantity of coal is only thoroughly to warm the ſides and walls of the furnace; and it is, after this, to be kept carefully ſupplied with fuel, and the ore only out toward the ſides, as the extreme heat, moſt ſenſibly in the center, increaſes. If too much be laid on of the ore at firſt, there is always a loſs from the quantity of metal. The quantity of the coals, neceſſary to any given quantity of the ore, differs in proportion to the advantageous or faulty ſtructure of the furnace. In the very beſt conſtructed ones, the weight of the coals and of the ore need be no more than equal. The flame which makes its way out of the bottom of the furnace, is of different colours, according to the natures of the ore and of the coals; ſometimes red, ſometimes yellow, and ſometimes green. That which iſſues out from the top of the furnace is of a red colour, and aſcends in a ſort of ſpiral line, reſembling the ſound of diſtant falls of waters, as it mounts up. With all the care that can be taken to heat the ſides of the furnace, and to keep them hot, the middle is always greatly the hotteſt, and the ore ſooneſt runs into metal there. *Swedenborg. de Ferro & Igni.*

IRON *works.* See FORGE.

IRREDU'CIBLE *caſe*, in algebra, is uſed for that caſe of cubic equations where the root, according to Cardan's rules, appears under an impoſſible or imaginary form, and yet is real. Thus, in the equation, $x^3 - 90x - 100 = 0$, the root, according to Cardan's rule, will be $x = \sqrt[3]{50 + \sqrt{-24500}} + \sqrt[3]{50 - \sqrt{-24500}}$, which is an impoſſible expreſſion, and yet one root is equal to 10; and the other two roots of the equation are alſo real. Algebraiſts, for two centuries, have in vain endeavoured to reſolve this caſe, and bring it under a real form; and the queſtion is not leſs famous among them, than the ſquaring of the circle is among geometers.

It is to be obſerved, that, as in ſome other caſes of cubic equations, the value of the root, though rational, is found under an irrational or ſurd form; becauſe the root in this caſe is compounded of two equal ſurds with contrary ſigns, which deſtroy each other; as, if $x = 5 + \sqrt{5} + 5 - \sqrt{5}$, then $x = 10$; in like manner, in the Irreducible caſe, when the root is rational, there are two equal imaginary quantities, with contrary ſigns, joined to real quantities; ſo that the imaginary quantities deſtroy each other. Thus the expreſſion: $\sqrt[3]{50 + \sqrt{-24500}} = 5 + \sqrt{-5}$; and $\sqrt[3]{50 - \sqrt{-24500}} = 5 - \sqrt{-5}$. But $5 + \sqrt{-5} + 5 - \sqrt{-5} = 10 = x$, the root of the propoſed equation.

Dr. Wallis ſeems to have intended to ſhew, that there is no caſe of cubic equations Irreducible, or impracticable, as he calls it, notwithſtanding the common opinion to the contrary.

Thus, in the equation, $r^3 - 63r = 162$, where the value of the root, according to Cardan's rule, is, $r = \sqrt[3]{81 + \sqrt{-2700}} + \sqrt[3]{81 - \sqrt{-2700}}$, the doctor ſays, that the cubic root of $81 + \sqrt{-2700}$ may be extracted by another impoſſible binomial, viz. by $\frac{9}{2} + \frac{1}{2}\sqrt{-3}$; and in the ſame manner, that the cubic root of $81 - \sqrt{-2700}$ may be extracted, and is equal to $\frac{9}{2} - \frac{1}{2}\sqrt{-3}$; from whence he infers, that $\frac{9}{2} + \frac{1}{2}\sqrt{-3} + \frac{9}{2} - \frac{1}{2}\sqrt{-3} = 9$ is one of the roots of the equation propoſed. And this is true: but thoſe who will conſult his Algebra, p. 190, 191, will find that the rule he gives is nothing but a trial, both in determining that part of the root which is without a radical ſign, and that part which is within: and if the original equation had been ſuch as to have its roots irrational, his trial would never have ſucceeded. Beſides, it is certain, that the extracting the cube root of $81 + \sqrt{-2700}$ is of the ſame degree of difficulty, as the extracting the root of the original equation $r^3 - 63r = 162$; and that both require the triſection of an angle for a perfect ſolution. *See M. de Moivre in the Appendix to Saunderſon's Algebra.*

ISA'TIS, *woad*, in botany, a genus of plants, whoſe characters are:

The flower conſiſts of four leaves, which are diſpoſed in form of a croſs; out of whoſe flower-cup riſes the pointal, which afterward turns to a fruit in the ſhape of a tongue, flat at the edges, gaping two ways, having but one cell; in which is contained, for the moſt part, one oblong ſeed.

Woad is commonly ſown upon a lay, which they plow into high ridges, except the land be very dry; and they harrow the turf till they break it to pieces, and pick out all the graſs, weeds, and lumps of earth, and fling them into the furrows to rot.

The land for this ſeed ought to be finely plowed and harrowed, and all the clods and turfs broken, and the ſtones picked up, and carried off.

The beſt time for ſowing it is the latter end of July, ſoon after the ſeed is ripe; which will come up in Auguſt, and muſt be hoed out, as is practiſed for turneps, leaving the plants ten or twelve inches aſunder; by which means they will grow ſtrong, and produce much larger leaves; and beſides, that ſown at this ſeaſon doth ſeldom miſcarry; whereas that which is ſown in the ſpring will be very liable thereto; and if it doth not, the plant will not have half the ſtrength the firſt ſummer.

It ought to be kept conſtantly weeded; but if it come up good, it will need the leſs weeding: the ordinary price of weeding is eight ſhillings per acre.

Some recommend the ſowing of it about the beginning of February; for which they give this reaſon, that whereas it is apt to be ſpoiled by the fly and grub, it eſcapes the better being early ſown; and if they do kill any of it, they have the better opportunity of ſowing more.

They do this by making holes with a ſtick about ſeven or eight inches aſunder, and put five or ſix ſeeds into each hole. They ſeldom or never ſow it more than two years upon the ſame piece of land; becauſe, if it be long continued, it robs the ſoil: but if it be moderately uſed, it prepares land for corn; and where the ſoil is rank, it abates the too great fertility of it.

It is ripe, when the leaf is come to its full growth, and retains its perfect colour and lively greenneſs; which is ſometimes ſooner, and ſometimes later, as the year proves dry or moiſt. As ſoon as it is fit to cut, it ſhould be done with all the ſpeed that poſſibly may be, that it may not fade, or grow pale; and when it is cut, it ought to be immediately carried to the mill. The manner of doing which, and the way of ordering it, is beſt learned from experienced workmen, and is not to be truſted to a verbal deſcription of it.

In plowing it up, and ſowing it again, they pick up all the old roots, as they harrow it, except what they deſign for ſeed, which they let ſtand to the next year: it many times produces fifty quarters upon an acre.

They always keep a good quantity of ſeed by them, to plant the ground that fails: the ſeed of two years will ſometimes grow; but as it is apt to fail, it is better to ſow that of the firſt. And if they ſow or plant it late, if the ground be dry and hard, they ſteep it in water the day before they ſow it, which cauſes it to come up the ſooner.

Good woad may yield five or ſix crops in a plentiful year; though it ordinarily yields but four, ſometimes but three; eſpecially if it be let ſtand to grow for ſeed: but what grows in winter they do not uſe, though it is very good and very cheap. The two firſt crops are the beſt, which are uſually mixed in the ſeaſoning. The latter crops are much the worſe; which, if mixed with either of the former crops, ſpoil the whole.

It many times ſells from ſix pounds to thirty pounds a ton, an acre commonly yielding about a ton. *Miller's Gard. Dict.*

ISCHNA'MBLUCIS *, in natural hiſtory, the name of a genus of foſſils of the claſs of the ſelenitæ, but one of thoſe which are of a columnar form, not of the common rhomboidal one.

* The word is derived from the Greek, ἰσχνὸς, thin, ἀμβλὺς, blunt or obtuſe, and χιὼν, a column; and expreſſes a body in form of a thin or flatted column, with obtuſe ends.

The characters of this genus are: that the bodies of it are of a flatted columnar form, and octohedral in figure, conſiſting of ſix long planes, and two abrupt or broken ends; the whole being of a flatted figure. The top and bottom planes are much broader than the reſt; the four other planes, called the ſides, are narrower than theſe, but are uſually of very near the ſame breadth with one another, as are alſo theſe tops and bottoms, ſo that the whole figure comes very near an hexaedral priſm. *Hill's Hiſt. of Foſſ.*

I'SIA, feaſts and ſacrifices antiently ſolemnized in honour of the goddeſs Iſis. The Iſia were full of abominable impurities; and for that reaſon, thoſe who were initiated were obliged to take an oath of ſecrecy. They held for nine days ſucceſſively, but were ſo abominable, that the ſenate aboliſhed them at Rome, under the conſulate of Piſo and Gabinius. Two hundred years after, they were re-eſtabliſhed by the emperor Commodus, who himſelf aſſiſted at them. *Dict. Trevoux.*

I'SLAND *Cryſtal*, a body famous among the writers on optics for its property of a double refraction; but very improperly called by that name, as it has none of the diſtinguiſhing characters of cryſtal, and is plainly a body of another claſs. Dr. Hill has reduced it to its proper claſs, and determined it to be of a genus of ſpars, which he has called, from their figure, parallellopipedia, and of which he has deſcribed ſeveral ſpecies, all of which, as well as ſome other bodies of a different genus, have the ſame properties. Bartholine, Huygens, and Sir Iſaac Newton, have deſcribed the body at large, but have accounted it either a cryſtal or a talc; errors which could not have happened, had the criterions of foſſils been at that time fixed; ſince Sir Iſaac Newton has recorded its property of making an ebullition with aqua-fortis, which alone muſt prove that it is neither talc nor cryſtal, both bodies being wholly unaffected by that menſtruum.

It is always found in form of an oblique parallellopiped, with ſix ſides, and is found of various ſizes, from a quarter of an inch to three inches or more in diameter. It is pellucid, and not much leſs bright than the pureſt cryſtal, and its planes are all tolerably ſmooth, though, when nicely viewed, they are found to be waved with crooked lines made by the edges of imperfect plates. What appears very ſingular in the ſtructure of this body is, that all the ſurfaces are placed in the ſame manner, and conſequently it will ſplit off into thin plates, either horizontally or perpendicularly; but this is found, on a microſcopic examination, to be owing to the regularity of figure, ſmoothneſs of ſurface, and nice joining of the ſeveral ſmall parallellopiped concretions, of which the whole is compoſed; and to the ſame cauſe is probably owing its remarkable property in refraction. *Hill's Hiſt. of Foſſ.*

ISOPERIME'TRICAL (*Dict.*)—Iſoperimetrical lines and figures have greatly engaged the attention of mathematicians, ſince the invention of fluxions. The analyſis of the general problem concerning figures, that all thoſe of the ſame perimeter produce maxima and minima, was given by Mr. James Bernouilli, from computations that involve ſecond and third fluxions. And ſeveral inquiries of this nature have been ſince proſecuted in like manner, but not always with equal ſucceſs. Mr. Mac Laurin, to vindicate the doctrine of fluxions from the imputation of uncertainty, or obſcurity, has illuſtrated this ſubject, which is commonly conſidered as one of the moſt abſtruſe parts of this doctrine, by giving the reſolution and compoſition of theſe problems by firſt fluxions only; and in a manner that ſuggeſts a ſynthetic demonſtration, ſerving to verify the ſolution.

ISO'RA, *the ſcrew-tree*, in botany, a genus of trees, whoſe characters are:

It hath a ſpreading anomalous flower, conſiſting of one or many leaves, divided into ſeveral parts, and appearing like two lips: from the bottom of the flower ariſes the pointal, whoſe apex afterwards becomes a twiſted fruit, conſiſting of many cells, which are intorted like a ſcrew; in which are contained ſeveral almoſt kidney-ſhaped ſeeds.

The name Iſora, which father Plumier has given to this genus, is the Indian name for the plant; but by the Engliſh inhabitants of America, it is called ſcrew-tree, from the form of the fruit, which is twiſted like a ſcrew.

JU'GLANS, *the walnut*, in botany, a genus of trees, whoſe characters are:

It hath male flowers or catkins, which are produced at remote diſtances from the fruit on the ſame tree: the female flowers grow two or three together, cloſe to the branches: theſe are divided into four acute ſegments: the pointal is ſituated in the bottom of the empalement, which turns to a large nut covered with a thick green coat: the nut is deeply furrowed, and divided in the middle, containing a kernel having four lobes, which is covered with a thin ſkin.

This genus of plants has been univerſally intitled nux juglans, till Dr. Linnæus altered it to this of Juglans, the other being a compound name.

All the ſorts of walnuts which are propagated for timber, ſhould be ſown in the places where they are to remain; for theſe trees always incline downwards; which, being ſtopped or broken, prevent their aſpiring upward; ſo that they afterwards divaricate into branches, and become low ſpreading trees: but ſuch as are propagated for fruit, are greatly mended by tranſplanting; for hereby they are rendered more fruitful, and their fruit are generally larger and fairer; it being a common obſervation, that downright roots greatly encourage the luxuriant growth of timber in all ſorts of trees; but ſuch trees as have their roots ſpreading near the ſurface of the ground, are always the moſt fruitful.

The nuts ſhould be preſerved in their outer-covers in dry ſand until February; when they ſhould be planted in lines, at the diſtance you intend them to remain; but in the rows they may be placed pretty cloſe, for fear the nuts ſhould miſcarry; and the young trees, where they are too thick, may be removed, after they have grown three or four years, leaving the remainder at the diſtance where they are to ſtand.

In tranſplanting theſe trees, you ſhould always obſerve never to prune either their roots or branches, both which are very injurious to them; nor ſhould you be too buſy in lopping or pruning the branches of theſe trees; for it often cauſes them to decay: but when there is a neceſſity of cutting any of their branches off, it ſhould be done early in September, that the wound may heal over before the cold increaſes; and the branches ſhould always be cut off quite cloſe to the trunk, otherwiſe the ſtump which is left will decay, and rot the body of the tree.

The beſt ſeaſon for tranſplanting theſe trees is as ſoon as the leaves begin to decay; at which time, if they are carefully taken up, and their branches preſerved intire, there will be little danger of their ſucceeding, although they are eight or ten years old, as I have ſeveral times experienced.

This tree delights in a firm rich loamy ſoil, or ſuch as is inclinable to chalk or marl; and will thrive very well in ſtony ground, and on chalky hills, as may be ſeen by thoſe large plantations near Leatherhead, Godſtone, and Carſhalton in Surry, where are great numbers of theſe trees planted upon the downs; which annually produce large quantities of fruit, to the great advantage of their owners; one of which, I have been told, farms the fruit of his trees, to thoſe who ſupply the markets, for thirty pounds per annum.

The diſtance theſe trees ſhould be placed, ought not to be leſs than forty feet, eſpecially if regard be had to their fruit; though, when they are really deſigned for timber, if they ſtand near, it promotes their upright growth. The black Virginian walnut is much more inclinable to grow upright than the common ſort; and the wood, being generally of a more beautiful grain, renders it preferable to that, and better worth cultivating. I have ſeen ſome of this wood, which hath been beautifully veined with black and white; which, when poliſhed, has appeared at a diſtance like veined marble. This wood is greatly eſteemed by the cabinet-makers for inlaying, as alſo for bedſteads, ſtools, tables, and cabinets; and is one of the moſt durable woods for thoſe purpoſes yet known, it being rarely infected with inſects of any kind, which may proceed from its extraordinary bitterneſs; but it is not proper for buildings of ſtrength, it being of a moſt brittle nature, and exceeding ſubject to break very ſhort, though it commonly gives notice thereof, by its cracking ſome time before it breaks.

The general opinion, that the beating of this fruit improves the trees, I do not believe, ſince, in the doing of this, the younger branches are generally broken and deſtroyed: but as it would be exceeding troubleſome to gather it by hand, ſo in beating it off, great care ſhould be taken that it be not done with violence, for the reaſon before aſſigned. In order to preſerve the fruit, it ſhould remain upon the trees till it is thorough ripe; when it ſhould be beaten down, and laid in heaps for two or three days; after which they ſhould be ſpread abroad, when, in a little time, their huſks will eaſily part from the ſhells: then you muſt dry them well in the ſun, and lay them up in a dry place, where mice or other vermin cannot come to them: in which place they will remain good for four or five months: but there are ſome perſons who put their walnuts into an oven, gently heated, where they let them remain four or five hours to dry; and then they put them up in oil jars, or any other cloſe veſſel, mixing them with dry ſand; by which method they will keep good ſix months. The putting of them in the oven is, to dry the germ, and prevent their ſprouting: but, if the oven is too hot, it will cauſe them to ſhrink; therefore, great care muſt be had to that. *Miller's Gard. Dict.*

Concrete JUICES, in minerology, a name given by many authors to ſuch ſubſtances found in the bowels of the earth, as have once been in a ſtate of fluidity, and are capable of being rendered fluid again by art, by means of heat, moiſture, or other common agents.

Others apply the word concrete to all thoſe ſubſtances which may be ſeparated from fluids by chemical operations, whether they are afterwards ſoluble in them again or not; ſuch are the principles of ſpar ſeparated from water by a ſlow diſtillation, and remaining at the bottom of the veſſel.

Mineral JUICES.— Many countries afford theſe, and give marks by them of treaſures that might be turned to great account, were the proper manner of aſſaying them known; which is, by firſt properly reducing them to a dry ſubſtance, ſo as to come at the ſolid matter they contain. With a view to the diſcovery of metallic veins, the erection of ſalt works, vitriol works, allum works, borax works, and the like, the curious on this ſubject may find many excellent hints for further diſcoveries in the cloſe of Agricola's work, De re metallica; and the view is farther carried on by Boyle, Becher, Stahl, and Homberg. The Royal Academy of Paris have alſo given ſome hints that may be of uſe, in their Memoirs; and ſome practical things are recorded in the Philoſophical Tranſactions.

I'VORY (*Dict.*)—A green dye may be given to Ivory by ſteeping it in aqua-fortis tinged with copper or verdigreaſe.

And by converting the aqua-fortis into aqua-regia, by diſſolving a fourth part of its weight of ſal ammoniac in it, ivory may be ſtained of a fine purple colour. *Boyle's Works abr.*

JUSTI'CIARY *court*, in Scotland. The court of Juſticiary, has ſupreme juriſdiction in all criminal cauſes. It came in place of that of juſtice eyre, or juſtice general, which was laſt in the perſon of the earl of Argyle, who tranſacted for it with king Charles the Firſt, and was made juſtice general of all the iſlands; which raiſing great debates between him and ſome hereditary ſheriffs there, the juriſdiction was taken away in 1672, and this court of Juſticiary erected inſtead of it, conſiſting of a juſtice general, alterable at the king's pleaſure; a juſtice clerk, and five other judges, who are likewiſe lords of the ſeſſion.

This court commonly ſits on Mondays, and has an ordinary clerk, who has his commiſſion from the juſtice clerk. They have four ordinary macers and a doomſter, appointed by the lords of the ſeſſion.

JUSTS, a combat on horſeback, man againſt man, armed with lances. Antiently juſts and tournaments made a part of the entertainment at all ſolemn feaſts and rejoicings. The Spaniards borrowed theſe exerciſes from the Moors, and call them the cane plays. This is the ſame with the ludus Trojanus, antiently practiſed by the youth. The Turks uſe it ſtill, and call it lancing the gerid. The difference between juſts and tournaments conſiſts in this, that the latter is the genus, of which the former is the ſpecies. Tournaments were all kinds of military races and engagements, made out of gallantry and diverſion. Juſts were ſuch particular combats, where parties were near each other, and engaged with lance and ſword: the tournaments were frequently performed by a number of chevaliers, who fought in a body. The Juſts was a ſingle combat of one man againſt another; though the Juſts were uſually made in a tournament, after the general re-encounter of all the cavaliers, yet they were ſometimes ſingle and independent of any tournament. He who appeared for the firſt time at a Juſt, forfeited his helmet or caſque, unleſs he had forfeited before at a tournament.—The word is derived from the Latin, *juxta*, near, becauſe combatants fought near one another: ſome derive it from *juſta*, which, in the corrupt age of the Latin tongue, was uſed for this exerciſe; this being ſuppoſed a more juſt and equal combat than the tournament.

IVY. See HEDERA.

K.

K.

KA'BIN, or Kebin, a kind of marriage permitted in Turkey and Perſia, by which a man may take a wife for a certain term of time; having entered his promiſe, before a cadi, of giving the woman ſuch a ſum of money at his leaving her; for Kabin, in the Turkiſh language, ſignifies a dowry: ſome hiſtorians tells us, that this half marriage is only allowed among the Perſians that are of the ſect of Hali, and that it is condemned by the Turks; but it is very common with ſome nations of the negroes. *Ricaut. Pietro Della Valle, Tome* III.

KA'MAN, in natural hiſtory, a name given by many authors to a ſtone found about the burning mountains, and at ſome times uſed to engrave ſeals on. It is deſcribed as a white ſtone variegated with ſeveral colours.

KA'OLIN, the name of one of the two ſubſtances, which are the ingredients of China-ware. The other, which is called petuntſe, is eaſily vitrifiable, and this Kaolin is ſcarce at all ſo. Whence the fire compoſes, from a mixture of them both, a ſemivitrification, which is China ware.

Mr. Reaumur had an opportunity of examining this ſubſtance, not in its native ſtate, but only in form of ſmall bricks, made out of a paſte of the powder of the native Kaolin and water. He found it of a white colour, and ſprinkled all over with fine glittering particles; but theſe he did not judge to be fragments of a different ſubſtance mixed among the maſs, as are the ſmall flakes of talc in our clays and ſands; but that the whole maſs was compoſed of ſome ſtone reduced to powder and made into a paſte with water, and that theſe larger ſpangles were only coarſer particles of the powder; the examination of which he promiſed himſelf would diſcover what the ſtone was of which they were formed. And this was the more worthy a diligent enquiry, ſince the petuntſe might eaſily be ſupplied by many of our own earths and ſands; nothing being required of that but a ſubſtance eaſily running into a white glaſs. But the difficulty of vitrifying this other ingredient renders it a thing much more difficult to be ſupplied by one of the ſame nature among ourſelves. The compariſon of theſe with other mineral ſubſtances ſoon proved that they were of the nature of talc; or, in other words, that Kaolin was talc powdered, and made up into a paſte with water. And, to be aſſured whether the whole maſs was talc powdered, or any thing elſe with a mixture of talc, he ſeparated the particles of the Kaolin by water, and found the ſmall ones wholly the ſame with the larger, and that the larger, when reduced to powder alone, made with water a paſte wholly the ſame with the Kaolin. It is well known, that the fragments of talc have a great reſemblance to the pearly part of ſome ſhell fiſhes; and hence unqueſtionably has ariſen the opinion of porcelain being made of ſea-ſhells; ignorant perſons having ſeen the talc or Kaolin, and taken it for ſhelly matter. Talc has not yet been ſucceſsfully uſed in any of our European manufactures of porcelain; but it is eaſy to ſee, from many unanſwerable reaſons, that, ſince China porcelain is made of a mixture of a vitrifiable and an unvitrifiable matter, nothing is ſo likely to ſucceed with us, in the place of the laſt of theſe, as talc.

1. We know no ſubſtance in the foſſil world ſo difficult to reduce to glaſs as talc, which, if put into the ſtrongeſt of our fires, in a crucible, is not to be vitrified, nor even calcined. 2. We know no ſubſtance which keeps ſo much brightneſs after having paſſed the fire as talc, or is of ſo pure a white; whence we may alſo learn that it is not to the petuntſe alone, that the China ware owes its whiteneſs, but that the Kaolin is inſtrumental to the giving it that colour. 3. Talc is tranſparent, nay, and in ſome degree keeps its tranſparence after the action of the moſt violent fire. If we are to make porcelain of a vitrifiable and an unvitrifiable matter mixed together, yet it is neceſſary that the unvitrifiable matter ſhould retain its tranſparence, otherwiſe it would obſcure the maſs; and talc is therefore the only known ſubſtance qualified for this purpoſe. Perſons who have been at the China works, ſay, that the porcelain is made of equal quantities of petuntſe and Kaolin, and it is therefore a juſt and exact ſemi-vitrification. 4. Talc is well known to have a great flexibility and toughneſs, and, as it is found to preſerve this even after it has paſſed the fire, it is very probable, that it is owing to this property of the Kaolin, that the China ware is ſo much leſs brittle than glaſs. *Mem. Acad. Par.*

KE'RMES *Mineral.* The Kermes mineral was a preparation of Glauber, which the king of France bought of Mr. de la Ligerie, and made public in 1720. That receipt was in the following form: take a pound of Hungarian antimony, broken into thin pieces, according to the direction of its ſpicula; four ounces of nitre, fixed by charcoal; and a pint of rain water: boil them two hours: then filtre the warm liquor, and, when it cools, the Kermes precipitates. The ſame antimony undergoes the ſame operations with the remaining liquor, to which three ounces of fixed nitre, and a pint of water, are added. In a third boiling, two ounces of nitre, and a pint of water, are to be added to the former lixivium. The Kermes thus obtained is about a drachm, which after being well edulcorated by waſhing it in water, and burning ſpirit of wine on it, is dried for uſe.

Mr. Geoffroy ſhews, by many experiments, that the Kermes is the reguline part of the antimony, joined to a ſort of hepar ſulphuris. He teaches us a much eaſier way of preparing this medicine, thus: mix intimately the fine powder of two parts of antimony, and one of any fixed alkaline ſalt; melt thoſe materials in a crucible; then, having powdered them while hot, boil them two hours in a large quantity of water; after this, paſs the hot liquor through paper, receiving it into a veſſel, in which there is hot water; the Kermes ſeparates, when it cools. The groſſer parts, which do not paſs through the paper, are to be boiled again, and filtrated again; and the operation is to be repeated a third time, by which ſix or ſeven drachms of Kermes may be got out of every ounce of antimony. He ſays, he has ſeen effects, like to thoſe of mild Kermes from antimony, reduced to ſuch a fine powder, that none of the ſhining ſpicula are to be ſeen; and that the magiſtery of antimony, made by pouring ſpirit of nitre, or aqua regia, on the powder of antimony, and then edulcorating the maſs with water, has the ſame effects as Kermes. *Mem. de la Acad. des Sciences.*

Half a grain, or a grain, of this powder, given every three or four hours, produces no violent effects; but, by increaſing the doſe, it may be made to vomit, purge, and ſweat. Some commend this medicine as the moſt univerſal reſolvent and deobſtruent; aſſuring us, that it almoſt infallibly cures pleuriſies, peripneumonies, aſthmas, catarrhs, anginæ, ſmall-pox, and many other diſeaſes. Others are as poſitive, that it heats and thickens the blood, thereby increaſing obſtructions, and is particularly hurtful in all inflammatory diſeaſes.

This preparation was famous in France, and known by the name of poudre des Chartereux, becauſe a Carthuſian monk, who got it from Mr. de la Ligerie, firſt brought it into vogue. See *Hiſt. de l'Acad. des Sciences* 1720, and the Memoirs for the ſame year, where it is ſaid that Glauber was looked upon as the firſt inventor of this remedy.

Its effect, like that of many other antimonial preparations, is very various, which is frequently owing, as Mr. Geoffroy obſerves, to the different manner and care of making it. He adds, that, the more the Kermes contains of a regulus eaſily revivified, the more it proves emetic. He alſo ſhews how to make a cinnabar with Kermes and mercury, and to diſengage the vitriolic acid from the Kermes. *See Mem. de l'Acad. des Sciences* 1734.

KERN, in the Engliſh ſalt-works, a word uſed to ſignify the cryſtallizing, or ſhooting of ſalt in the brine, when ſufficiently evaporated in the boiling pan. The word is alſo uſed by the ſeamen for the firſt forming of the bay ſalt, made by the ſun's heat in the iſle of May.

KETTLE-*Drums*, are formed of two large baſons of copper or braſs, rounded at the bottom, and covered over with vellum or goat ſkin, which is kept faſt by a circle of iron, and ſeveral holes faſtened to the body of the drum, and a like number of ſkrews to ſkrew up and down, with a key for that purpoſe. The two drums are kept faſt together by two ſtraps of leather, which go through two rings, and are faſtened, the one before, the other behind the pommel of the Kettle-drummer's ſaddle. They have each a banner of ſilk or damaſk, richly embroidered with the ſovereign's arms, or thoſe of the colonel, and are fringed with ſilver or gold; and, to preſerve them in bad weather, they have each a cover of leather. The drum-ſticks are of crab-tree or other hard wood, of eight or nine inches long, with two knobs on the ends, which beat the drum-head, and cauſe the ſound. The Kettle-drum with trumpets is the moſt martial ſound of any; each regiment of horſe has a pair.

KING *of ſacrifices*, a Roman magiſtrate, who had the diſpoſing of all that was neceſſary for the ſacrifices they offered to their deities, and the ſolemnities of their feſtivals: he was ſet up, after the expulſion of their kings, becauſe there were certain ſacrifices, wherein it was cuſtomary for the king himſelf to officiate, that there might be ſomebody to repreſent the royal character: however, to preſerve their liberty, he had the adminiſtration of nothing but what appertained to religion, and even in that the pontifex maximus was above him.

KIRK-*Seſſions*, the name of a petty eccleſiaſtical judicatory in Scotland. Each pariſh, according to its extent, is divided into ſeveral particular diſtricts, every one of which has its own elder and deacon to overſee. A conſiſtory of the miniſters, elders, and deacons, forms a Kirk-ſeſſions. This meets once a week, the miniſter being moderator, but without a negative voice: it regulates matters relating to public worſhip, elections, catechiſing, viſitations, &c. It judges in matters of leſs ſcandal; but greater, as adultery, are left to the preſbytery; and, in all caſes, appeal lies from it to the preſbytery.

KITCHEN-*Garden*, a garden appropriated to herbs and plants uſed at the table.

The Kitchen-garden ſhould always be ſituated on the ſide of the houſe, ſo as not to appear in ſight, but muſt be placed near the ſtables, for the conveniency of dung; which ought always to be conſidered in the diſpoſition of the buildings, and the laying out of the garden: for, if this garden be placed at a great diſtance from the ſtables, the labour will be very great in wheeling the dung; and ſuch expences ſhould ever be avoided, if poſſible.

As to the figure of the ground, that is of no great moment, ſince in the diſtribution of the quarters all irregularities may be hid; though, if you are at full liberty, an exact ſquare, or an oblong, is preferable to any other figure.

The great thing to be conſidered is, to make choice of a good ſoil, not too wet, nor over-dry, but of a middling quality; nor ſhould it be too ſtrong or ſtubborn, but of a pliable nature, and eaſy to work: and, if the place where you intend to make the Kitchen-garden ſhould not be level, but high in one part, and low in another, I would by no means adviſe the levelling it; for by this ſituation you will have an advantage which could not be obtained on a perfect level, which is, the having one part of dry ground for early crops, and the low part for late crops, whereby the Kitchen may be the better ſupplied throughout the ſeaſon with the various ſorts of herbs, roots, &c. And in very dry ſeaſons, when in the upper part of the garden the crops will greatly ſuffer with drought, then the lower part will ſucceed, and ſo vice verſa; but I would by no means direct the chuſing a very low moiſt ſpot of ground for this purpoſe; for, although in ſuch ſoils garden-herbs are commonly more vigorous and large in the ſummer ſeaſon, yet they are ſeldom ſo well taſted or wholeſome as thoſe which grow upon a moderate ſoil: and eſpecially, ſince in this garden your choice fruits ſhould be planted, it would be wrong to have a very wet ſoil.

This garden ſhould be fully expoſed to the ſun, and by no means overſhadowed with trees, buildings, &c. which are very injurious to your Kitchen-plants and fruit-trees; but, if it be defended from the North wind by a diſtant plantation, it will greatly preſerve your early crops in the ſpring; as alſo from the ſtrong South-weſt winds, which are very hurtful in autumn to fruit and garden-herbs.

The quantity of ground neceſſary for a Kitchen-garden muſt be proportioned to the largeneſs of the family, or the quantity of herbs deſired: for a ſmall family, one acre of ground may be ſufficient; but, for a large family, there ſhould not be leſs than three or four acres; becauſe, when the ground is regularly laid out, and planted with eſpaliers of fruit-trees, as will hereafter be directed, this quantity will be found little enough, notwithſtanding what ſome perſons have ſaid on this head.

This ground muſt be walled round; and, if it can be conveniently contrived, ſo as to plant both ſides of the walls, which have good aſpects, it will be a great addition to the quantity of wall-fruit: and thoſe ſlips of ground, which are without-ſide of the walls, will be very uſeful for planting of gooſberries, currants, ſtrawberries, and ſome ſorts of Kitchen-plants; ſo that they may be rendered equally uſeful with any of the quarters within the walls: but theſe ſlips ſhould not be too narrow, leſt the hedge or pale which incloſes them ſhould ſhade the borders where the fruit-trees ſtand: the leaſt width of theſe ſlips ſhould be twenty feet; but, if they are double that, it will be yet better, and the ſlips will be more uſeful; and the fruit-trees will have a larger ſcope of good ground, for their roots to run. Theſe walls ſhould be built about twelve feet high, which will be ſufficient height for any ſort of fruit.

If the ſoil where you intend to place your Kitchen-garden be very ſtrong, then you ſhould plow or dig it three or four times, before you plant any thing therein; and, if you throw it up in ridges, to receive the froſt in winter, it will be of great ſervice to meliorate and looſen its parts.

The manure which is moſt proper for ſuch ſoils, is ſea-coal aſhes, and the cleanſing of ſtreets and ditches, which will render it light much ſooner than any other dung or manure; and, the greater quantity of aſhes, the better, eſpecially if the ground be cold; and, where theſe aſhes are not to be obtained in plenty, ſea-ſand is very proper, or rotten wood, or the parts of vegetables rotted are very good: all which will greatly looſen the ſoil, and cauſe it to be not only eaſier to work, but alſo more advantageous for the growth of plants.

But, on the contrary, if your ſoil be light and warm, you ſhould manure it with rotten neats-dung, which is much preferable to any other, for hot ſoils; but, if you uſe horſe-dung, it muſt be well rotted, otherwiſe it will burn up the crops, upon the firſt hot dry weather.

The ſoil of this garden ſhould be at leaſt two feet deep; but, if deeper, it will be ſtill better, otherwiſe there will not be depth enough for many ſorts of eſculent roots, as carrots, parſneps, beets, &c. which run down pretty deep in the ground, and moſt other ſorts of eſculent plants delight in a deep ſoil: and many plants, whoſe roots appear ſhort, yet if their fibres, by which they receive their nouriſhment, are traced, they will be found to extend to a conſiderable depth in the ground; ſo that, when theſe are ſtopped by meeting with gravel, chalk, clay, &c. the plants will ſoon ſhew it, by their colour and ſtinted growth.

You ſhould alſo endeavour to have a ſupply of water in the different parts of the garden, which, if poſſible, ſhould be contained in large baſons or reſervoirs, where it may be expoſed to the open air and ſun, that it may be ſoftened thereby; for ſuch water as is taken out of wells, &c. juſt as it is uſed, is by no means proper for any ſort of plants.

In the diſtribution of this garden, after having built the walls, you ſhould lay out banks or borders under them, which ſhould be at leaſt eight or ten feet broad, whereby the roots of the fruit-trees will have greater liberty than in ſuch places where the borders are not above three or four feet wide; and upon theſe banks you may ſow many ſorts of early crops, if expoſed to the ſouth; and upon thoſe expoſed to the north you may have ſome late crops: but I would by no means adviſe the planting any ſort of deep-rooting plants too near the fruit-trees; eſpecially peaſe and beans; though, for the advantage of the walls, to preſerve them in winter, and to bring them forward in the ſpring, the gardeners in general are too apt to make uſe of thoſe borders, which are by the beſt aſpected walls, to the great prejudice of their fruit-trees; but for theſe purpoſes it is much better to have ſome reed-hedges fixed in ſome of the warmeſt quarters, under which you ſhould ſow and plant early peaſe, beans, &c. where they will thrive as well as if planted under a wall; and hereby your fruit-trees will be entirely freed from ſuch troubleſome plants.

Then you ſhould proceed to dividing the ground out into quarters, which muſt be proportioned to the largeneſs of the garden; but I would adviſe, never to make them too ſmall, whereby your ground will be loſt in walks; and, the quarters being incloſed by eſpaliers of fruit-trees, the plants therein will draw up ſlender, and never arrive to half the ſize as they would in a more open expoſure.

The walks of this garden ſhould be alſo proportioned to the ſize of the ground, which in a ſmall garden ſhould be ſix feet, but in a large one ten; and on each ſide of the walk ſhould be allowed a border three or four feet wide between the eſpalier and the walk, whereby the diſtance between the eſpaliers will be greater, and the borders, being kept conſtantly worked and manured, will be of great advantage to the roots of the trees; and in theſe borders may be ſown ſome ſmall ſallad, or any other herbs, which do not continue long, or root deep; ſo that the ground will not be loſt.

The breadth of theſe middle walks, which I have here aſſigned them, may by many perſons be thought too great; but my reaſon for this is to allow proper room between the eſpaliers, that they may not ſhade each other, or their roots interfere, and rob each other of their nouriſhment; but, where the walks are not required of this breadth, it is only inlarging of the borders on each ſide, and ſo reducing the walks to the breadth deſired.

But the walks of theſe gardens ſhould not be gravelled; for, as there will conſtantly be occaſion to wheel manure, water, &c. upon them, they would ſoon be defaced, and rendered unſightly; nor ſhould they be laid with turf, for, in green walks, when they are wheeled upon, or much trodden, the turf is ſoon deſtroyed; and thoſe places, where they are much uſed, become very unſightly alſo: therefore the beſt walks for a Kitchen-garden are thoſe which are laid with a binding ſand; but, where the ſoil is ſtrong, and apt to detain the wet, there ſhould be ſome narrow under-ground drains made by the ſide of the walks, to convey off the wet; otherwiſe there will be no uſing the walks in bad weather: and, where the ground is wet, if ſome lime-rubbiſh, flints, chalk, or any ſuch material as can be procured with the leaſt expence, is laid at the bottom of theſe walks, and the coat of ſand laid over it, the ſand will be kept drier, and the walks will be found in all ſeaſons: theſe ſand-walks are by much the eaſieſt kept of any;

for, when either weeds or moſs begin to grow, it is but ſcuffling them over with a Dutch hoe in dry weather, and raking them over a day or two after, and they will be as clean as when firſt laid.

The beſt figure for the quarters to be diſpoſed into is a ſquare, or an oblong, where the ground is adapted to ſuch a figure; otherwiſe they may be triangular, or of any other ſhape, which will be moſt advantageous to the ground.

When the garden is laid out in the ſhape intended, if the ſoil is ſtrong, and ſubject to detain the moiſture, or is naturally wet, there ſhould always be under-ground drains made, to convey off the wet from every quarter of the garden: for otherwiſe moſt ſort of Kitchen-plants will ſuffer greatly by moiſture in winter: and, if the roots of the fruit-trees get into the wet, they will never produce good fruit; ſo that there cannot be too much care taken to let off all ſuperfluous moiſture from the Kitchen-garden.

Theſe quarters ſhould be conſtantly kept clear from weeds; and, when any part of the ground is unoccupied, it ſhould always be trenched up into ridges, that it may ſweeten, and imbibe the nitrous particles of the air, which is of great advantage to all ſorts of land; and the ground will then be ready to lay down, whenever it is wanted.

The ground in theſe quarters ſhould not be ſown or planted with the ſame crop two years together: but the crops ſhould be annually changed, whereby they will prove much better than when they conſtantly grow upon the ſame ſpot. Indeed, the Kitchen-gardeners near London, where land is dear, are often obliged to put the ſame crop upon the ground for two or three years together; but then they dig and manure their land ſo well every year, as to render it almoſt new: though, notwithſtanding all this, it is conſtantly obſerved, that freſh land always produces the beſt crops.

In one of theſe quarters, which is ſituated neareſt to the ſtables, and beſt defended from the cold winds; or, if either of the ſlips without the garden-wall, which is well expoſed to the ſun, lies convenient, and is of a proper width; that ſhould be preferred, for a place to make hot-beds for early cucumbers, melons, &c. The reaſons for my giving the preference to one of theſe ſlips, are, firſt, there will be no dirt or litter carried over the walks of the Kitchen-garden in winter and ſpring, when the weather is generally wet; ſo that the walks will be rendered unſightly: ſecondly, the view of the hot-beds will be excluded from ſight: and, laſtly, the convenience of carrying the dung into theſe ſlips; for, by making of a gate in the hedge or pale, wide enough for a ſmall cart to enter, it may be done with much leſs trouble than that of barrowing it through the garden: and, where there can be a ſlip long enough to contain a ſufficient number of beds for two or three years, it will be of great uſe, becauſe by the ſhifting of the beds annually, they will ſucceed much better than when they are continued for a number of years on the ſame ſpot of ground. As it will be abſolutely neceſſary to fence this melon-ground with a reed-hedge, it may be ſo contrived as to move away in panels; and then that hedge which was on the upper ſide the firſt year, being carried down to a proper diſtance below that which was the lower hedge, and which may remain, there will be no occaſion to remove more than one of the croſs-hedges in a year; therefore, I am perſuaded, whoever will make trial of this method, will find it the moſt eligible. *Miller's Gard. Dict.*

KNEE.—The mucilaginous glands of the Knee, which lie near the edges of the patella, are very remarkable: they are diſpoſed in fringes, and ſupported by a great quantity of fatty matter, which in ſome meaſure makes one maſs with them. This common maſs is contained within the capſular ligament, and on the ſide of the joint is covered by a very fine membrane, which likewiſe lines the inner ſurface of the ligament. The glandulous ſubſtance is eaſily diſtinguiſhed from the fat by the reddiſh colour of the capillary veſſels, which ſurround the glands. The ſuperior portion of this maſs is, as it were, ſupported by a ſmall ligament, fixed in the anterior part of the great common notch of the condyles of the os femoris, and which from thence runs from the upper part of the patella. There are alſo other mucilaginous glands, both above and below the edges of the ſemilunar cartilages, and likewiſe in the ham: ſome of theſe ſerve for a joint, and the others for the crucial ligaments. Theſe laſt lie in folds, formed by the internal membrane of the capſular ligament, which give particular coverings to the crucial ligaments, and to the other bundles of ligamentary fibres near them. *Winſlow's Anatomy.*

Luxated KNEE. A luxation of the Knee is a receding of the tibia from under the femur. The leg is ſometimes thus luxated from the baſis of the thigh-bone, on the outſide, ſometimes on the inſide, and ſometimes backward, but very rarely or never forwards, unleſs it be forcibly driven with great violence that way; for the patella is bound againſt the articulation forwards, by the ſtrong tendons of the muſcles which extend the leg; nor is it indeed eaſy for the bones of the leg to be wholly diſplaced from that of the thigh, ſo as to make a perfect luxation of the Knee, by reaſon of the great ſtrength of the ligament, and the two deep ſinuſes, which receive the head of the thigh-bone, unleſs thoſe ſtrong ligaments ſhould happen to be broken aſunder at the ſame time. This is the reaſon alſo why people, who ſuffer a perfect luxation of the Knee, are generally tortured with violent and excruciating pains and convulſions; and, if they eſcape the miſchiefs uſually attending ſuch ſymptoms, they are generally troubled afterwards with a lameneſs and ſtiffneſs of the joint; but ſlight or imperfect luxations of this joint are uſually very ſpeedily and eaſily cured. The patient in this caſe is to be ſeated on a bed, bench, or table, and one aſſiſtant is to hold the thigh firmly above the Knee, and another ſtrongly to extend the leg, while the ſurgeon replaces the bones by his hands and Knee, in their natural places. If the hands and ſlings are not ſufficient, in this caſe, to make a proper extenſion, recourſe muſt be had to the pullies, generally uſed on ſuch occaſions; but, in children and young perſons, great care muſt be taken not to make the extenſion ſo violent, as to ſeparate the epiphyſes from the bones, to which they are, in ſuch ſubjects, not yet firmly united. After the luxation is properly reduced, the Knee is to be bound up with a proper bandage, and placed in a frame or caſe, ſo as to be kept at reſt for a proper time. *Heiſter's Surgery.*

L.

LA'BYRINTH, in gardening, a winding, mazy, and intricate turning to and fro, through a wilderneſs, or a wood.

The deſign of a Labyrinth is, to cauſe an intricate and difficult labour to find out the center; and the aim is, to make the walks ſo intricate, that a perſon may loſe himſelf in them, and meet with as great a number of ſtops and diſappointments as is poſſible, they being the moſt valuable that are moſt intricate.

As to the contrivance of them, it will not be poſſible to give directions in words; there are ſeveral plans and deſigns in books of gardening: they are rarely met with but in great and noble gardens, as Hampton-Court, &c.

There are two ways of making them; the firſt is with ſingle hedges: this method has been practiſed in England. Theſe, indeed, may be beſt, where there is but a ſmall ſpot of ground to be allowed for the making them; but, where there is ground enough, the double are moſt eligible.

Double ones, or thoſe that are made with double hedges of a conſiderable thickneſs of wood between hedge and hedge, are approved as much better than ſingle ones; as is the manner of making them in France, and other places; of all which, that of Verſailles is allowed by all to be the nobleſt of its kind in the world.

It is an error in Labyrinths in making them too narrow, for by that means the hedges muſt be kept cloſe clipped: whereas, if the walks be made wider, according to the foreign practice, they will not ſtand in need of it.

The walks are made with gravel, uſually ſet with hornbeams: the paliſades ought to be ten, twelve, or fourteen feet high: the hornbeam ſhould be kept cut, and the walks rolled. *Miller's Gard. Dict.*

LACE'RNA, the name of a garment worn by the ancients, being a kind of a cloke made of wool, only uſed by the men. They wore it over the toga or tunica; it was at firſt very ſhort, but, growing popular in the Roman army, was ſoon lengthened. The Lacerna was ſcarce known in Rome till the time of the civil wars and the triumvirate; then indeed it came into faſhion; for, the ſoldiers being frequently in the city-gates, the ſight became familiar to the citizens, and they fell into the uſe of it; ſo that it became a common dreſs of the knights and ſenators, but Valentinian and Theodoſius prohibited the ſenators wearing it in the city. Some will have this garment the ſame with the chlamys.

LACTU'CA, *lettuce*, in botany, a genus of plants whoſe characters are:

It hath a fibroſe root, which is, for the moſt part, annual: the leaves are ſmooth, and grow alternately upon the branches; the ſtalks are, for the moſt part, ſlender and ſtiff, and commonly terminate into a ſort of umbel: the cup of the flower is oblong, ſlender, and ſcaly: the ſeeds are oblong, depreſſed, and generally terminate in a point.

It would be beſide my purpoſe to mention in this place the ſeveral ſorts of lettuce that are to be found in botanic writers, many of which are plants of no uſe, and are never cultivated but in botanic gardens for variety; and ſome of them are found wild in many parts of England. I ſhall therefore paſs over thoſe here, and only mention the ſeveral ſorts which are cultivated in the kitchen-garden for uſe: 1. Common or garden lettuce. 2. Cabbage lettuce. 3. Cilicia lettuce. 4. Dutch brown lettuce. 5. Aleppo lettuce. 6. Imperial lettuce. 7. Green capuchin lettuce. 8. Verſailles or upright white cos lettuce. 9. Black cos. 10. White cos. 11. Red capuchin lettuce. 12. Roman lettuce. 13. Prince lettuce. 14. Royal lettuce. 15. Egyptian cos lettuce.

The firſt of theſe ſorts is commonly ſown very early for cutting, to mix with other ſmall ſallad-herbs, and is only different from the ſecond ſort, in being a degeneracy therefrom; or, otherwiſe, the ſecond is an improvement by frequent cultivation from the firſt: for, if the ſeeds are ſaved from ſuch plants of the ſecond ſort as did not cabbage cloſely, the plants produced from that ſeed will all degenerate to the firſt ſort; which is by the gardeners called lapped lettuce, to diſtinguiſh it from the other, which they call cabbage lettuce. The ſeeds of the firſt, which are commonly ſaved from any of the plants, without having any regard to their goodneſs, are generally ſold at a very cheap rate, eſpecially in dry ſeaſons, when theſe plants always produce the greateſt quantity of ſeeds; though ſometimes this ſeed is ſold in the ſeed ſhops, and by perſons who make a trade of ſelling ſeeds, for the cabbage lettuce; which is often the occaſion of people's being diſappointed in their crop: ſo that this ſort ſhould never be cultivated, but to be cut up very young; for which purpoſe this is the only good ſort, and may be ſown any time of the year; obſerving only in hot weather to ſow it on ſhady borders, and in the ſpring and autumn upon warm borders; but in winter it ſhould be ſown under glaſſes, otherwiſe it is ſubject to be deſtroyed by ſevere froſts.

The cabbage lettuce may alſo be ſown at different times of the year, in order to have a continuation of it through the whole ſeaſon. The firſt crop is generally ſown in February; which ſhould be upon an open warm ſpot of ground, and, when the plants are come up, they ſhould be thinned out, to the diſtance of ten inches each way; which may be done by hoeing them out, as is practiſed for turneps, carrots, onions, &c. provided you have no occaſion for the ſuperfluous plants; otherwiſe they may be drawn up, and tranſplanted into another ſpot of good ground at the ſame diſtance; which if done before the plants are too large, they will ſucceed very well, though they will not be ſo large as thoſe which were left upon the ſpot where they were ſown; but they will come ſomewhat later, which will be of ſervice, where people do not ſow every month.

The Cilicia, imperial, royal, black, white, and upright cos lettuces may be ſown at the following times: the firſt ſeaſon for ſowing theſe ſeeds is at the end of February, or the beginning of March, upon a warm light ſoil, and an open ſituation; i. e. not overſhadowed with trees; and, when the plants are come up, they ſhould be either hoed out, or tranſplanted into another ſpot of ground, as was directed for the cabbage lettuce, obſerving to leave theſe ſorts fifteen or ſixteen inches apart each way; which will be full near enough for theſe plants, eſpecially if the ſoil be good; and you muſt carefully keep them clear from weeds, which is the only culture they will require, except the black cos lettuce, which ſhould be tied up when they are full grown, to whiten their inner leaves, and render them criſp; otherwiſe they are ſeldom good for much, rarely cabbaging without this aſſiſtance.

You may alſo continue theſe ſorts through the ſeaſon, by ſowing them in April, May, and June; obſerving to ſow the late crops in a moiſt ſhady ſituation, otherwiſe they will run up to ſeed before they grow to any ſize; but in Auguſt, toward the latter end, you may ſow of theſe ſorts, to abide the winter; which plants ſhould be tranſplanted either under glaſſes, or into a hot-bed, which ſhould be arched over with hoops, in order to be covered in winter, otherwiſe in hard winters they are often deſtroyed; but you muſt conſtantly let theſe plants have as much open free air as poſſible, when the weather is mild; only covering them in hard rains, or froſty weather; for if they are kept cloſely covered in winter, they will be ſubject to a mouldineſs which ſoon rots them.

The moſt valuable of all the ſorts of lettuce in England are the Egyptian green cos, and the Verſailles or white cos, the Cilicia, and black cos; though ſome people are very fond of the royal and imperial lettuces; but they ſeldom ſell ſo well in the London markets as the others, nor are ſo generally eſteemed. Indeed of late years, ſince the white cos has been commonly cultivated, it has obtained the preference of all the other ſorts, until the Egyptian green cos was introduced; which is ſo much ſweeter and tenderer than the white cos, that it is by all good judges eſteemed the beſt ſort of lettuce known. This ſort will endure the cold of our ordinary winters full as well as the white cos; but at the ſeaſon of its cabbaging, if there happens to be much wet, this ſort, being very tender, is very ſubject to rot.

The brown Dutch and green capuchin lettuces are very hardy, and may be ſown at the ſeaſons as was directed for the common cabbage lettuce; and are very proper to plant under a wall or hedge to ſtand the winter; where many times theſe will abide, when moſt of the other ſorts are deſtroyed; and, therefore, they will prove very acceptable, at a time when few other ſorts are to be had; they will alſo endure more heat and drought than moſt other ſorts of lettuce, which renders them very proper for late ſowing; for it often happens, in very hot weather, that the other ſorts of lettuce will run up to ſeed in a few days after they are cabbaged; whereas theſe will abide near three weeks in good order, eſpecially if care be taken to cut the forwardeſt firſt, leaving thoſe that are not ſo hard cabbaged to be laſt. In ſaving of theſe ſeeds, the ſame care ſhould be taken to preſerve only ſuch as are very large, and well cabbaged, otherwiſe the ſeeds will degenerate, and be good for little.

The red capuchin, Roman, and prince lettuces are pretty varieties, and cabbage very early; for which reaſon a few of them may be preſerved; as may ſome of the Aleppo, for the beauty of its ſpotted leaves; though very few people care for either of theſe ſorts at table, when the other more valuable ones are to be obtained; but, in a ſcarcity, theſe may ſupply the place pretty well; and theſe ſorts are very proper for ſoups. The ſeeds of theſe muſt alſo be ſaved from ſuch as cabbage beſt, otherwiſe they will degenerate, and be good for little. *Miller's Gard. Dict.*

LA'DLE-*boards*, thoſe boards diſpoſed on the circumference of the water-wheels of over-ſhot mills; forming hollows, or receptacles not unlike ladles, to receive the water that falls upon the wheel.

LA'MMAS-*day*, *quaſi lamb-maſs*, the firſt of Auguſt, ſo called from a fond conceit the Popiſh people had, that St. Peter was patron of the lambs, becauſe our Saviour ſaid to him, Feed my lambs; upon which account they thought the maſs of this day very beneficial to make their lambs thrive.

LAMP, λαμπὰς, a ſort of luminary, conſiſting of oil diſpoſed with a wick in a proper veſſel for burning.

The uſe of lighted Lamps in churches, and places of devotion, is very antient.—In the city of Fez is a moſque, wherein are nine hundred brazen Lamps burning every night.—In Turkey, all the illuminations are made with Lamps.—Polydore Virgil aſcribes the firſt invention of Lamps to the Egyptians; and Herodotus deſcribes a feaſt of Lamps held annually in Egypt.

Kircher ſhews the manner of preparing Lamps, which ſhall diffuſe a light ſo diſpoſed, as to make the faces of thoſe preſent appear black, blue, red, or of any other colour.

There has been a great diſpute among the learned, about the ſepulchral Lamps of the antients: ſome maintain, they had the ſecret of making Lamps that were inextinguiſhable, alledging ſeveral that had been found burning, at the opening of tombs, fifteen or ſixteen hundred years old. But others treat theſe relations as fables; and others think that the Lamps which before were extinguiſhed, took light afreſh upon the admiſſion of freſh air.

Dr. Plott, however, is of opinion, ſuch perpetual Lamps are things practicable, and has himſelf made ſome propoſals of this kind. The linum aſbeſtinum, he thinks, may do pretty well for the wick, and that naphta, or liquid bitumen, conſtantly ſpringing into ſome of the coal mines, will anſwer for the oil.

If the aſbeſtos will not make a perpetual wick, he thinks there is no matter in the world that will; and argues, that the tradition of ſuch Lamps muſt be fabulous, or that they made them without wicks.

Such a Lamp he thinks it poſſible to make of the bitumen ſpringing into the coal mines at Pitchford in Shropſhire; which, he ſays, like other liquid bitumens, will burn without a wick. Thoſe Lamps that kindle on the immiſſion of freſh air, the ſame author thinks, might be imitated by incloſing ſome of the liquid phoſphorus in the recipient of an air-pump; which, under thoſe circumſtances, will not ſhine at all; but on letting in the air into the recipient, there will poſſibly, ſays he, appear as good a perpetual Lamp, as ſome that have been found in the ſepulchres of the antients.

Cardan's LAMP, is a contrivance of the author of that name, which furniſhes itſelf with its own oil.

It conſiſts of a little column of braſs, tin, or the like, well cloſed every-where, excepting a ſmall aperture at bottom, in the middle of a little gullet or canal, where the wick is placed.

Here the oil cannot get out, but in proportion as it ſpends, and ſo opens the paſſage of that little aperture.

This kind of Lamp was in much uſe ſome years ago; but it has ſeveral inconveniencies; as that the air gets into it by ſtarts and gluts; and that, when the air in the cavity comes to be much rarefied by heat, it drives out too much oil, ſo as ſometimes to extinguiſh the Lamp.

Dr. Hook and Mr. Boyle have invented other Lamps, that have all the conveniencies of Cardan's, without the inconveniencies.

LA'MPADARY, an officer in the antient church of Conſtantinople. His buſineſs was to ſee the church well lighted, and he bore a taper before the emperor, the empreſs, and the patriarch, when they went to church or in proceſſion. There were alſo Lampadaries in the emperor's palaces; the word is from the Latin, *lampas*, a lamp.

LANCE, an offenſive weapon, borne by the antient cavaliers, in form of a half-pike; it conſiſts of three parts, the handle, the wings, and the dart. Pliny attributes the invention of Lances to the Etolians. Varro and Aulus Gellius ſay the word Lance is Spaniſh, whence others conclude the uſe of this weapon was borrowed by the people of Italy from the Spaniards.

LAND.—There are various methods of improving Lands, as, 1. By incloſing and dividing the ſame into ſeveral fields, for paſture or tillage, which is one of the moſt principal ways of improvement; firſt, by aſcertaining to every man his juſt property, and thereby preventing an infinity of treſpaſſes and injuries, that Lands in common are ſubject unto, beſide the diſadvantage of being obliged to keep the ſame ſeaſons with the other people who have Land in the ſame field; ſo that the ſowing, fallowing, and tilling the ground, muſt be equally performed by all the Land-holders; and, when there happens a ſlothful, negligent perſon, who has Land intermixed with others, it is one of the greateſt nuiſances imaginable. Secondly, it being of itſelf a very great improvement: for, where Land is properly incloſed, and the hedge-rows planted with timber trees, &c. it preſerves the Land warm, and defends and ſhelters it from the violent cold nipping winds, which in ſevere winters deſtroy much of the corn, pulſe, or whatever grows on the open field, or champain grounds. And, where it is laid down for paſture, it yields much more graſs than the open fields, and the graſs will begin to grow much ſooner in the ſpring. The hedges and trees alſo afford ſhelter for the cattle from the cold winds in winter; as alſo ſhade for them in the great heats of ſummer. And theſe hedges afford the diligent huſbandman plenty of fuel, as alſo plough-boot, cart-boot, &c. and, where they are carefully planted and preſerved, furniſh him with timber, and maſt for his ſwine: or, where the hedge-rows are planted with fruit-trees, there will be a ſupply of fruit for cyder, perry, &c. which, in moſt parts of England, are of no ſmall advantage to the huſbandman.

By this method of incloſing, there is alſo much more employment for the poor, and is therefore a good remedy againſt beggary; for in thoſe open countries, where there are great downs, commons, heaths, and waſtes, there is nothing but poverty and idleneſs to be ſeen amongſt the generality of their inhabitants. It is very obſervable of late years, how much advantage the incloſing of the Land in Worceſterſhire, and ſome other counties at a diſtance from London, has been to the inhabitants; for, before this method was introduced amongſt them, the Lands, for the moſt part, lay in commons, &c. Upon which the poorer ſort of people built themſelves cottages with mud walls, where they contented themſelves with a cow or two, and ſome ſwine: and thoſe of them who were more induſtrious than the reſt, travelled to the neighbourhood of London every ſpring, where they were employed in the gardens and fields for the ſummer ſeaſon; and in autumn they returned to their native countries, where they lived, in winter, upon what money they had ſaved in ſummer. But, ſince they have converted their waſtes and commons into incloſures, there are but few of the inhabitants of thoſe countries, who come to London for work, in compariſon to the numbers that formerly came; ſo that moſt of the labourers, who come to London for employment, are either Welch, or inhabitants of ſome diſtant counties, where this improvement hath not as yet been introduced.

The advantages of incloſing Land are now ſo generally known, that there is no occaſion for us to enumerate them here; ſince the improvements which have been made of late years, in ſeveral parts of England, and the increaſe of rent, that is every-where made by thoſe that incloſe, are ſufficient arguments to enforce the practice, and render it general; more eſpecially in the north, where it is much neglected; becauſe it would greatly ſhelter the Lands, and render them much warmer than they now are.

In incloſing of Land, there ſhould be regard had to the nature of the ſoil, and what it is intended for; becauſe corn Land ſhould not be divided into ſmall parcels; for, beſides the loſs of ground in hedges, &c. the corn ſeldom thrives ſo well in ſmall incloſures, as in more open fields; eſpecially where the trees are large in the hedge-rows. The graſs alſo in paſtures is not ſo ſweet near hedges, or under the drip of trees, as in open expoſures; ſo that where the incloſures are made too ſmall, or the Land is overplanted with trees, the herbage will not be near ſo good, nor in ſo great plenty, as in larger fields: therefore, before a perſon begins to incloſe, he ſhould well conſider how he may do it to the greateſt advantage: as, for inſtance, it is always neceſſary to have ſome ſmaller incloſures near the habitation, for the ſhelter of cattle, and the conveniency of ſhifting them from one field to another, as the ſeaſon of the year may require; and hereby the habitation, barns, ſtables, and outhouſes, will be better defended from ſtrong winds, which often do great damage to thoſe that are expoſed to their fury. Theſe ſmall incloſures may be of ſeveral dimenſions; ſome of them three, four, ſix, or eight acres in extent; but the larger diviſions for corn ſhould not contain leſs than twenty or thirty acres, or more, according to the ſize of the farm.

The uſual method of incloſing Land is, with a ditch and bank ſet with quick. But in marſh Land, where there is plenty of water, they content themſelves with only a ditch, by the ſides of which they uſually plant ſallows or poplars, which, being quick of growth, in a few years, afford ſhade to the cattle; and, when they are lopped, produce a conſiderable profit to their owners. In ſome counties the diviſion of their Lands is by dry walls made of flat ſtones, laid regularly one upon another,

ther, and laying the top courſe of ſtones in clay, to keep them together, the weight of which ſecures the under ones. But in ſome parts of Suſſex and Hampſhire they often lay the foundation of their banks with flat ſtones, which is of a conſiderable breadth at bottom; upon which they raiſe the bank of earth, and plant the hedge on the top, which in a few years make a ſtrong durable fence, eſpecially if they are planted with holly, as ſome of thoſe in Suſſex are. See the article FENCES.

2. The draining of Land is alſo another great improvement to it: for though meadows and paſtures, which are capable of being overflowed, produce a greater quantity of herbage than dry Land; yet, where the wet lies too long upon the ground, the graſs will be ſour, and extremely coarſe; and, where there is not care taken in time to drain this Land, it will produce little graſs, and ſoon be over-run with ruſhes and flags, ſo as to be of ſmall value. The Land which is moſt liable to this is cold ſtiff clays, where the water cannot penetate, but is contained as in a diſh; ſo that the wet which it receives in winter, continues till the heat of the ſun exhales the greateſt part of it.

The beſt method of draining theſe Lands is, to cut ſeveral drains acroſs the Land, in thoſe places where the water is ſubject to lodge; and from theſe croſs drains to make a convenient number of other drains, to carry off the water to either ponds or rivers in the lower parts of the Land. Theſe drains need not be made very large, unleſs the ground be very low, and ſo ſituated as not to be near any river to which the water may be conveyed: in which caſe, there ſhould be large ditches dug at proper diſtances, to contain the water; and the earth which comes out of the ditches ſhould be equally ſpread on the Land, to raiſe the ſurface. But, where the water can be conveniently carried off, the beſt method is, to make under-ground drains, at proper diſtances, which may empty themſelves into large ditches, which are deſigned to carry off the water. Theſe ſort of drains are the moſt convenient; and, as they are hid from the ſight, do not incommode the Land; nor is there any ground loſt where theſe are made.

The uſual method of making theſe drains, is to dig trenches, and fill the bottoms with ſtones, bricks, ruſhes, or buſhes, which are covered over with the earth, which was dug out of the trenches: but this is not the beſt method, becauſe the water has not a free paſſage through the drains; ſo that, whenever there is a flood, theſe drains are often ſtopped by the ſoil which the water frequently brings down with it. The beſt method I have yet obſerved to make theſe drains, is, to dig trenches to a proper depth for carrying off the water, which ſhould be three feet wide at their tops, and ſloped down to about a foot wide at their bottom; then, having prepared a quantity of good bruſh wood, the larger ſticks ſhould be cut out to pieces of about ſixteen or eighteen inches in length, which ſhould be laid acroſs the lower part of the drain, at about fourteen inches diſtance from the bottom, driving them down at both ends, ſo as that they may have firm hold of the ground on each ſide; ſo as to leave a foot of the lower part of the drain open, through which the water is to paſs; then cover theſe ſticks with the ſmaller bruſh-wood, furz, broom, or any other kind of bruſh, laying it lengthwiſe pretty cloſe; on the top of theſe may be laid ruſhes, flags, &c. and then the earth laid on to cover the whole. Theſe ſorts of drains will continue good for a great number of years, and are never liable to the inconveniencies of the other drains; for the water will find an eaſy paſſage through them; and, where there is plenty of bruſh-wood, they are made at an eaſy expence: but, in places where wood is ſcarce, it would be chargeable to make them: however, in this caſe, it would be a great advantage to theſe Lands, to plant a ſufficient number of cuttings of willow, or the black poplar, on ſome of the moiſt places, which would furniſh bruſh-wood for theſe purpoſes in four or five years; and, as the expence of planting theſe cuttings is trifling, there cannot be a greater advantage to an eſtate which wants draining, than to practiſe this method, which is in every perſon's power, ſince there is little expence attending it.

In countries where there is plenty of ſtone, that is the beſt material for making theſe under-ground drains; for when theſe are properly made, they will never want repairing.

The beſt time of the year for making theſe drains is about Michaelmas, before the heavy rains of autumn fall; becauſe, at this ſeaſon, the Land is uſually dry; ſo that the drains may be dug to a proper depth: for, when the ground is wet, it will be very difficult to dig to any depth; becauſe the water will drain in, wherever there is an opening in the ground.

When the drains are made, and the water carried off the Land, it will be proper to pare off the ruſhes, flags, &c. which may be laid in heaps in proper places to rot, and will afford a good manure for the Land. The ground muſt alſo be plowed, to deſtroy the roots of noxious weeds; and if it be laid fallow for one ſeaſon, and plowed two or three times, it will greatly mend the Land. The ruſhes and flags, which were pared off the ground, when rotten, ſhould be ſpread over the ſurface, and the graſs ſeed ſown thereon, which will greatly forward the graſs, ſo that it may ſoon be brought to a good turf; which Land, thus mended, has been let at four times the rent it was let at before.

There are ſome perſons, who, after they have pared off the flags, ruſhes, &c. from their Land, lay them in ſmall heaps, and burn them in dry weather, then ſpread the aſhes on the Land to improve it; which is a good method, where a perſon is in haſte to have graſs again: but, where the ground can be fallowed one year, it will looſen the ſoil, and more effectually deſtroy the roots of all noxious weeds; and the ruſhes, &c. when rotted, will afford a much larger quantity of manure for the Land, than when it was burnt; beſides, this can only be practiſed in the ſummer ſeaſon, when the weather is very dry; for, if there ſhould fall much rain, the fires will go out, and it will be impracticable to burn it. But, where the method of burning is practiſed, the heaps ſhould not be too great, and it ſhould burn very ſlowly: which will render the aſhes a much better manure, than where the fire is too violent, or the heaps too large; for, in this caſe, the inner part will be over burnt, before the fire reaches the outſide of the heap.

As the draining of cold wet Lands is a great improvement to them, ſo the floating or watering of dry looſe Lands is not a leſs advantage to them. This may be eaſily effected where there are rivers, or reſervoirs of water, which are ſituated above the level of the ground deſigned to be floated, by under-ground drains, made after the manner of thoſe before directed for draining of Land, through which the water may be conveyed at proper ſeaſons, and let out on the ground; in order to this, there muſt be good ſluices made at the heads of the drains, ſo that the water may never get out, but at ſuch times as is required; for, if this be not taken care of, the water, inſtead of improving the Land, will greatly damage it.

But where the Land lies ſo high, as that there is no water in the neighbourhood lying above its level, it will be more expenſive; becauſe, in ſuch caſe, the water muſt be raiſed, by machines, from reſervoirs or ſtreams which lie below it. The moſt common engine uſed for this purpoſe is the PERSIAN WHEEL (which ſee.) Yet, notwithſtanding the expence of raiſing the water, it has been found greatly advantageous, in many parts of England, to drown the Lands; for the profit has many times more than doubled the charge.

The time for drowning of Land is uſually from November to the end of April: but, though this is the general practice, yet I cannot approve of this, for many reaſons: the firſt is, that, by the wet lying continually on the ground in the winter, the roots of the finer ſorts of graſs are rotted and deſtroyed; and, by letting on of the water, at the ſeaſon when the ſeeds of docks, and other bad weeds, which commonly grow by river-ſides, are falling, theſe ſeeds are carried upon the Land, where they remain and grow, and fill the ground with bad weeds; which is commonly the caſe with moſt of the water meadows in England, the graſs in general being deſtroyed; ſo that ruſhes, docks, and other trumpery, make up the burden of theſe Lands: but if theſe meadows were judiciouſly managed, and never floated till March or April, the quantity of ſweet good graſs would be thereby greatly increaſed, and the beautiful verdure of the meadows preſerved: but there is little hope of convincing thoſe perſons by arguments, who are ſo much wedded to their own prejudices, as to ſhut their eyes and ears againſt experiments or reaſon. Where the Land is very hot and dry, and it lieth convenient to be watered at a ſmall expence, it ſhould be repeated every week in dry hot weather, which will prove a great advantage to the Land. But, whenever this is done, there ſhould no cattle be admitted, while it is wet; for they will poach, and ſpoil the turf.

3. Another great improvement of Land is by burning of it; which, for ſour, heathy, and ruſhy Land, be it either hot or cold, wet or dry, is a very great improvement: ſo that ſuch Lands will, in two or three years after burning, yield more, excluſive of the charges, than the inheritance was worth before. But this is not to be practiſed on rich fertile Land; for, as the fire deſtroys the acid juice, which occaſions ſterility in the poor Land, ſo it will in like manner conſume the good juices of the richer Land, and thereby impoveriſh it; ſo that it hath been with great reaſon diſuſed in deep rich countries. See the article BURNING *of land*.

4. It is alſo a very great improvement, where Land is over-grown with broom, furz, &c. to ſtub them up by the roots; and, when they are dry, lay them on heaps, and cover them with the parings of the earth, and burn them, and ſpread the aſhes over the ground. By this method vaſt tracts of Land, which at preſent produce little or nothing to their owners, might be made good at a ſmall expence, ſo as to become good eſtates to the proprietors.

LA'NTERNISTS, the name of the members of an academy of learned men ſet up at Toulouſe in France. The occaſion of the name was as follows: ſome counſellors of the parliament of this town, with other gentlemen of ſeveral diſtinctions, projecting to form a ſociety for cloſe correſpondence and communicating their notions to each other, appointed a ſet day to meet at each other's houſes; and here, to prevent interruption from foreign company, they choſe to meet in the evening, after the hours for common viſits were over; and, to make their meeting more private, they took no flambeaux along with them, but lighted themſelves with ſmall lanthorns. Thus they carried on their converſation with a great deal of pleaſure and improvement, and kept it private for a conſiderable time; but, there being few things which time does not diſcover, their meeting broke out at laſt, and all people of ſenſe and regularity commended the deſign: and now, being no longer incog, they puſhed the project further; they increaſed the ſociety, and made a company in form. Upon the ſcore of their ſmall lanthorns, ſome pleaſant men called them the Lanterniſts; and they took their denomination in good part, as the learned academies in Italy had done before them. Thus theſe Lanterniſts, to preſerve the memory of their original, took a ſtar for their device, with this motto, Lucerna in nocte. Afterwards they ſettled a prize to be given every year to the man or woman who made the beſt rhiming copy of verſes in commendation of the king, to be publiſhed by the company: the prize is a very fine medal, with a ſtar and legend as abovementioned; and, on the reverſe, Apollo playing upon the harp, ſitting on the top of Parnaſſus, with this motto, Apollini Toloſano. *Mercure galant, Juin*, 1698.

LA'PATHUM, *the dock*, in botany, a genus of plants whoſe characters are:

The empalement of the flower is compoſed of three ſmall leaves, which are reflexed: the flower hath three leaves, which are larger than thoſe of the empalement, and are coloured: in the center of the flower is ſituated the three-cornered pointal, ſupporting three ſmall ſtyles, and is attended by ſix ſtamina: the pointal afterwards becomes a triangular ſeed, incloſed by the petals of the flower.

LA'PWING, in ornithology, the Engliſh name of the black-breaſted tringa with a hanging creſt. Were the Lapwing leſs common, it would be highly eſteemed for its beauty. It is very frequent in our fenny countries, and in the wet places of moſt other parts of Europe.

Authors have deſcribed it under the names of vanellus, capra, and capella.

LA'RIX, the *larch-tree*, in botany, a genus of trees, whoſe characters are:

The leaves, which are long and narrow, are produced out of little tubercles, in form of a painter's pencil: the cones are produced at remote diſtances from the male flowers on the ſame tree: the male flowers are very like ſmall cones at their firſt appearance, but afterwards ſtretched out in length.

Theſe trees are propagated by ſeeds, which ſhould be ſown in the beginning of March, upon a bed of light ſoil, expoſed only to the morning ſun: or otherwiſe it may be ſown in pots or boxes of light earth, and placed near an hedge, where they may have the morning ſun only. The ſeed ſhould be be covered about half an inch thick with fine light earth, and in very dry weather ſhould be gently refreſhed with water. In about ſix weeks, if your ſeeds were good, your plants will come up, at which time you ſhould carefully guard them againſt the rapacious birds, which would otherwiſe pull off the heads of the plants, as they thruſt themſelves out of the ground with their covers on them; and obſerve to refreſh them with water in dry weather, eſpecially if they are ſown in pots or boxes; as alſo to keep them clear from weeds, which, if ſuffered to grow among the young plants, will ſoon deſtroy them: nor ſhould they be too much expoſed to the ſun, or ſtrong winds; both which are very injurious to theſe plants, while they are young: but in October you ſhould (if they are in boxes or pots) remove them into a ſituation where they may be defended from ſharp winds, which are ſometimes hurtful to them, while young; but afterwards they will endure the ſevereſt weather of our climate.

Theſe trees are very proper for the ſides of barren hills, where few other ſorts will thrive ſo well; nor is this tree very delicate in its ſoil, but will grow much better on poor ſtrong ſtony land, than in rich ground: and, during the ſummer, they appear very beautiful; but in autumn they caſt their leaves, whereby ſome people have been deceived, by ſuppoſing them dead, and have deſtroyed them.

From the wounded bark of this tree exudes the pureſt Venice turpentine; and on the body and branches of it grows the agaric, which is a drug uſed in medicine: the wood is very durable, and (by ſome) reported to be very difficult to burn. But I do not know how this ſhould be, to a tree which abounds with turpentine; though it is ſaid alſo to be ſo ponderous as to ſink in water. It will poliſh exceeding well, and is by the architects abroad much coveted, both for houſes, and building of ſhips. Witſen, a Dutch writer upon naval architecture, mentions a ſhip to be long ſince found in the Numidian ſea, twelve fathoms under water, being chiefly built of this timber and cypreſs, both which woods were reduced to that hardneſs, as to reſiſt the ſharpeſt tools; nor was any part of it periſhed, though it had lain above a thouſand years ſubmerged. And it was upon tables of this wood that Raphael, and ſeveral of the greateſt artiſts, eterniſed their ſkill, before the uſe of canvas was introduced. *Miller's Gard. Dict.*

LASERPI'TIUM, *laſerwort*, in botany, a genus of plants, whoſe characters are:

It hath an umbellated flower, compoſed of five heart-ſhaped leaves, which are equal, and expand in form of a roſe, and reſt on the empalement, which afterwards turns to a fruit compoſed of two ſeeds, which are gibboſe on one ſide, with four large foliaceous wings, which extend the length of the fruit, and are ſhaped like a water-mill.

Theſe plants are extreme hardy; ſo will thrive in moiſt ſoils and ſituations. They are propagated by ſeed, which if ſown in the autumn, the plants will come up the following ſpring; but, when they are ſown in the ſpring, the ſeeds commonly remain in the ground a whole year. The plants ſhould be tranſplanted the following autumn, where they are deſigned to remain; for they ſend out long deep roots, which are frequently broken; when the old plants are removed, they ſhould be planted three feet aſunder; for the plants grow very large. They decay to the ground every autumn, and come up again the following ſpring; but the roots will continue many years, and require no other culture, but to clear them from weeds, and to dig between the roots every ſpring.

LATHE (*Dict.*)—The Lathe is compoſed of two wooden cheeks, or ſides, parallel to the horizon, having a groove or opening between; perpendicular to theſe, are two other pieces, called puppets, made to ſlide between the cheeks, and to be fixed down at any point at pleaſure.

Theſe have two points, between which the piece to be turned is ſuſtained; the piece is turned round, backwards and forwards, by means of a ſtring put round it, and faſtened above to the end of a pliable pole, and underneath to a treddle or board moved with the foot. There is alſo a reſt which bears up the tool, and keeps it ſteady.

As it is the uſe and application of this inſtrument that makes the greateſt part of the art of turning, we refer the particular deſcription thereof, as well as the manner of applying it in various works, to that head. See TURNING.

LATHY'RUS, *chichling vetch*, in botany, a genus of plants, whoſe characters are:

It hath a papilionaceous flower, out of whoſe empalement riſes the pointal, covered with a membranaceous ſheath, which afterwards becomes a pod, ſometimes round, ſometimes cylindrical, and at other times angular: to which may be added, it hath a compreſſed ſtalk, with a raiſed rib, and a leafy border; and has only one pair of leaves, growing on the nerves, which terminates in a tendril.

LATIFO'LIOUS *, in botany, an epithet applied to ſuch trees and plants as have broad leaves.

* The word is formed from the Latin, *latus*, broad, and *folium*, a leaf.

LAT'TIN, a name formerly given to the plates of iron covered with tin, and now uſually called tin, of which our mugs and ſuch other things are made.

The method of preparing theſe plates of tin, as they are called, is as follows: plates of iron are prepared of a proper thinneſs; theſe are cut into ſquares fitted to receive the tinning, but it is not every kind of iron that will ſerve for this purpoſe, but only ſuch as is moſt diſtenſible, eaſily beating out to any degree of thinneſs when hot, and malleable even when cold, without danger of flying to pieces. Of this the Germans have large quantities, which they always ſelect for this purpoſe. This ſort of iron is firſt formed into ſquare bars of an inch in diameter; theſe they beat out a little into flatneſs, and then cut into pieces, which they call ſemelles, or ſoles. They fold theſe together, and having made them into parcels, containing forty pieces each, they beat them all at once with a hammer, which weighs ſix or ſeven hundred weight. When they have done this, the principal part of the whole work is to prepare the leaves, now beat out to a proper thinneſs, ſo as that they ſhall readily receive the tin; for, if there be but the ſmalleſt particle of duſt on them, or only the ſlighteſt ruſt in any part, the tin will never fix there.

This ſmoothing of the plates may be brought about by filing them, but that would be too expenſive, wherefore they do it by ſteeping them in acid waters. Thus, preparing a great number at a time, they leave them in this liquor till the ſurface is a little preyed upon by it, and then they are ſcowered with ſand, which makes them very ſmooth and fine. By this means a woman cleans more plates in an hour, than the moſt expert workman can do in many days. Mr. Reaumur, to whom the world owes the diſcovery of this proceſs, mentions ſeveral waters, any one of which will ſucceed; but the Germans themſelves uſe nothing but common water, made eager with rye. This they make a great ſecret of, but the preparation is very eaſy. After they have ground the rye groſly, they leave it to ferment in common water for ſome time; and they are thus ſure of a ſharp and eager menſtruum, excellently fitted for their purpoſe. With this liquor they fill certain troughs, or tons, and into theſe they put ſeveral bundles of the plates of iron: and to make the liquor be more eager, and act the better on them, they keep it in ſtoves, where it has little air, and is kept warm with ſmall charcoal fires. The workmen go into theſe vaults once or twice a day, to turn the plates, that they may be the better wrought upon by the acid, and to take out thoſe which are moſt wrought upon, and put in others in their room. The more acid the liquor is, and the warmer the ſtove; the ſooner the plates are cleanſed: it requires, however, at leaſt two days to effect this, and oftener ſomething more.

This was the method which the German labourers, employed in the tin works in France, always made uſe of, in order to prepare the iron to receive the covering of tin; but the authors, finding that this was a very laborious employ, and that the heat in the ſtoves was ſo great, that they could hardly bear it, propoſed ſome other methods in the place of this, which were attended with much leſs trouble, and as ſmall an expence, if not leſs; and theſe, upon trial, were found to ſucceed equally well.

Having obſerved that the iron leaves, or plates, are covered with a ſmall layer of a ſort of ruſt, which they contract in the fire, and which the acid liquor took very little hold of; he judged it might be better to expoſe the plates to ruſt, in order to the cleanſing them eaſily of it; as ruſt is always accompanied with a ſort of fermentation, and the particles of ruſt, found on the ſurface of the iron, would be ſure to raiſe up every thing in their way. To this purpoſe he ſteeped the plates of iron in waters in which were ſeparately diſſolved alum, common ſalt, and ſal armoniac. Some other plates he did not ſteep in theſe liquors, but only juſt dipped them in, and then expoſed them to the air to ruſt. All theſe liquors, thus uſed, cauſed the iron to ruſt very freely, but the ſal armoniac beſt of all. After two days, during which every plate had been dipped into this menſtruum only twice or thrice, he ordered both theſe, and thoſe which had been left ſteeping during the ſame ſpace of time, to be ſcowered; and on comparing them together, it was found, that thoſe which had been dipped, and expoſed to the air, became much cleaner than thoſe which had been all the time ſteeped. The ruſt covered all the ſurface in the latter, without raiſing the ſcale; whereas, in the former, the ſurface was raiſed into bliſters of ruſt, which carried it wholly off with them. The diſſolvents, though very weak, are obſerved to produce the deſired effect, as well as ſtronger, which muſt be much dearer; but, among the latter, he prefers vinegar in France, which ſucceeds very well, and, being plentiful there, is very cheap. This operates ſo quick on the iron, that the plate need only be once dipped into it, and immediately taken out again, and ſet in a moiſt place, where it will ruſt in eight and forty hours. If the dipping is repeated three or four times, the ruſting will be ſtill more expeditious, and, eſpecially, if a ſmall quantity of ſal armoniac be diſſolved in the vinegar about a pound to the puncheon. This will make a very efficacious menſtruum, the vinegar diſſolving iron very well, and the ſal armoniac ruſting it ſooner than any other ſalt. This, however, muſt be uſed very moderately, and the plate muſt be ſteeped in cold water afterwards, to take off any particle that might yet remain upon it, otherwiſe it would be ſubject to ruſt after it was tinned.

There are ſeveral other ways of making iron ruſt, as keeping it in a moiſt cellar, expoſing it to the dew, ſprinkling it with ſimple water, or, which is ſtill better, with water in which ſal armoniac has been diſſolved, ſeveral times a day; and, in thoſe countries where the pyrites is common, the vitriolic waters, which partake of it, will do it very well. This water may be prepared at little or no expence, only by heaping up large quantities of the pyrites, and letting it moulder in the air, then putting it into common water, and making a lixivium of it.

The leaves of tin, when they are finiſhed, are always found to be more bright and gloſſy on one ſide than on the other, which is owing to the plates of iron having always ſeveral roughneſſes on one ſide, where it has been moſt expoſed to the hammer. Theſe roughneſſes are what are principally to be eaten down by the menſtruums; for which reaſon Mr. Reaumur greatly prefers ſprinkling, or wetting them, to ſteeping; becauſe, in ſteeping, as both ſides are equally expoſed to the force of the menſtruum, the ſmooth ſide muſt be conſequently eaten away too far, while the other is but eaten barely enough; this occaſions a loſs of the iron, which the author propoſes to ſave by ſprinkling, or ſimply wetting, as the bad ſide only might be ſubjected to the action of the menſtruum.

There are two other cautions, very neceſſary to be obſerved in this part of the work. The firſt is in the management of the plates, before they come to be prepared; which is, in the beating of them, to turn them continually about, ſo that all parts of every plate may be equally extended. And the other is, to plunge them into ſome ſoft clay, or fuller's earth, before they are heated, that they may not ſolder themſelves together.

Which ever method of ruſting the plates be uſed, it is always neceſſary to ſcower them with ſand, as ſoon as it is done; and, when they are thus cleaned, they muſt be immediately plunged into water, to prevent their ruſting again; and they are to be left in this water till the inſtant in which they are to be tinned, or, in the language of the workmen, blanched. The people employed in this part of the operation are called blanchers, and the others who, aſſiſt at the cleaning the plates, the ſcalers. The blancher makes as great a ſecret of his art, as the ſcaler does of his; and it was with great difficulty that Mr. Reaumur obtained it. The manner of doing it is this:

They flux the tin in a large iron crucible, which has the figure of an oblong pyramid with four faces, of which two oppoſite ones are leſs than the two others. The crucible is heated only from below, its upper part being luted with the furnace all round. The crucible is always deeper than the plates, which are to be tinned, are long; they always put them in downwright, and the tin ought to ſwim over them. To this purpoſe artificers of different trades prepare plates of different ſhapes, but Mr. Reaumur thinks them all exceptionable. But the Germans uſe no ſort of preparation of the iron, to make it receive the tin, more than the keeping it always ſteeped in water till the time; only, when the tin is melted in the crucible, they cover it with a layer of a ſort of ſuet which is uſually two inches thick, and the plate muſt paſs through this before it can come to the melted tin. The firſt uſe of this covering is to keep the tin from burning; as, if any part ſhould take fire, the ſuet would moiſten it, and reduce it to its primitive ſtate again. The blanchers ſay, this ſuet is a compounded matter. It is indeed of a black colour, but Mr. Reaumur ſuppoſes that to be only an artifice to make it a ſecret, and that it is only coloured with ſoot, or the ſmoke of a chimney; but he found it true ſo far, that the common unprepared ſuet was not ſufficient; for after ſeveral attempts, there was always ſomething wanting, to render the ſucceſs of the operation certain. The whole ſecret of blanching, therefore, was found to lie in the preparation of this ſuet; and this he at length diſcovered to conſiſt only in the firſt frying and burning it. This ſimple operation not only gives it the colour, but puts it into condition to give the iron a diſpoſition to be tinned, which it does ſurpriſingly.

The melted tin muſt alſo have a certain degree of heat, for, if it is not enough, it will not ſtick to the iron; and, if it is too hot, it will cover it with too thin a coat, and the plates will have ſeveral colours, as red, blue, and purple; and, upon the whole, will have a caſt of yellow. To prevent this, by knowing when the fire has a proper degree of heat, they might try with ſmall pieces of iron; but, in general, uſe teaches them to know the degree, and they put in the iron when the tin is at a different ſtandard of heat, according as they would give it a thicker or a thinner coat. Sometimes, alſo, they give the plates a double layer, as they would have them very thickly covered. This they do by dipping them into the tin, when very hot, the firſt time, and, when leſs hot, the ſecond. The tin which is to give the ſecond coat, muſt be freſh covered with ſuet, and that with the common ſuet, not the prepared. *Philoſophical Tranſactions*, N°. 406.

LAVEN′DULA, *lavender*, in botany, a genus of plants whoſe characters are:

It is one of the verticillate plants, whoſe flower conſiſts of one leaf, which is divided into two lips; the upper lip, ſtanding upright, is roundiſh, and, for the moſt part, bifid: but the under lip is cut into three ſegments, which are almoſt equal: theſe flowers are diſpoſed in whorles, and are collected into a ſlender ſpike upon the top of the ſtalks.

Theſe are propagated by cuttings or ſlips; the beſt ſeaſon for which is in March, when you ſhould plant them in a ſhady ſituation, or at leaſt ſhade them with matts until they have taken root; after which they may be expoſed to the ſun, and, when they have obtained ſtrength, may be removed to the places where they are deſigned to remain. Theſe plants will abide the longeſt in a dry, gravelly, or ſtony ſoil, in which they will endure our ſevereſt winters; though they will grow much faſter in ſummer, if they are planted upon a rich moiſt ſoil; but then they are generally deſtroyed in winter; nor are the plants half ſo ſtrong-ſcented, or fit for medicinal uſes, as thoſe which grow upon the moſt barren rocky ſoil.

LA′VERS, ſacred veſſels in the temple of Solomon at Jeruſalem; they were a ſort of baſons which received the water that fell from another ſquare veſſel above them, from which they drew it by cocks; each Laver contained ten barrels; they were uſed in waſhing the victims, veſſels, &c. They were ten in number, placed five on each ſide the court, over-againſt the altar or place of ſlaughter.

LAVI′GNON, the name of a French ſhell fiſh common on the coaſt of Poitou. It is of the chama kind, having a very thin pair of ſhells for its covering, which are eaſily cruſhed to pieces between the fingers, and which never can ſhut cloſe, in the manner of the oyſter or muſcle, or other common bivalve ſhells. The fiſh, therefore, always buries itſelf in the mud by way of ſecurity. The ſhells are very ſmooth and poliſhed, eſpecially, on the inſide, and they are naturally white. This colour they always retain within, though their outer ſurface is often tinged black with the mud.

LAU′NDER, in minerology, a name given, in Cornwall, Devonſhire, and other places, to a long and ſhallow trough, which receives the powdered ore after it comes out of the box or coffer through the iron ſtrainer, at the foot of the ſtamping-mills; the waſte or light part of the ore is waſhed away by a gentle ſtream of water, but the more ponderous part ſtays behind, which is ſent to the melting-houſes after it is dreſſed, at the frames, or waſhing-places, then dried, and made fit for the furnaces.

LAU′RA *, a place where monks anciently dwelt.

* The word is derived from the Greek λαῦρα, a village.

Authors are divided about the difference between a Laura and a monaſtery. Some pretend that a Laura was a monaſtery, wherein lived at leaſt 1000 monks; but this is no ways creditable. But the Lauræ were a kind of villages, whereof each ſeveral houſe was inhabited by one or two monks at the moſt. The term Laura was only underſtood of the religious places in Egypt and the Eaſt, where their houſes ſtood apart from each other, and were not joined by any common cloiſter, the monks that inhabited them only meeting in public once a week.

LAURE'OLA, *the ſmall ſpurge laurel*, in botany, is the ſame with the thymelæa, with laurel-ſhaped leaves.

Laureola is a very rough purge; it operates both upwards and downwards, and uſually carries off a great quantity of matter, but it is apt to erode, and inflame the ſtomach and inteſtines. The leaves are ſomewhat milder than the bark of the ſtem; that of the root is ſtrongeſt of all. Many have given it in drops with ſucceſs; but it is ſo rough and dangerous a medicine, that, while there are others capable of anſwering all the purpoſes intended by it, it is unpardonable to bring it into uſe.

LAU'RO-*ceraſus*, the laurel, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of ſeveral petals arranged in a circular form. The cup is hollowed, and funnel-faſhioned, and from it there ariſes a piſtil, which finally becomes a fruit, reſembling a cherry, ſoft, and incloſing a ſtone with a roundiſh kernel.

This was diſcovered to be poiſon by the accident of two women dying ſuddenly at Dublin, after drinking ſome of the common diſtilled laurel water. Several experiments were then made on dogs, and communicated to the Royal Society by Dr. Madden, and afterwards confirmed by Dr. Mortimer, which plainly ſhewed the poiſonous effect of laurel water. See *Philoſophical Tranſactions*. N°. 418, 420.

LAU'RUS, *the bay-tree*, in botany, a genus of trees, whoſe characters are:

It hath a flower conſiſting of one leaf, which is ſhaped like a tunnel, and divided into four or five ſegments: the male flowers (which are produced on ſeparate trees from the female) have eight ſtamina, which are branched into arms: the ovary of the female flowers becomes a berry, incloſing a ſingle ſeed within an horny ſhell, which is covered with a ſkin.

Theſe trees are very proper to plant upon the warm ſides of dry hills, where they may be protected from the ſevere blaſts of the north and eaſt winds; in which ſituations I have ſeen ſome of theſe trees upwards of thirty feet in height, which is a plain indication of their large growth.

But I know it will be objected, that theſe trees are often deſtroyed in hard winters, and ſo are improper to make large plantations of in England. That they have been ſometimes killed by ſevere winters, I cannot deny: but, if they are brought up thus hardy, as has been directed, and not ſheared, I dare affirm, they will reſiſt the ſevereſt cold of our climate, when grown to a moderate age, provided they are planted in a dry ſoil; in which, though their leaves ſhould be intirely ſhrivelled by extreme cold, yet, if permitted to remain undiſturbed, and not cut, they will ſhoot again the ſucceeding ſummer, as I have more than once experienced. And in the hard winter, anno 1728, when moſt of the bay-trees ſeemed to be deſtroyed which grew abroad, and many people were ſo inconſiderate as to dig them up, and throw them away, it was obſervable, that all thoſe which were permitted to ſtand did ſhoot out again in the ſucceeding ſummer, and recovered their uſual verdure. Which ſhould caution every perſon, not to be over haſty in condemning trees to the fire, but to wait for the ſucceſs of a whole ſeaſon, before they are pulled up. *Miller's Gard. Dict.*

Canon LAW, a public regulation for the deciding eccleſiaſtical affairs. The canon Law is made up of theſe following parts: firſt, the holy ſcriptures; ſecondly, the conſtitutions of councils, properly called canons; thirdly, the decrees and decretal epiſtles of popes; and, fourthly, the opinions of the fathers: beſides theſe conſtituent parts, the civil Law is likewiſe taken in, in ſome caſes, i. e. extracted from the Theodoſian or Juſtinian codes, and ſometimes from the capitularies of the ancient kings of France. The time, in which the ſeveral collections were put together, which make up the canon Law, is divided into three diviſions: the firſt comprehends the old Laws, by which the church was governed for above 1000 years, and which is contained in the ancient collections and eccleſiaſtical conſtitutions. The ſecond diviſion conſiſts of that which the French call cours, canon; being compoſed of collections, which were made ſince the year 1150 to 1483; and the third diviſion of time takes in all the additions made ſince the period above-mentioned, either by the conſtitutions of new councils, the decrees of later popes, or by other proviſions which are owned to have the force of Law in eccleſiaſtical matters. To ſay ſomething of the progreſs of this matter, upon each diviſion of time; to begin with the firſt with reſpect to what was collected either in Greek or Latin: the firſt collection of the Greeks was publiſhed about the year 385; the author of the performance being Stephen biſhop of Epheſus, or, as others will have it, Sabinus biſhop of Heraclea. This work took in the canons of the two general councils of Nice and Conſtantinople, together with thoſe made by the five provincial councils of Ancyra, Neo-Cæſarea, Gangra, Antioch, and Laodicea, held in Aſia much about the ſame time. The ſecond collection was made a little after the general council of Chalcedon, held in 458; and here moſt of the canons of the general council of Epheſus, and of that of Chalcedon, were added to the canons of the firſt collection; the greateſt part of the learned are of opinion that this collection was drawn up by Stephen biſhop of Epheſus. To this body were added, the canons of the council of Sardica, the apoſtles canons, and thoſe of St. Baſil. The third Greek collection was ordered to be drawn up by the council in Trullo, held at Conſtantinople in 692. This was afterwards augmented in the year 790; ſome canons of the ſecond general council of Nice, as Morery calls it, being added to it. The fourth Greek collection was compiled by Photius, patriarch of Conſtantinople, about the year 880; beſides theſe four Greek collections, in which the canons were ranged according to the order of the councils, or the epiſtles of the fathers made uſe of; beſides theſe collections, I ſay, John of Antioch made another in the year 550, in which, the canons were diſpoſed into heads according to the ſubject-matter under fifty titles or diviſions; the ſame John of Antioch, being preferred to the patriarchate of Conſtantinople in 554, drew up the firſt nomo-canon, divided likewiſe into fifty titles or heads, in which he cites the civil Laws from Juſtinian's codes and novels, i. e. ſo much of them, as the canons are concerned in. Photius drew up another nomo-canon, where the reſembling Laws and canons are placed together, for view and compariſon, about the year 883. Arſenius, a monk of Athos, and, afterwards, patriarch of Conſtantinople, made a new nomo-canon in 1255, and Matheus Blaſtares, a monk of St. Baſil's order, made another in 1335: ſo much for the Greeks. We ſhall ſay ſomething of the Latin collections, of which the moſt conſiderable are four. The oldeſt was drawn up by the order of pope Leo, in 460. The ſecond Latin collection was made by Donyſius Exiguus, who was likewiſe the author of the paſchal cycle, and the chriſtian æra; this collection was publiſhed in 496, to which, in the year 500, Dionyſius added a ſupplement conſiſting of popes decrees. The third Latin collection was made in Spain by Iſidore, biſhop of Seville, in the year 620. The fourth appeared in 790, under the name of Iſidorus Peccator, or Mercator: beſides theſe collections, in which the order of time in the councils or decretal epiſtles is generally obſerved, there have been ſeveral others drawn up, in which, the diviſion is made, according to the diverſity of the ſubject-matter; and of this kind are thoſe drawn up by Ferrandus, deacon of the church of Carthage, in the year 527; by Martin archbiſhop of Braga in Portugal, 572; by Creſconius, an African biſhop, in 670; and by Regino Abbot of Prûm, in the dioceſe of Treves, in the year 900; this laſt added the civil Laws to the canons and opinions of the fathers where they had any relation to them; ſo that, in reality, this collection may paſs for a nomo-canon. About the year 1020, Burchardus, biſhop of Wormes, made a new collection of canons, vulgarly called the decretum of Burchard (inſtead of a book or collection of decreta) ſome likewiſe call this work Brocardica, by miſtake for Burchardica. In the year 1100, Ivo Carnutenſis, or biſhop of Chartres, drew up two bodies of canon Law, one of which was commonly called the decretum, and the other panormia, or rather pannomia, that is to ſay, a collection of all the Laws. And likewiſe, among the collections of canon Law, may be added the orders and conſtitutions of biſhops, and pœnitentials, or books in which penance and diſcipline are ſtated; as likewiſe Gregory, a Spaniſh prieſt, his Polycarp, which compiler lived ſome little time after Ivo Carnutenſis; and thus much for the firſt diviſion of time, with reference to the common law. The ſecond period of the canon law takes in that commonly called the Curſus Canonicus. This conſiſts of three parts, the firſt of which contains Gratian's Decretum; the ſecond takes in the great Decretals collected by order of pope Gregory IX, in 1230; the third comprehends the four leſſer collections of Decretals, i. e. the Sextus, the Clementines, the Extravagants of John XXII, and the common Extravagants. The Decretum of Gratian is a collection of eccleſiaſtical conſtitutions, and of thoſe ancient regulations which paſſed for Law in the church, till the middle of the XIIth century. This Gratian was a Benedictine, who employed twenty-four years in this work, which he publiſhed in the year 1150; the performance is divided into three parts, the firſt of which contains 101 diſtinctions, in which eccleſiaſtical perſons are his principal ſubject; the ſecond part contains 36 cauſes, in which, the matter and form of trial and ſentence are handled; and the third conſiſts of five diſtinctions, concerning conſecration of holy things. (This Decretum of Gratian was received and corrected by pope Gregory XIII, and a new edition publiſhed in 1580.) After the Decretum of Gratian, there was a collection of the decretal epiſtles drawn up, which were written by popes living after Gratian's time. Bernard Circa, afterwards biſhop of Fayenza, compiled a new body of canon Law in 1188; and Johannes Valenſis drew up another about twelve years after. Peter of Beneventum finiſhed a third collection which was approved by pope Innocent the IIId, in 1210. After the IVth council of Lateran, held in the year 1215, under the ſame pope Innocent the IIId, there appeared a fourth collection, the author of which is not known. Tancred, archdeacon of Bologne, made a fifth, in the year 1226. The ſecond part of the Curſus Canonicus, or Courſe of Canon Law, being a collection of the Decretal Epiſtles, drawn up by the order of pope Gregory the IXth, takes in the epiſtles of ſeveral popes, and particularly thoſe epiſtles which were written from the year 1150, the time in which Gratian publiſhed his decree, till the year 1230, in which this collection of Decretals was publiſhed; to this ſecond part likewiſe

wiſe are added the conſtitutions of councils, and ſome deciſions of the fathers: this collection was put in order by Raymond de Pegnafort, the pope's penitentiary, and is divided into five books. The firſt book treats principally of the eccleſiaſtical Law in general, and of the ſeveral ſorts of judges who have juriſdiction in the church. The ſecond treats of civil proceſs, or the forms of proſecuting an action. The third and fourth give directions about ſentence and paſſing judgment in civil matters, taking in the caſes in which the clergy are concerned, together with thoſe relating to marriage. The fifth enlarges both upon the matter and form, concerning trial and judgment in criminal cauſes. The third part of the Curſus Canonicus, or Courſe of Canon Laws, conſiſts of a collection of new decretals, and contains the Sextus, the Clementines, and the Extravagants. The Sextus, i. e. the ſixth book of the decretals, was drawn up by pope Boniface the VIIIth's order in the year 1298: this collection is divided into five books, like that of Gregory the IXth, the matter being thrown into the ſame order, and divided under the ſame heads. The Clementines were formed into a body by pope Clement the Vth, ſome time after the celebration of the council of Vienna, held in 1311, and publiſhed in the year 1317, by his ſucceſſor John the XXIId. The Extravagants of John the XXIId are the decretal epiſtles of that pope, which were ſo called, becauſe, being not yet inſerted into the body of the Law, they ſeemed as it were outliers, and to range out of the confines of the Curſus Canonicus, which name has continued upon them; afterwards the decretals of ſeveral popes were called the Common Extravagants, to the year 1483, and, in this latter body of the canon Law, there are more of the conſtitutions of pope John the XXIId, than in the collection that goes under his name. The third period of the canon Law takes in the conſtitutions of councils and popes made ſince the laſt collections of the decretals, with other regulations which have the force of Law in eccleſiaſtical affairs; this laſt diviſion of Law is either common, i. e. as Morery ſpeaks, received by all Catholics, or elſe particular to ſome community. There are two ſorts of common Law; the one relates to diſcipline, and the other to the forms and proceſs of courts. The firſt conſiſts of the decrees of general councils, held ſince Clement the Vth, and the bulls of popes, not yet taken into the body of the Law, the greateſt part of which has been put together by Laertius and John-Mary Cherubins; from whence Pétrus Matheus, a lawyer of Lyons, has extracted a collection, which he calls the ſeventh book of the decretals. The ſecond part of this common Law takes in the forms and regulations of the apoſtolic Chancery, made ſince John the XXIId, amounting to the number of ſeventy-one, the three principal of which are received in France, upon the ſcore of being founded upon natural equity. That branch of the civil Law, which is called proper or particular, is that, which beſides the general Law of the whole church, is peculiar to particular nations, provinces, churches, dioceſes, chapters, and communities: as to France, continues Morery, that part of the canon Law, which is particular to us, is, in the firſt caſe, taken from the antient decrees, uſages, or cuſtoms of the univerſal church, being preſerved by our forefathers with greater care, than by the neighbouring nations; and in theſe uſages and regulations that which we call the privileges or immunities of the Gallican church principally conſiſts. In the ſecond place, that part, which makes the canon Law particular to France, conſiſts of royal ordinances made by the kings of the third race, either with the concurrence of the ſtates of the realm, or their own proper authority, or elſe in concert with the holy See, ſuch as the pragmatic ſanction, the ordinances of Orleans, Blois, and others, ſo far as the church is concerned; the concordat, made in the year 1516, between pope Leo the Xth and Francis the Iſt, which was concluded to ſoften that which ſhocked the court of Rome, in the pragmatical ſanction: to this we may add the German concordat, made in the year 1447, between pope Nicholas the Vth and the emperor Frederic the IIId, and which is ſtill obſerved in Lorraine and Alſace. The third branch of eccleſiaſtical Law, which, though particular to France, is not obſerved all the kingdom over, is made up of the canons of late provincial courts, ſynodal conſtitutions, and regulations of corporations or communities. *Doujat Hiſtoire du Droit Canonique.*— There is a new edition of the body of canon Law, and decretals, printed in 1687, with notes and corrections of Petrus and Franciſcus Pithæus, two eminent lawyers, printed from an original in the library of M. le Pelletier, miniſter of ſtate, comptroller general of the finances, and great grandſon to Petrus Pithæus; this edition was ſome time ſince printed at Paris.

Roman or Civil LAW.—Under this denomination, we are to underſtand Laws made by the Romans for the ſupport of their government, and the adminiſtring juſtice to private perſons. Romulus, who built Rome, gave the firſt beginning of theſe regulations in his leges curiatæ, ſo called, becauſe they were made by the conſent of a general meeting of the people, divided into thirty parts or wards, called curiæ. The other kings, who ſucceeded him, made ſeveral Laws during their reſpective reigns, which, in all, laſted 244 years. Theſe Laws being drawn into a body, by Sextus Papyrius, in the 245th year of Rome, the collection was called Jus Papyrianum. But, theſe Laws being ſoon after repealed by the Lex Tribunitia, there are none of theſe royal Laws to be met with, in the books of the Jus Romanum. About the year of Rome 303, there were ten learned men pitched upon to travel to the republics of Greece, and to tranſcribe all the Laws which they believed ſerviceable to their own government. Theſe ten men, called decem-viri, made ten Laws, to which, the year after, they added two more. Theſe Laws being engraven upon plates of ivory, and hung up in public places of the town, were called the Laws of the twelve tables. But, notwithſtanding this publication, the people, were obliged in ſeveral caſes, to apply to the lawyers for explanation and direction; whoſe opinions, upon caſes put, being approved by cuſtom, came, at laſt, to be called Law. Much about the ſame time, there were forms of proceſs ſettled, for the grounding of actions, and ſtating the method of proſecution; and theſe they called actions of Law. Theſe forms, being publiſhed by Cn. Flavius, made them be called the Flavian civil Law. Some time after, Sextus Ælius wrote another book of actions, or forms of proceſs, which were called Jus Ælianum. And thus, at that time of the day, the Roman Law was made up of the twelve tables, the civil Law, and, as they called it, the actions of the Law. The people of Rome, falling afterwards into a miſunderſtanding with the ſenate, and retiring to mount Aventine, made, during this ſeparation, Laws called plebiſcita, which were afterwards received by the whole commonwealth. After the people or plebeians had yielded the ſenate the power of making Laws, the ſenatus conſulta appeared, i. e. the ordinances or ſtatutes made by the ſenate. To theſe, in the year 387 of Rome, were added the edicts of prætors, who were magiſtrates, choſen every year for the adminiſtration of juſtice, whoſe edicts or decrees were called jus honorarium; Julianus, an eminent lawyer, made a collection of theſe decrees, which was called the perpetual edict, and approved by the emperor Adrian in the year 130, according to the Chriſtian computation. The form of the Roman government being changed a little before the birth of our Saviour, the authority of making Laws devolved upon the emperors, whoſe conſtitutions were drawn into two codes, by Gregorius and Hermogenes, two learned lawyers, under the reign of Diocleſian, in the year 290. Theſe two collections, called the Gregorian and Hermogenian code, took in the imperial conſtitutions, from Adrian to Conſtantine the Great. The emperor Theodoſius the younger ordered a third collection to be drawn up, called the Theodoſian code, in which all the conſtitutions of the ſucceeding emperors, from Conſtantine to himſelf, were inſerted. The writings, likewiſe, and opinions of ſome eminent lawyers, made part of the Roman Law: for, ſince the reign of Auguſtus, there were ſeveral of that profeſſion named by the emperors, to give their judgment upon caſes put, whoſe reſolutions, upon the point, were looked upon as Law, becauſe they were authoriſed by the princes commiſſion to give their opinions. The moſt conſiderable of theſe lawyers, were Publius Papyrius, Appius Claudius, Sempronius, Sextus Ælius, Q. Mutius Scævola, Ateius Capito, Antiſtius Labeo, Papinianus, Ulpianus, Junius Paulus, Pomponius, Modeſtinus Africanus, &c. In the year of our Lord 530, the emperor Juſtinian, perceiving the civil Law very confuſed, ordered a review of it, that the inſignificant part of it ſhould be cut off, and put into the method and condition it is in at preſent. In this great work, he employed the ableſt lawyers of his time; the names of which were, Trebonianus, Conſtantinus, Theophilus, Dorotheus, Anatolius, Cratinus, with ſome others. This committee, after having ſelected what was moſt uſeful in the XII tables, in the plebiſcita, and ſenatus conſulta, in the edicts of prætors, the reſolutions of eminent lawyers, the conſtitutions, or reſcripts of emperors; after having done this, I ſay, they divided the body of Law into four books, viz. the Digeſt, the Inſtitutes, the Code, and the Novels. The Digeſt, otherwiſe called the Pandects, is a collection which contains the old Law, together with the reſolutions of eminent lawyers. The Inſtitutes contain the elements or principles of the Roman Law. The Code is a collection of all the conſtitutions, from Adrian to Juſtinian, for there are few imperial conſtitutions older than Adrian; ſo that it takes in the three codes, the Gregorian, Hermogenian, and Theodoſian. It was called the Juſtinian Code, from that emperor's name, who got it drawn up. The Novels is a ſupplemental book to the Code, and contains the conſtitutions of Juſtinian, which were made after the Code was publiſhed. Theſe Novels are faithfully tranſlated from the Greek into the Latin, and commonly called Authenticæ, to ſhew the exactneſs of the verſion, and to diſtinguiſh them from the epitome of Julianus, conſul of Conſtantinople, and likewiſe from thoſe which Irenerius, a lawyer, inſerted into the Code in the reign of the emperor Frederick the Iſt, in the year 1155; which performance is often, not very carefully and judiciouſly, managed. The civil Law of the Romans, being put in this good condition by the care of the emperor Juſtinian, took place only in Greece, Illyricum, and part of Italy; becauſe the Goths, Lombards, Vandals, Franks, and other barbarous nations, had poſſeſſed themſelves of the weſtern parts of the Roman empire. About the year 868, the emperor Baſilius made an abridgment of the Juſtinian code, and his ſon Leo, the philoſopher, publiſhed the Baſilicæ, in 888, which paſſed for Law, till the ruin of the eaſtern empire, which happened in the year 1453; Juſtinian's body being no longer read in the ſchools, nor pleaded at the bar in Conſtantinople. After theſe Baſilicæ, the emperor Leo ſet forth an hundred and thirteen new conſtitutions, which treat of ſeveral things undecided by the Laws of Juſtinian. The Greek lawyers made gloſſes and explanations upon the Baſilicæ, but not ſo voluminous as thoſe of the Latins upon the civil Law. Michael Attaliottes, a lawyer, who flouriſhed in the year 1070, publiſhed another abridgment of the Juſtinian code, which he called the Abridgment abridged, i. e. an abridgment of what Baſilius the emperor had ſet out before. About the ſame time, Michael Pſellus made another little collection of the Baſilicæ, afterwards tranſlated by Leunclavius in the year 1580. And, laſtly, in 1143, Conſtantine Herminopulus furniſhed out another abridgment of the whole Law, which he called Promptuarium: but the taking of Conſtantinople by Mahomet the IId, in 1453, put an end to the eaſtern empire, and to the uſe of the Laws obſerved there. And thus we have ſeen the ſtate of the Roman or civil Law in Greece: as for Italy, as has been remarked already, it was little obſerved there, for the ſpace of 506 years, after the death of the emperor Juſtinian: for the Goths made themſelves maſters of Italy about ſixty years after the reign of that emperor, and the Lombards, having chaced the Goths out of that country, reigned there about 200 years. During this time, the Viſigoths and Vandals held the government of Spain; and the Goths, Huns, and other barbarous people, ſeized upon part of Gaul; Charlemaigne, having conquered Deſiderius king of the Lombards, in the year 774, was choſen emperor of the Romans, by the ſenate and people of Rome, in the pontificate of Leo the IIId. This emperor had then a deſign of reviving the practice of the Roman or civil Law, but the men of that profeſſion could not furniſh him with a copy of what Juſtinian had publiſhed; but at laſt, in the year 1137, in the reign of Lotharius the IId, emperor of the Weſt, and in the popedom of Innocent the IId, they found a copy of the Digeſts at Amalfi in Puglia, which was called the Florentine pandects, for a reaſon to be given by and by. The emperor Lotharius and pope Innocent, joining in a war againſt Roger, king of Sicily and Naples, deſired aſſiſtance from the then republic of Piſa. In the courſe of this war, the town of Amalfi being taken by ſtorm, and plundered, Juſtinian's copy above-mentioned, being found there, was given to the Piſans, for the good ſervices they had done on this occaſion. Theſe books remained in the hands of this commonwealth, till they were conquered by the Florentines, who carried off the pandects, from Piſa, to Florence; where they are ſtill carefully preſerved, as the only, or at leaſt the moſt authentic original of the Roman law. After the diſcovery of theſe pandects, the emperor Lotharius the IId publiſhes an edict, commanding the Roman or civil Law to be taught in public ſchools, and that cauſes ſhould be tried by it; and, in the year 1150, gave Irenerius leave to read upon it, in the univerſity of Bononia, after whom, it was taught and cultivated, in the ſame place, by ſeveral eminent profeſſors, as, Placentinus, Azo, Accurſius, &c. There have been, likewiſe, a great many other famous civilians in ſeveral parts of Europe, as Bartholus, at Piſa and Perugia; Baldus, at Bononia and Pavia; Alciat, Coverruvius, Antonius Auguſtinus, &c. The moſt eminent civilians among the French, are, Budæus, Duarenus, Du Moulin, Cujacius, Hottoman, Briſſonius, Tiraqueao, Chopinus, Pithæus, &c. The Roman or civil Law was not received in Germany till the XVth century, but ſince that time, it has made its way farther there than elſewhere, upon the account of the emperors of this country ſtiling themſelves the Roman emperors. *Hiſtoire du Droit Romaine.*

LAWN (*Dict.*)—Many perſons have preferred the lime-tree for this purpoſe, on account of their regular growth: but as the leaves of this tree often change their colour, and begin to fall very ſoon in the autumn, occaſioning a great litter in the garden; and from the end of July the trees make but an indifferent appearance; ſo they are not to be eſteemed for theſe plantations.

The elm, oak, beech, and cheſnut, among the deciduous trees, are to be preferred to all others, as they keep their leaves late in autumn: and theſe are all of them large-growing trees; ſo are very proper for this purpoſe.

If there are ſome clumps of ever-green trees intermixed with the deciduous trees in this plantation, it will add to the beauty of it, eſpecially in the winter ſeaſon: the beſt ſorts for this purpoſe, are, the lord Weymouth's pine, the ſilver and ſpruce firs, which will grow faſt, and become large trees: and, as the two latter ſorts always grow pyramidically, ſo they will have a good effect to the ſight, when properly diſpoſed with the deciduous trees: but, as theſe generally feather out their branches near the ground, they ſhould be planted where they do not obſtruct the view of any diſtant objects.

But, as moſt perſons who take pleaſure in beautifying their ſeats in the country, are in haſte for ſhade, they generally plant the trees too cloſe together, and often in ſuch a manner, as to render it difficult, when the trees are advanced, to reduce their number, without injury to the deſign; therefore thoſe trees ſhould be firſt planted, which are deſigned to remain; and then there may be ſome few others planted for preſent ſhade, which may afterwards be taken away. When perſons who are beautifying their ſeats meet with full grown trees on the ſpot, it is a great pleaſure; for theſe ſhould not be deſtroyed, if they can poſſibly ſtand. *Miller's Gard. Dict.*

LAYING *of trees*, a very neceſſary operation, and thus performed:

1. Take ſome of the boughs, and lay them into the ground about half a foot deep in fine freſh mould, leaving them with the end of the layer about a foot or a foot and a half out of the ground; and keep them moiſt during the ſummer-ſeaſon, and they will probably have taken, and be fit to remove, in autumn; and, if they have not by that time taken root, they muſt lie longer.

2. Tie a piece of wire hard round the bark of the bough, at the place you intend to lay in the ground; and twiſt the ends of the wire, ſo that they may not untie; and prick the place above the wire, through the bark, with an awl in ſeveral places; and then lay it in the ground, as before directed.

3. Cut a ſlit upwards at a joint, as is practiſed in Laying of carnations, which, by gardeners, is called tonguing the layers.

4. Twiſt the place which you deſign to lay in the ground like a withy, and lay it into the ground, as directed in the firſt way of Laying.

5. Cut a place round about the bough, that is deſigned to be laid, an inch or two, at the place that is moſt convenient to lay into the ground, and manage it, as is directed in the firſt method of Laying.

The ſeaſon for Laying hardy trees, that ſhed their leaves, is in October; but, for ſuch as are tender, in March; for evergreens, June or Auguſt are good ſeaſons.

Though layers may be laid at any time in the year, the before-mentioned ſeaſons are moſt proper, for the reaſons following: becauſe they have the whole winter and ſummer to prepare and draw root; for at thoſe times of the year the ſun has ſufficient power on the ſap of the tree, to feed the leaf and bud, but has not power ſufficient to make a ſhoot.

And if that ſmall quantity of ſap that does ariſe be hindered, as it will by ſome of the preceding ways of Laying, the leaves and buds will gently crave of the layer, and, by that means, will prepare the layer to take root, or put forth roots a little to maintain itſelf, finding it cannot have it from the mother-plant.

And, therefore, becauſe it wants but little nouriſhment at that time of the year, it is better to lay layers of trees, or to ſet cuttings, than at other times, either in the winter, when the ſap ſtirs but little, or in the ſummer, when the ſap abounds, or in the ſpring, when it begins to riſe; becauſe it is then apt to come too ſuddenly to draw ſap from the layer, before the layer has drawn or prepared for root.

However, the ſpring or ſummer may do well for ſmall plants; becauſe ſuch plants, being but ſhort-lived, draw root the quicker.

If you would lay young trees from an high ſtandard, the boughs of which cannot be bent down to the ground, then you muſt make uſe of oſier-baſkets, boxes, or pots, filled with fine ſifted mould, mixed with a little rotten willow-duſt, which will keep moiſture to aſſiſt the layer in taking root: this baſket, box, &c. muſt be ſet upon a poſt or treſſel, &c. and the bough muſt be laid according to either of the four firſt ways of Laying; but too much head muſt not be left on, leſt that be injured by the wind, or by its own motion rub off the tender root; and the ſmaller the boughs are, the leſs way they ſhould be ſet out of the ground, and care muſt be taken to keep them clear from weeds.

The harder the wood is, the better will the young wood take root; but if the wood be ſoft, the older boughs will take root the beſt. *Miller's Gard. Dict.*

LEACH *brine*, a word uſed by the Engliſh ſalt-workers, to expreſs the brine, which runs out from the ſalt, when it ſtands in the baſkets to drain, immediately after being taken out of the pan: and alſo the liquor left in the pan, when no more ſalt will ſhoot. This is alſo called the mother brine, and bittern. In the German ſalt works they always throw this liquor away. In our brine ſalt works in Cheſhire they always preſerve it, and add it to the next boiling; and, in the Newcaſtle, and other ſea-water ſalt works, they ſave it for the making the bitter purging ſalt, called Epſom ſalt.

LEAD (*Dict.*)—This metal may be procured from its ore, of whatever kind that be, by a ſtratification with charcoal. The method of doing it in aſſay is this: take for a docimaſtical centner of the ore a hundred half ounces, or three pounds and four half ounces, that, by this means, each half ounce may ſtand in lieu of the docimaſtical pound; beat this to a coarſe powder, or lumps not larger than a pea. Put it at firſt into a large earthen or iron frying-pan, and heat it firſt by a gentle fire, which muſt be increaſed gradually, that the greateſt part of the ſulphur may be diſſipated. Now, have at hand a melting furnace, with its bed made of lute and duſt of charcoal. Apply to this, on the outſide, another bed, joined to it by lute, that the matter running out of the inferior hole, when open, may be received into it. Surround this outer bed with burning and freſh coals; and fill the whole furnace with the ſame fuel, that it may be dried. Then, with a pair of bellows, excite the fire for a quarter of an hour, then put in the ore at ſeveral times; nor will it be amiſs to add to it ſome ſcales of iron; but the ore muſt be put in ſo as to be above the coals, facing the hole, through which the blaſt of the bellows is made; but let it not touch the wall of the furnace. Fill the furnace at leaſt two thirds with charcoal, and let it be in pieces of a moderate bigneſs; and, after every portion of ore is put in, add a larger of charcoal above it. When all the ore is put in, continue to blow till all the fire is conſumed; then pour water upon the foremoſt bed, drop by drop, to cool the Lead gathered in it, and ſee among the ſcoriæ if there be any Lead lodged among them; and, if there be, ſeparate it, and weigh all together, and you will, from this, know the value of the ore, and what the ſmelter may obtain from it. *Cranmer's Art of Aſſay.*

It has been proved, by the experiments of different chemiſts, that Lead contains a real running mercury. Kunkel and Becher both ſeparated mercury from it; and Mr. Groſſe, of the Paris academy, has juſtified their experiments, by producing the ſame effect, by means, not only very different from theirs, but abſolutely oppoſite and contrary. They ſuppoſe that the mercury contained in Lead is fixed there, either by acids or by ſulphurs, and therefore they uſed alkaline materials to diſengage and ſupport it. On the contrary, Mr. Groſſe uſed only acids, and by means of theſe procured a pure running mercury from this metal. His method was to diſſolve thin plates of Lead in ſpirit of nitre, weakened with an equal quantity of water. He then obſerved a grey-coloured powder precipitate, which, when tried on gold or copper, ſhewed itſelf to be mercurial, and even in the powder he ſaw ſmall globules of quick-ſilver. *Mem. de l'Acad. des Scienc.* 1733.

LEAF (*Dict.*)—The diſtinction of Leaves, made by thoſe who have written on botany, are:

A ſimple Leaf is that which is not divided to the middle.

A compound Leaf is divided into ſeveral parts, each reſembling a ſimple Leaf, as in liquorice, &c.

A digitated Leaf is a compound Leaf divided into ſeveral parts, all of which meet together at the tail, as in the hemp, black hellebore, &c.

A trifoliated Leaf is a digitated Leaf, conſiſting of three fingers, as the trefoil, &c.

A quinquefoliated Leaf is a digitated Leaf, conſiſting of five fingers, as in the quinque folium.

A pennated Leaf is a compound Leaf divided into ſeveral parts, each of which is called a lobe, placed along the middle rib, either alternately, or by pairs. When the middle rib is terminated by an odd lobe, it is ſaid to be unequally pennated, as in the goats rue, &c. and equally pennated, when it is not terminated by an odd lobe, as in the caſſia: when the lobes are all nearly of the ſame form and bigneſs, it is called an uniform pennated Leaf, as in the liquorice; when they are not ſo, it is ſaid to be difform, as in the agrimonia.

A winged Leaf is, as it were, divided into ſeveral pennated Leaves, as in the orobus, &c.

A ramoſe Leaf is that which is ſtill farther divided than the winged Leaf, as in the oſmund royal, female fern, &c.

An entire Leaf or lobe is that which has no diviſion on its edges, as in the apple-tree, &c.

A ſinuated Leaf is that which is cut about the edges into ſeveral long ſegments, as in common mallows.

A ſerrated Leaf is that which is cut about the edges into ſeveral acute ſegments, reſembling the teeth of a ſaw, as in the nettle, &c.

A crenated Leaf is that which is cut about the edges into ſeveral obtuſe ſegments, as in the betony, &c.

A laciniated or jagged Leaf is that which is cut about the edges into ſeveral pretty deep portions, in an irregular manner, as in the horned poppy, &c.

Leaves are a part of a plant that is ordinarily very thin and flat, growing in the ſpring, and falling off at the autumn; though there are ſome plants without Leaves, as the truffles and muſhrooms. *Miller's Gard. Dict.*

The Leaves of plants are of the utmoſt conſequence to the life of the whole. Air evidently paſſes in at the Leaves, and goes through the whole plant, and out again at the roots. If the Leaves have no air, the whole plant will die, as is eaſily proved by the air-pump; but, in theſe experiments, if the Leaves be left on the outſide of the receiver, and parted by a hole cemented with wax, and have air, the plant will thrive, and grow, though its roots and ſtalk are kept in vacuo in water. The Leaves of plants perform the neceſſary work of altering the water, received in at the roots, into the nature of the juices of the plant; and hence it is, that the life of the plants depends ſo immediately upon their Leaves. The huſbandman often ſuffers for want of this knowledge. A crop of ſaintfoin is a very valuable thing, and, its root being perennial, will yield him increaſe many years; but it is often deſtroyed at firſt, by ſuffering it to be indiſcreetly fed upon by the ſheep, which eating up all the leaves, the root remains without the means of a ſupply of air, and the whole periſhes.

Leaves being thus neceſſary to plants, nature has, in all perennial plants, provided a reverſionary ſtock of them. The Leaves of theſe plants are always formed in autumn, though they are not unfolded till the following ſpring. They then open and increaſe gradually, in proportion to the motion of the ſap, and the quantity of pabulum it then receives to be circulated. Theſe Leaves may alſo, though not wholly appearing out of the bud, be ſufficient for the extremely ſmall motion of life, which the ſap of perennial plants, that drop their Leaves, has in winter. *Tull's Horſe-hoeing Huſbandry.*

LEA'O, in natural hiſtory, a mineral ſubſtance approaching to the nature of the lapis lazuli, found in the Eaſt-Indies, and of great uſe in the Chineſe porcelain manufacture, being the fineſt blue they are poſſeſſed of. This is found in the ſtrata of pit coal, or in thoſe of a yellowiſh or reddiſh earth in the neighbourhood of the veins of coal. There are often pieces of it lying on the ſurface of the ground, and theſe are a ſure indication, that more will be found on digging. It is generally found in oblong pieces, of the ſize of a finger, not round, but flat. Some of this is very fine, and ſome coarſe, and of a bad colour. The latter is very common, but the fine ſort is ſcarce, and greatly valued. It is not eaſy to diſtinguiſh them at ſight, but they are found by experiment, and the trying one piece is generally ſufficient for judging of the whole mine; for all that is found in the ſame place, is uſually of the ſame ſort.

Their manner of preparing it for uſe is this: they firſt waſh it very clean, to ſeparate it from the earth, or any other foulneſs it may have; they then lay it at the bottom of their baking furnaces; and when it has been thus calcined for three or four hours, it is taken out and powdered very fine in large mortars of porcelain with peſtles of ſtone faced with iron. When the powder is perfectly fine, they pour in ſome boiling water, and grind that with the reſt; and, when it is thoroughly incorporated, they add more, and finally pour it off, after ſome time ſettling. The remainder at the bottom of the mortar, which is the coarſer part, they grind again with more water, and ſo on, till they have made the whole fine, excepting a little dirt or grit. When this is done, all the liquors are mixed together, and well ſtirred. They are ſuffered to ſtand two or three minutes after this, and then poured off, with the powder remaining in them. This is ſuffered to ſubſide gradually, and is the fine blue they uſe in their beſt works, our common ſmalt ſerving for the blue of all the common low-priced China ware. *Obſervat. ſur les Coutumes de l'Aſie.*

LECH, in metallurgy, a term uſed by the miners, to expreſs the gold ore which has been powdered, and waſhed, and afterwards run with the aſſiſtance of lime-ſtone. The Lech is afterwards burnt in a fire of charcoal, in order to render it fit for the ſeparation of the metal, by means of lead, which, abſorbing and ſcorifying the extraneous matter, renders the gold pure.

LEECH. See HIRUDO.

LEEK, *porrum*, in botany.—We have two kinds of Leek commonly cultivated amongſt our gardens, the one called the common Leek, and the other a broader-leaved one, commonly called the London Leek. There are ſome reaſons to ſuſpect that theſe are only varieties of the ſame ſpecies of plant, both ariſing from the ſame ſeed.

The method of propagating theſe is by ſeeds, and they are commonly ſown along with onions. The onions grow up firſt; and after they are pulled up, the Leeks have time enough to grow to their ſize. *Miller's Gard. Dict.*

LEER, in glaſs-making, a ſort of third furnace, intended to anneal and cool, by proper degrees, the veſſels when made. This properly comprehends two parts, the tower and Leer. The tower is that part which lies directly above the melting furnace, with a partition between them of a foot thick; in the midſt whereof there is a round hole, placed exactly over the furnace, through which the flame and heat paſs into the tower. On the floor of this tower the veſſels are ſet to anneal. There are two openings, by which the veſſels are put into this tower, and after ſtanding there ſome time, they are put into iron pans, which, by degrees, are drawn out all along that part of this furnace, which is properly called the Leer; which is five or ſix yards long, that the veſſels may cool by degrees. This Leer is continued to its tower, and arched all along, and is about four feet wide, and high within. The glaſſes are cool by that time they are come to the mouth of this, which enters into a room where the glaſſes are placed, when taken out. *Neri's Art of Glaſs.*

LEETCH *of a ſail*, in a ſhip, the outward edge or ſkirt of the ſail from the earing to the clew, or rather the middle of the ſail between theſe two.

Leetch-*lines*, in a ſhip, ſmall ropes faſtened to the Leetch of the top-ſails (only) and then reeved into a block at the yard, juſt by the top-ſail ties. Their uſe is to hail the Leetch of the ſails, when the top-ſails are to be taken in; which is always firſt done, and then the ſail can be taken in with the greater eaſe.

LE'GATE-*note*, in the Italian muſic. Notes are ſaid to be Legate when this ⌢, or this ⌣ mark is found over or under the heads of them. This is what we call tying them, and is done, when they are properly but one note, but obliged to be ſeparated into two, becauſe part is found at the end of one bar, and the other part in the beginning of the following bar; or becauſe the two halves of a note are in different parts of the meaſure.

LE'GER-*line*, in muſic, is uſed to ſignify a line added to the ſtaff of five lines, when the aſcending and deſcending notes run very high or very low. We often meet with ſeveral of theſe lines both above and below the ſtaff.

LEMU'RIA, a feaſt of ghoſts and phantoms, ſolemniſed the ninth day of May, to pacify the manes of the dead, who were the lemures that came in the night to torment the living. The inſtitution of this feaſt is aſcribed to Romulus, who to rid himſelf of the phantom of his brother Remus, whom he had ordered to be murdered, ordained a feaſt called after his name, Remuria and Lemuria. They offered ſacrifices for three nights together, during which time all the temples of the gods were ſhut up, and there was no wedding.

LE'NÆA, Ληναῖα, in antiquity, a feſtival of Bacchus, ſurnamed Lenæus, from ληνὸς, i. e. a vine-preſs. Beſides the uſual ceremonies at feaſts ſacred to this god, it was remarkable for poetical contentions, and tragedies acted at this time. *Potter, Archæol.*

LE'NTES *lapideæ, foſſil lentils*, the name given by many writers to a very remarkable foſſil ſubſtance, uſually found immerſed in hard ſtone, and of a roundiſh but flatted ſhape, reſembling, not unaptly, a pea or lentil flatted by preſſure.

LENTI'SCUS, *the lentiſk or maſtich-tree*, in botany, the name of a genus of trees, very nearly allied to the terebinthus or turpentine-tree in its characters, but differing, in that the leaves are pinnated; but there is no ſingle leaf to terminate the end of each compound one. *Tourn. Inſt.* See MASTICH in the Dictionary.

LEO, *the lion*, in zoology. See LION.

LEO-*pulex*, a name given by Mr. Reaumur to a ſpecies of inſect which feeds on the pulex arboreus, or common tree-puceron, in the ſame manner that the creature, called the formica Leo, does on the ants: this being alſo, like that, an animal, yet in an imperfect ſtate, and finally to be changed into a different creature, this author has kept up the remembrance of this analogy between them, by giving this a ſimilar name.

LE'OPARD, in zoology, the Engliſh name of a voracious beaſt of prey, beautifully ſpotted, and virgated.

This creature, when carefully examined, is found to be very like a cat; particularly its head, teeth, tongue, feet, and claws. Its actions alſo are all like a cat's; it boxes with its fore feet, as a cat does her kittens; leaps at its prey, as the cat does; and will ſpit much in the ſame manner.

All the Leopard kind, as they walk, keep the claws of their fore feet turned up from the ground, and ſheathed, as it were, in the ſkin of the toes, whereby they preſerve them ſharp for the ſeizing of their prey.

Notwithſtanding the natural fierceneſs of the Leopard, numbers of them are bred up tame, and kept for the great cham of Tartary's uſe, for the hunting of deer and other beaſts.

They are moſt numerous in Africa and Syria. *Grew's Muſ.*

LE'TTUCE; ſee LACTUCA.

LERICOI'UM, *ſtock-gilliflower*, in botany, a genus of plants, whoſe characters are:

The flower is compoſed for the moſt part of four leaves, which are placed in form of a croſs: out of the flower cup riſes the pointal, which becomes a long flat pod, divided into two cells by an intermediate partition, to which the valves adhere on both ſides, and are furniſhed with flat ſmooth ſeeds, which are orbicular, and bordered round their edges: to which may be added, the flowers are ſpecious, and ſweet-ſmelling.

All the ſorts of ſtock-gilliflowers are propagated by ſeeds: the beſt time for ſowing them is in the beginning of April, upon a border of freſh light earth, where they may be expoſed to the morning ſun; for, if they are too much expoſed to the ſun in the heat of the day, they are very ſubject to be eaten by a ſort of fly; as they often are, while young, upon an hot dry ſoil. To remedy which, you ſhould always ſow a few radiſhes amongſt them, which will ſecure them from this miſchief: for the flies will always prey upon the radiſhes, whereby your gilliflower plants will be preſerved; but then you muſt not ſuffer the radiſhes to be too thick amongſt them; for that would draw them up very weak, and cauſe them to be long-ſhanked. When your plants have gotten ſix leaves, they muſt be tranſplanted into other borders of the like freſh earth, and expoſed to the morning ſun at about four inches diſtance; obſerving to water and ſhade them until they have taken root; after which they will require no farther care, than only to keep them clear from weeds until the latter end of Auguſt, or the beginning of September, when you muſt tranſplant them into the borders of the pleaſure-garden; which ſhould be done, if poſſible, in moiſt weather, that they may the ſooner ſtrike root, whereby they will be ſecurely faſtened in the ground before the froſt comes on; which would prevent their taking root, and thereby either quite deſtroy them, or at leaſt cauſe them to flower very weak the ſucceeding ſpring.

LE'WING, in metallurgy, the ſifting the ores of metals in water. This is done in fine ſieves moved backwards and forwards under water; and is the method of ſeparating the finer part of the ores which had ſubſided among the larger lumps, under that part of it ſeparated for uſe in the various waſhings. The coarſer matter, left in the ſieve, is powdered again with the larger maſſes, and all thus ſifted together for the blowing-houſe. *Ray's Engliſh Words.*

LIBE'LLA, in natural hiſtory, the name of a very large genus of four-winged flies, called by us adder-flies and dragon-flies.

Theſe flies have alſo two very large and reticulated eyes, covering the whole ſurface of the head. They fly very ſwiftly, and prey upon the wing, being of great uſe to mankind, in clearing the air of innumerable little flies.

LI'BRARY (*Dict.*)— Some authors refer the origin of Libraries to the Hebrews, and obſerve, that the care they took for the preſervation of their ſacred books, and the memory of what concerned the actions of their anceſtors, became an example to many other nations, and particularly the Egyptians. Oſymandrias, king of Egypt, is ſaid to have taken the hint firſt, and had a Library built in his palace with this inſcription over the door ψυχῆς ἰατρειὼν. The Ptolemies of that country were alſo very curious in books. The ſcripture, Eſdras the Vth and VIth, ſpeaks of a Library of the kings of Perſia, which ſome imagine to have conſiſted of the hiſtorians of that nation, and of memoirs of the ſtate; but it appears rather to have been a depoſitory of laws, charters, and ordinances of the kings. The firſt who erected a Library at Athens was the tyrant Piſiſtratus; yet, Strabo ſays, Ariſtotle was the firſt. That of Piſiſtratus was tranſported by Xerxes to Perſia, and afterwards brought by Seleucus Nicanor to Athens. Long after it was plundered by Sylla, and re-eſtabliſhed by Hadrian. Plutarch ſays, that, under Eumenes, there was a Library at Pergamos containing 200,000 books. Tarannion, a celebrated grammarian, cotemporary with Pompey, had a Library of 3000 volumes. That of Ptolemy Philadelphus, according to Ammianus Marcellinus, contained 7000 all in rolls, burnt by Cæſar's ſoldiers. Conſtantine and his ſucceſſors erected a magnificent one at Conſtantinople, which, in the eighth century, contained 300,000 volumes, all burnt by order of Leo Iſauricus, and, among the reſt, one wherein the Iliad and Odyſſey were written in letters of gold on the guts of a ſerpent. The moſt celebrated Libraries of ancient Rome were the Ulpian and the Palatine. Antiently, every large church had its Library. One of the moſt complete Libraries in Europe is ſaid to be that erected, at Florence, by Coſmo Medicis: though it is now exceeded by that of the French king, begun by Francis the Firſt. The Emperor's Library, according to Lambecius, conſiſts of 80,000 volumes, and 15,940 curious medals. The Bodleian Library at Oxford, built on the foundation of that of duke Humphrey, exceeds that of any univerſity in Europe, and even thoſe of all the ſovereigns of Europe, except the emperor's and French king's, which are each of them 100 years older; it was firſt opened in 1602, and has ſince found a great number of benefactors. The Vatican, the Medicean, as that of Beſſarioni at Venice, and thoſe juſt mentioned, exceed the Bodleian in Greek manuſcripts, which yet out-does them all in Oriental manuſcripts. As to the printed books, the Ambroſian at Milan, and that at Wolfenbuttel, are two the moſt famous, and yet both inferior to the Bodleian. The Cotton Library conſiſts wholly of manuſcripts, particularly ſuch as relate to the Hiſtory of Antiquities in England, which, as they are now bound, make about 1000 volumes.

LI'CHEN, *liverwort*, in botany, the name of a genus of moſſes, the characters of which are theſe: they have the moſt perfect fructification of all the moſſes, having evident flowers as well as ſeeds. Their flowering heads are of various figures, and have a number of monopetalous flowers in them, divided into a different number of ſegments; theſe have ſeveral filaments, and among them have a large quantity of farina, which, when examined by the microſcope, appears of a globular figure. The ſeeds are produced in other parts of the plant, and are contained in certain cups, which ſtand without pedicles on the ſurface of the leaves; theſe are ſometimes on the ſame individual plant with the flowering heads, but ſometimes they are on different plants of the ſame ſpecies.

LICHENOI'DES, in botany, the name of a genus of moſſes, the characters of which are theſe: they are compoſed of parts of different figure and ſtructure, not ſimple and uniform as the byſſi; they have uſually no ſtalk, but grow on the branches of trees, on ſtones, and other bodies, either in form of a mere cruſt, or of leaves variouſly divided and raiſed. They have tubercles on the ſeveral parts of theſe, ſerving in the place of flowers or ſeeds, and growing cloſely upon the leaves without pedicles. Micheli has deſcribed the flowers and ſeeds of theſe plants from microſcopic obſervations, but theſe are too minute to form generical diſtinctions on. Theſe plants have the name Lichenoides, from their reſemblance to the lichen, or liverwort, as they conſiſt, like it, of leaves diffuſed every way. They have hence been called by ſome lichens; but the difference between the two genera is very great, theſe having very imperfect flowers, the others the moſt perfect of all the moſſes.

LI'CTORS, among the ancient Romans, were officers who attended the magiſtrates, when they appeared in public.

They were twelve in number, and carried bundles of rods, in which was tied up an ax, the head whereof appeared amongſt the rods. Their office was to go before the king and clear the way for him. Afterwards, when Rome was become a commonwealth, the conſuls, dictators, and prætors, and other magiſtrates who had a right to command the Roman armies, had alſo Lictors going before them; the conſuls and dictators twelve; the prætors ſix. At triumphs the Lictors marched before the conqueror's chariot, carrying their bundles wreathed about with laurels, and holding a branch of the ſame in their hands. They were alſo common executioners: I, Lictor, colliga manus, expedi virgas, plecte ſecuri. They were ready to undo their bundle of rods, whether it were to whip, or to cut off the head of the condemned offender: they were thus called a ligando, becauſe they bound the hands and feet of the condemned perſon before his execution. *Rollin's Roman Antiquities.*

Expectation of LIFE, a term uſed by Mr. De Moivre, for the time which a perſon of a given age may juſtly expect to continue in being, that is, when the chance for his living or dying becomes equal.

According to that gentleman's calculation, upon the ſuppoſition of an equal decrement of Life, the expectation of Life would be expreſſed by $\frac{1}{2} n$, if n denotes the complement of Life. Thus the expectation of Life for a man of 50 years of age will be $18 = \frac{36}{2}$: that is, he had an equal chance, or of 1 to 1, of living 18 years. But, if that interval be once attained, there ariſes a new expectation of $\frac{1}{4} n$, and afterwards of $\frac{1}{8} n$, &c.

Hence he gives the ſolution of the following problem: to find the expectation of two joint Lives, that is, the time which two Lives may expect to continue together in being.

For this, the rule is, from one half of the ſhorteſt complement ſubtract the ſixth part of its ſquare divided by the greateſt complement, the remainder will expreſs the number of years ſought.

Thus, ſuppoſing a Life of 40, and another of 50; the ſhorteſt complement will be 36; the greateſt 46; $\frac{1}{2}$ of the ſhorteſt will be 18; the ſquare of 36 is 1296, whereof the ſixth part is 216, which being divided by 46, the quotient will be $\frac{216}{46} = 4.69$; and this being ſubtracted from 18, the remainder 13.31 will expreſs the number of years due to the two joint Lives.

LI'FTING-*pieces*, in a clock, are thoſe parts which lift up and unlock the detents in the clock part.

LIFTS, in a ſhip, ropes belonging to the yard-arms of all yards. Their uſe is to ſtop the yard-arms, i. e. to make the end of the yards hang higher or lower, as occaſion ſerves.

LIGHT (*Dict.*)—It is evident that the intenſeneſs of the ſun's Light, falling upon any given ſurface, is greater or leſs, according as his rays fall in greater or leſs quantity; or, in other words, any ſurface is more or leſs illuminated, according as the light falls thicker or thinner upon it; now, that this denſity of the ſun's Light is reciprocally, as the ſquares of the diſtances of the illuminated bodies from the ſun, is thus demonſtrated: let S (*Plate* XLI. *fig.* 10, in the Dictionary) be the ſun ſending forth rays of Light every way round, in the ſtraight lines S A, S B, S C, S D, &c. all theſe rays, at the diſtance S *a*, are ſpread uniformly over the ſpherical ſurface *a b c d e*; at the diſtance S A, the ſame rays are ſpread uniformly over a larger ſpherical ſurface A B C D E; the Light then muſt be as much thinner upon this larger ſpherical ſurface than it is upon the ſmaller one, as the larger ſpherical ſurface is greater than the ſmaller one: now the ſurfaces of ſpheres are as the ſquares of their diameters; that is, the ſpherical ſurface A B C D E is to the ſpherical ſurface *a b c d e*, as the ſquare of S A is to the ſquare of S *a*: therefore the Light at A is to the Light at *a*, as the ſquare of S *a* is to the ſquare of S A: which was to be proved.

The prodigious velocity of Light has always been looked upon as one of the greateſt difficulties attending the Newtonian ſyſtem. This difficulty the learned Dr. Knight has attempted to remove, by ſuppoſing that Light is propagated by the progreſſive motion of a repellent fluid; and has ſhewn that all the phænomena of Light and colours will be the ſame, whether we ſuppoſe the propagation of Light performed by a progreſſive motion of its particles, or by the vibrations of a repellent fluid. See REPELLENT *Fluid.*

For, ſays this ingenious author, it makes no difference, in reſpect to the action of a body impinging upon another, whether the impinging body has moved already through a great ſpace, or is only juſt put in motion, provided the velocity and direction be exactly the ſame in both caſes. Therefore a particle of Light will ſtrike upon the retina of the eye with the very ſame effect, when it receives its motion from the next contiguous particle, as when it has moved all the way from the ſun, with the ſame direction and velocity. And it is much eaſier to comprehend how a tremor may be propagated from one end of a ſeries of elaſtic bodies to the other, in the ſame time that Light takes up in coming from the ſun to us, than to conceive how a particle of Light can continue its motion and direction unaltered, through ſo vaſt a ſpace, and with ſo great a velocity; whilſt innumerable other particles are everywhere moving in different and often contrary directions. Is it poſſible that it can move ſo far, and not frequently impinge upon other particles, when every minute part of ſpace muſt contain thouſands of them? What confuſion muſt neceſſarily ariſe in the direction of its motion from ſuch a variety of percuſſions! But, ſuppoſing the motion propagated through our repellent fluid, theſe difficulties immediately vaniſh. In that caſe, the motion may be conveyed in all directions at once, without danger of confuſion; becauſe, as before obſerved, the motion of the intermediate particles from their places will be inconſiderable; and from the nature of percuſſion, amongſt equal elaſtic bodies, one particle is no ſooner removed from its place, but the particle which removed it, takes poſſeſſion of the ſame, and remains there at reſt. The moſt obvious objection to this doctrine is, that in a repellent fluid a particle in motion will not only act upon the next that lies exactly in the direction of that motion, but alſo upon all thoſe that are placed but a very little way out of that direction; and by this means ſeveral other vibrations will commence, which will be communicated in ſuch directions as correſpond with the degrees of obliquity with which the particles act: whereby Light will not only be propagated from one body to another, in right-lines, but will at the ſame time be communicated ſide-ways, in almoſt all directions. And this will not only create confuſion in regard to viſion, but alſo make it impoſſible that there ſhould be any darkneſs in the night. To this I anſwer, that, even granting a particle of the repellent fluid will act upon ſuch particles as lie but a little way out of the direction of its own motion, yet it will not act on them with the ſame force as it does on thoſe directly in its way; therefore theſe lateral vibrations will be much weaker than the direct ones, which give us the ſenſation of Light: however, though theſe vibrations may be too weak for our organs, yet they may be well enough ſuited to the delicate ſtructure of the eyes of many inſects and animalcula, and even of ſome larger animals; for doubtleſs what is darkneſs to us, is not ſo to many of them. The ſame thing happens in regard to ſounds: for, if all the vibrations of the air were capable of affecting our organs of hearing, there could be no ſuch thing as ſtillneſs or ſilence; becauſe the particles of air muſt be put in continual vibrations in all directions, by every little percuſſion that happens among bodies. All nature is perpetually in motion; and every motion, in ſuch an elaſtic fluid as the air, muſt be attended with a greater or leſs vibration of that fluid. As to the objections that may be drawn from the analogy betwixt the waves in water, and the undulations of an elaſtic fluid, they will be anſwered all at once, by denying the exiſtence of theſe undulations; at leaſt with regard to the propagation of ſound or Light. I will not ſay, that the air is never made to undulate: the winds themſelves have often a wave-like motion; but this is not ſound: a large body in motion through the air may make undulations in it. The oſcillations of a pendulum, or the ſtring of an inſtrument, may do the ſame. But none of theſe are the immediate cauſe of ſound. The moving body, pendulum, and ſtring are all ſilent. Only it generally happens in the laſt caſe, that, whilſt the ſtring performs its oſcillations, its component corpuſcles, being elaſtic, are put into a tremulous motion, which motion they communicate to the circumambient air. Touch the ſtring with a ſoft unelaſtic body, and the tremulous motion of the parts ceaſes. But the ſtring continues to oſcillate for a long time after with as much ſilence as a pendulum.

From the whole of what has been ſaid, I think it is ſufficiently evident, that the effect of Light will in all caſes be the ſame, when its motion is propagated through a repellent fluid, as when it is progreſſive, in the manner that Sir Iſaac Newton has ſuppoſed. So that the whole theory of optics, demonſtrated by that excellent philoſopher, continues the ſame as before. Only one thing, that is of any conſequence, remains to be reconciled, I mean his doctrine of colours. He ſhews the diverſity of colours to be owing to the different momenta of the particles of Light, and ſuppoſes their momenta to differ on account of their different magnitudes. I have ſuppoſed all the particles of Light to be of the ſame ſize. This was done for the ſake of ſimplicity, which muſt always take place, as far as the nature of things will admit. And the momenta of the particles of Light will differ, though their ſizes are the ſame, if Light be propagated by vibrations. For in the ſame manner as the tones in muſic make a difference in ſound, according as thoſe vibrations are quicker or ſlower; ſo the momenta of the particles of Light will differ, according as they vibrate with more or leſs force. A great many will be ready to object, that if the particles of Light are equal, and yet their momenta different, they muſt move with different velocities: and, conſequently, that the red rays will come from Jupiter to us, in leſs time than the blue. I grant the premiſſes, but deny the conſequence: for ſound moves with equal velocities, let the tone be what it will. What I advance may at firſt ſight appear a very great paradox. But it ſeems evident to me, that, in two different ſeries of equal and elaſtic bodies, thoſe of one ſeries may move with greater velocity than thoſe of another, and yet the propagation of motion from one to the other be performed in equal times. *Knight's attempt to demonſtrate that all the phænomena in nature may be explained by two ſimple active principles, Attraction and Repulſion.*

LILIA'CEOUS, in botany, a term uſed to expreſs the flowers of ſome plants, which approach to thoſe of the lily in ſhape. The characters of a Liliaceous flower are theſe: it is compoſed of ſix leaves, or elſe of three leaves divided into ſix, but this is more rarely the caſe; the piſtil, or cup of this flower, always becomes finally a ſeed veſſel divided into three cells.

Of this ſort are the flowers of the tulip, hyacinth, aſphodel, ephemerum, and the like; many of which, though they leſs reſemble the lily flowers than the others, yet are to be diſtinguiſhed by this title, becauſe they leave behind them the Liliaceous ſeed-veſſel, which is long, and divided into three cells. *Tourn. Inſt.*

LI'LIUM, *the lily*, in botany, the name of a large genus of plants, the characters of which are theſe: the flower is a ſort of bell-faſhioned ſhape, but is compoſed of ſix leaves which are more or leſs expanded and bent back. The piſtil ſtands in the center of the flower, and finally becomes an oblong and trigonal fruit, which is divided into three cells, and contains a number of marginated ſeeds, arranged in a double order one on another. To this it is to be added, that the root is of a bulbous form, and is compoſed of a number of fleſhy ſcales affixed to an axis.

All ſorts of lilies and martagons are propagated by ſowing their ſeeds; and, if the ſeeds are carefully ſaved from good flowers, the martagons very frequently afford very beautiful varieties.

The manner of ſowing them is this: ſome ſquare boxes ſhould be provided of about ſix inches deep, with holes bored in the bottoms to let out the wet; theſe muſt be filled with freſh light ſandy earth, and the ſeeds muſt be ſown on them pretty thick in the beginning of Auguſt, ſoon after they are ripe, and covered over about half an inch deep with light ſifted earth of the ſame kind. They ſhould be then placed where they may have the morning ſun; and, if the weather prove dry, they muſt be watered at times, and the weeds carefully picked out. In the month of October, the boxes are to be removed to a place where they may have as much ſun as poſſible, and be ſecured from the north and north-eaſt winds. In ſpring the young plants will appear, and the boxes are then to be removed into their former ſituation; they ſhould be watered at times during the ſummer, and in Auguſt the ſmalleſt roots are to be emptied out of theſe boxes, and ſtrewed over a bed of light earth, and covered with about half an inch depth of light earth ſifted over them; they muſt here be watered and ſhaded at times, and defended from the ſeverity of the winter, by a light covering of ſtraw, or peaſe-haulm, in the hardeſt weather. In February the ſurface of the bed ſhould be cleared, and a little light earth ſifted over it. When the leaves are decayed, the earth ſhould be a little ſtirred over the roots, and in the month of September following a little earth ſifted on. In the September of the following year, the roots muſt be tranſplanted to the places where they are to remain, and ſet at eight inches diſtance, the roots being placed four inches below the ſurface: this ſhould be done in moiſt weather. They will now require the ſame care as in the preceding winters; and, the ſecond after they are tranſplanted, the ſtrongeſt roots will begin to flower. The fine ones ſhould then be removed at the proper ſeaſon into flower-beds, and planted at great diſtances from one another, that they may flower ſtrong. *Miller's Gard. Dict.*

The roots of the white lily are emollient, maturating, and greatly ſuppurative. They are uſed externally in cataplaſms for theſe purpoſes with ſucceſs. The common form of applying them is boiled and bruiſed; but ſome prefer the roaſting them till tender, and then beating them to a paſte with oil, in which form they are ſaid to be excellent againſt burns. Gerard recommends them internally in dropſies.

Water-LILY. See NYMPHÆA.

LI'MBERS, in artillery, a ſort of advanced train joined to the carriage of a cannon upon a march. It is compoſed of two ſhafts wide enough to receive a horſe betwixt them, which is called the fillet horſe; theſe ſhafts are joined by two bars of wood, and a bolt of iron at one end, and have a pair of ſmall wheels; upon the axle-tree riſes a ſtrong iron ſpike, upon which the train of the carriage is put. But, when a gun is upon action, the Limbers are run out behind her.

LIMBER-*holes*, in a ſhip, are little holes cut through her floor timbers, ſerving to let the water to the well of the pump, which otherwiſe would lie between thoſe timbers where the keel rope runs.

LIME (*Dict.*)—Lime makes the greateſt improvement upon light ſandy lands, or upon a dry gravel: but a cold clay is ſeldom much benefited by it. If it be mixed with dung, or with mud drawn from the bottom of rivers, it makes an excellent mixture, eſpecially where the ſoil is very ſandy; and in Weſtmoreland they procure fine crops of barley from their ſandy lands, by manuring them with Lime and cow-dung mixed together. The nature of Lime on land is like that of chalk, it works downwards, as the farmers expreſs it; it is therefore beſt to treat it in the ſame manner, laying it upon a lay the year before it is to be plowed up. Lime is reckoned to make corn grow with a thick huſk; but it is not a laſting manure, ſeldom holding for more than five crops. When Lime is uſed to land which lies upon a deſcent, it ſhould be mixed with dung, and laid principally on the higher part of the land; the conſequence of which will be, that the rain will waſh out the virtue of the Lime and dung together, and carry the whole to the lower parts, as it runs down. Dung and Lime mixed together will do better for any land, than either of them alone.

Lime is made of chalk, or of any ſtone, that is not too cold, or ſandy, as free-ſtone, and the like. All the ſoft ſtones that are of a tolerable cloſe texture, will burn to good Lime, as will alſo marble, ſlate, ſea-ſhells, corals, and flints; but this laſt kind of ſtone is more difficult to be burnt to Lime than the others, except in a reverberatory kiln, for they are apt to run to glaſs. The harder the ſtones of which Lime is made, the better the Lime is; and, when it is made of chalk, that is much better which is made of the hard ſtony kind, than that which is made from the ſoft; but, the harder the ſtones are, the more fire is required to burn them: both ſorts may be burnt with wood, coals, turf, or fern, which makes a very fierce fire. The kilns uſed for chalk, or ſtone, they commonly make in a large pit, which is dug either round or ſquare, according as they have convenience; and is of ſuch a ſize, as will be proper for the quantities they intend to burn. They are wideſt at the top, and narrower, by degrees, as they come nearer the bottom. The inſide of this pit is lined with a wall built of Lime-ſtone; at the outſide, near the bottom, they have a hole, or door, by which they take out the aſhes, and, above that, ſome have an iron grate, which comes cloſe to the wall all about it: but others arch it over with ſtone, or large pieces of chalk; and upon this they lay a layer of ſtone, or of whatever elſe they burn in the pit; upon this they place a layer of wood, or coals, and ſo on, layer over layer, to the top of the pit; only they obſerve, that the outermoſt layer be always of the fuel, not of the ſtone. When the kiln is thus filled, they give fire at the hole underneath, and the Lime is finiſhed in a different time, according to the nature of the ſubſtance. That made of chalk is commonly burnt into Lime in twenty-four hours; but Lime ſtone generally takes ſixty hours in burning. Ten buſhels of ſea-coal, or one hundred of faggots, three feet long, will burn forty buſhels of chalk, and this will yield thirty buſhels of unſlaked Lime. Where chalk is ſcarce, they work up the chalk rubbiſh into a ſort of ſtiff paſte with water, and make it into a ſort of bricks, which they dry in the air, and then burn them into Lime in the common way; but this is not quite ſo good as the other. Hot Lime taken out of the kiln, and mixed into a very ſoft paſte with water, and then mixed with ſand, makes a kind of mortar very much ſuperior to the common ſort. *Mortimer's Huſbandry.*

All Lime is a very good manure, but that made of ſtone is much better than what is made of chalk. The common allowance is a buſhel to a pole ſquare, or a hundred and ſixty buſhels to an acre.

This they cover with earth, and ſo leave it till the rains fall and flake it, and after that they ſpread it as evenly as poſſible upon the ground. They always find that, if it be carried hot out of the kiln, and laid upon the land to cool, it does much better than in any other way.

The improvement it makes upon land is owing chiefly to its heat, and the ſalt it contains. It is in much the ſame manner that coal-aſhes and the ſoot of coal become uſeful upon the like ſort of lands; but the farmers always find that a mixture of good earth and Lime, that has lain a conſiderable time together, is better for this purpoſe than freſh Lime alone. *Moreton's Northampt.*

LIME-*galls*, in natural hiſtory, a ſort of galls or vegetable protuberances, formed on the edges of the leaves of the Lime-tree in ſpring-time; they are very common in the plantations of Limes, and are irregularly ſhaped, but uſually oblong and rugged, and of a reddiſh colour; they occupy only the edges of the leaves, and are of a red colour, ſometimes very beautiful. As theſe are very plentiful, Mr. Reaumur was of opinion, that they might be of ſervice in the dying trade; he made trial by rubbing them on ſome parts of his linen, and found that they gave a very beautiful red colour, which did not come out in the firſt waſhings afterwards. It is extremely probable, that there wants only inquiry to prove that we have many valuable productions of this kind, which, though diſregarded at preſent, might prove of great uſe in the ſeveral mechanical arts as well as in medicine.

Theſe galls of the Lime leaves are formed by a worm, which inhabits them during its term of life, being found in them of all ſizes, from the moſt minute to that of the full growth, which is about half an inch in length; but, when its period of life, as a worm, draws near, it deſerts this habitation, and goes elſewhere to paſs into its chryſalis ſtate. This alſo is the caſe with the worms that inhabit many galls, which are frequently found to contain them in the worm ſtate, but never in that of the chryſalis, which they always paſs into elſewhere. *Reaumur's Hiſt. Inſ.*

LIME-*tree*.—The ſeveral ſpecies of the tilia, or Lime-tree, are all eaſily propagated by layers, which in one year will take good root, and ſhould then be removed to the nurſery, planting them at four feet diſtance in rows, and the plants two feet aſunder in each row. The beſt ſeaſon for removing them is Michaelmas. They ſhould remain four or five years in the nurſery, and ſhould afterwards be removed to the places where they are to remain. The ſoil they love beſt is a ſtrong fat loam, in which they will grow very faſt. *Miller's Gard. Dict.*

LI'MMA λεῖμμα, *reſiduum*, in the antient muſic, is the difference of the diateſſeron and the ditonus. It is expreſſed by $\frac{256}{243}$.

LI'MON, the lemon-tree, in botany, a genus of trees whoſe characters are theſe:

It hath large ſtiff leaves like the citron, without any appendage at the bottom; the flower conſiſts of many leaves which expand in form of a roſe: the fruit is almoſt of an oval figure, and divided into ſeveral cells, in which are lodged hard ſeeds ſurrounded by a thick fleſhy ſubſtance, which, for the moſt part, is full of an acid juice.

All ſorts are propagated by budding or inarching them either on ſtocks of lemons or citrons produced from ſeeds, but they will not ſo readily unite on orange ſtocks; for which reaſon the citrons are preferable to either oranges or lemons for ſtocks, as they readily join with either ſort; and, being of larger growth, cauſe the buds of the other ſorts to be much ſtronger than if they were on ſtocks of their own kind.

The culture of the lemon being the ſame with that of the orange-tree, it would alſo be needleſs to repeat it here: therefore I ſhall only obſerve, that the common lemons are ſomewhat hardier than the oranges, and will bring their fruit to maturity with us better than they will do, and require to have a greater ſhare of freſh air in winter; for which reaſon they ſhould always be placed nearer to the doors or windows of the green-houſe: and in ſome curious gardens theſe trees have been planted againſt walls, where, by covering them with glaſſes in winter, and protecting them from ſevere froſt, they have produced plenty of large fruit: as theſe trees do generally produce ſtronger ſhoots, ſo they require more water to be given them than the orange; but, as to the tender ſorts, they muſt be treated with a little more care, otherwiſe their fruit will fall off in winter, and come to nothing. See the article ORANGE in the Dictionary.

LIMO'NIUM, *ſea-lavender*, in botany, a genus of plants whoſe characters are:

It hath a fibrous root; the ſtalks are naked and branched; the cup of the flower is long and tubuloſe, but expanded at the top; the flower in ſome ſpecies conſiſts of one leaf, but in others of ſeveral, and is ſhaped like a clove-gilli-flower: the pointal, which ariſes out of the flower-cup, becomes an oblong fruit, wrapped up in the flower-cup, as in an huſk.

LIN'ARIA, *toad-flax*, in botany a genus of plants whoſe characters are theſe:

The leaves are oblong, and produced alternately on the branches: the cup of the flower conſiſts of one leaf, which is divided into five long acute ſegments; the flower, which conſiſts of one leaf, is of an anomalous perſonated figure, ending in a tail behind, and in the fore-part divided into two lips, of which the upper is cut into two or more parts, and the under into three: the ovary (which riſes from the center of the flower-cup) becomes a roundiſh fruit or huſk, divided into cells or apartments by an intermediate partition, and full of ſeeds, which are ſometimes flat and bordered, ſometimes cornered and roundiſh, adhering to the placenta.

LINA'RIA, in zoology, the name of the linnet, a genus of birds, of which there are ſeveral ſpecies. The general characters of the genus are theſe: the birds of it are ſomewhat ſmaller than the chaffinch; their general colour is a greyiſh brown; their tail is a little forked, the outer feathers of it having white extremities; they all ſing very ſweetly. We have in England four ſpecies of this bird. 1. The common brown linnet, well known to every one. 2. The Linaria rubra major, or greater red-headed linnet. This has a fine red head, a grey neck, a duſky reddiſh brown back, and its breaſt and belly are ſomewhat reddiſh. The female of this ſpecies, however, has no redneſs on its head, or breaſt, but has ſomewhat of a greeniſh caſt among the brown of her back, and is yellowiſh on the breaſt, with ſome browniſh ſpots. 3. The Linaria rubra minor, or leſſer red-headed linnet. This is ſmaller than the former, and on the back is of the ſame colour with the common linnet. The back part of its head is red, as is alſo its breaſt, but the lower part of its belly is whitiſh. In this ſpecies the female, as well as the male, has a red head, and both have their beaks much ſharper, and their feet and legs blacker than in the larger kind. This alſo is a gregarious bird; the larger kind commonly flies ſingle. 4. The laſt ſpecies is the Linaria montana, or mountain linnet. This is the largeſt of all the linnets. Its beak is very ſmall; its head and back are of the ſame colour with thoſe of the common linnet, and the feathers of the breaſt and belly are black in the middle, and edged with a whitiſh colour. The rump is of a fine and beautiful red, and is the only part of the bird which is ſo. This is common in Derbyſhire, but ſeems not ſo frequent in other places. *Ray's Ornitholog.* See LINNET.

Angling LINE.—The beſt materials for making theſe Lines are fine and even horſe-hairs: the hair ſhould be round and twiſted even, for that greatly ſtrengthens it; and all the hairs ſhould be of an equal bigneſs, or as nearly ſo as may be. They ſhould be laid in the water about a quarter of an hour after twiſting, that it may be ſeen which will ſhrink: they are then to be twiſted over again. In this laſt twiſting ſome intermingle ſilk among them, but that is not ſo well. The beſt colours for a Line are ſorrel, white, and grey; the two laſt are beſt for angling in clear waters; the former in muddy ones. The pale watery green is alſo a very good colour, and may be made thus: boil in a quart of alum water a large handful of marygold flowers; there will ariſe a ſcum, which muſt be taken off; then add to this liquor copperas and verdigreaſe, of each half a pound, beat to powder together; boil theſe up together; then put the hair into this liquor, and let it lie ten or twelve hours; it will obtain a watery bluiſh green colour, which will not waſh out afterwards.

LINES, in heraldry, the figures uſed in armories to divide the ſhield into different parts, and to compoſe different figures. They are of different forms, and, were it not for this, many arms would be one and the ſame; for a chief wavey differs from a plain chief, by the lines which compoſe them, and the heralds ſhew particular reaſons for all theſe different forms of Lines.

LING, in ichthyology, the Engliſh name for a kind of fiſh, which is a ſpecies of the aſellus, according to the generality of authors, and is generally called aſellus longus. According to the new Artedian ſyſtem, it is a ſpecies of the gadi, and is diſtinguiſhed by the expreſſive name of the gadus, with two fins on the back, with a bearded mouth, and with the upper jaw longeſt.

Ling is eſteemed, both freſh and cured, for the table. It is a long-bodied fiſh, more approaching to the merlucius or hake than to any other ſpecies. It is covered with very ſmall ſcales which are ſcarce viſible, as they adhere ſo cloſely to the ſkin. The back and ſides are of a bluiſh or greeniſh brown, and the belly white. Its head is flat and large, and its ſnout conſiderably long. The upper jaw is longer than the under, and both are furniſhed with ſeveral rows of ſhort teeth, and the lower with one range of longer; and in the palate there are a large number of ſmall teeth, among which there are four or five large and long ones intermixed. The mouth opens very wide, and in the angle of the lower jaw has a ſingle ſhort beard. It has two fins upon the back, one near the head, the other not far behind it, and reaching down almoſt to the tail. The gill-fins are ſmall, the belly fins are placed high, and the tail is not forked. *Ray's Ichthyog.*

LI'NNET, *linaria*, in zoology, the name of a well known ſinging bird.

It is remarkable of this bird, that when it builds in hedges, and when in furz buſhes on heaths, in both which places the neſts are very common, they are made of different materials. When they build in hedges, they uſe the ſlender filaments of the roots of trees, and the down of feathers and thiſtles; but, when they build in heaths, they uſe moſs, principally, for the outer part, finiſhing it within with ſuch things as the place will afford. Theſe birds will have young ones three or four times a year, eſpecially if they are taken away before they are able to leave their neſts.

When they are intended to be taught to whiſtle tunes, or to imitate the notes of any other bird, they are to be taken from the old one when they are not more than four days old; for at this time they have no idea of the note of the old ones, and will readily be taught to modulate their voice like any thing that is moſt familiar to their ears, and within the compaſs of their throats. There requires more care in the feeding them when they are taken thus young, than when they are left in the neſt till nearly fledged; but they will be reared very well upon a food half bread, half rape-ſeed, boiled and bruiſed: this muſt be given them ſeveral times a day. It muſt be made freſh every day, and given them ſufficiently moiſt, but not in the extreme. If it be in the leaſt ſour, it gripes and kills them; and, if too ſtiff, it is as miſchievous by binding them up.

LI'ON, *leo*, in zoology.—The head of the Lion appears very large, in proportion to its body, and is the moſt fleſhy of the heads of all the known animals. Its jaw bones alſo are remarkably large. The beaſt alſo appears very large, but this is only owing to the great quantity of long hair that covers it, for the ſternum is ſmaller than that of moſt animals of the ſame ſize. The tail, which is very long, appears alſo of the ſame thickneſs all the way, but this is wholly owing to the growth of the hair. The tail itſelf is largeſt at the baſe, and thence goes taper to the point; but the hair, being very ſhort near its baſe, and continuing to grow longer all the way, as that decreaſes in thickneſs, is ſo exactly proportioned in this growth, that it always gives the whole tail this regular appearance. See *Plate* XXXII. *fig.* 5.

The long hair that grows about the neck and breaſt, and makes what is called the mane of the Lion, only differs from the hair of the reſt of the body in length, having no greater thickneſs, or rigidity, like that of the manes of other animals. The claws of the Lion have no caſes, as Pliny pretends that they have, for the animal to withdraw them into in walking; but Plutarch, Solinus, and ſome others, are much more in the right, in ſaying that the Lion draws them up backwards when he walks, and places them cloſely among the articulations of the toes.

It is certain that the laſt joint but one of every toe in this creature has a peculiarly eaſy joint for motion, and by means of this the laſt joint, with the claw that is affixed to it, are very readily drawn up, and hid upon the foot, and placed wholly out of the way of being hurt in walking. This creature, therefore, does not put the extremities of its toes to the ground in walking, but the termination of each toe, as to its touching the earth, is the joint of the laſt piece with the laſt but one. This drawing up of the laſt joint of every toe, by means of which each claw is hid between the toe it belongs to and the next, is the effect of a ligament, which in its natural ſtate is ſo ſhortened, as to keep them in this poſition; and it is only by the action of a very ſtrong muſcle, that this joint can be pulled downward, when the claws are to be uſed, the ligament beforementioned always drawing them naturally into their firſt poſition again, as ſoon as the force of the muſcle is over.

The Lion has fourteen teeth in each jaw, four inciſores, four canine, and ſix molares. The inciſores are ſmall; the canine are unequal in ſize, two being very large, and two very ſmall; the large ones are an inch and half long, and are the only ones the antients allowed to be canine teeth. The molares alſo are irregular in ſize, the anterior ones being very ſmall, the others large, and terminated by three or four points, forming a ſort of flower-de-luce.

Ariſtotle, Ælian, and others ſay, that the neck of the Lion is all compoſed of one unjointed bone. It appears indeed very rigid in this creature, but it does not proceed from ſo ſtrange a cauſe, but is found owing to this, that the ſpinoſe apophyſes of the vertebræ of the neck are long, and faſtened together by extremely ſtrong and rigid ligaments.

The tongue of the Lion is very rough and rigid, being covered with a great number of prominences of a hard matter, reſembling that of a cat's claws, and nearly of the ſame ſize, the baſe of each being a round fleſhy prominence on the ſurface of the tongue.

The eyes of the Lion are clear and bright, even after the creature is dead. The common obſervation that this creature ſleeps with its eyes open, is founded on this, that it has a very thick membrane lodged in the greater canthus of the eyes, which it can extend over the whole eye upon occaſion, as birds do their membrana nictitans, and thus will have no occaſion to ſhut its eye-lids, in order to exclude the light. It is very remarkable that the common cat has all the ſingular ſtructure of the ſeveral parts as the Lion has, its claws, feet, tongue and eyes, being of the ſame kind, and its internal parts bearing as ſtrong a reſemblance.

The heart of the Lion is greatly larger than that of any other creature of the ſame ſize, being ſix inches long, and four in diameter, in the largeſt part, and terminating in a very ſharp point. The brain is as remarkably ſmall; and, upon the compariſon of this with the great quantity of brain in a calf, and purſuing the obſervation through ſeveral other creatures, as to the proportion of brain they have, it does not appear that a ſmall quantity of brain is a mark of folly, but uſually of great ſubtlety, and of a cruel diſpoſition. *Mem. pour l'Hiſtoire des Anim.*

LION-*puceron*, in natural hiſtory, the name given by Mr. Reaumur to a genus of worms which deſtroy the pucerons in the ſame manner that the formica leo does the ants.

Theſe little inſects are prey alſo to a ſort of worm hatched from the egg of a two-winged fly. This has no legs, and is of ſeveral colours.

Though theſe Lion-pucerons be all hexapodes, yet they are of different origin; ſome being produced from the eggs of a four-winged fly, others from thoſe of a beetle. As the formica leo has two horns, the extremities of which ſerve him by way of mouth, our Lion-puceron has the ſame kind alſo; but as the former of theſe inſects can only move backwards, but is forced to make ſnares for his prey, not being able to hunt it; this creature runs very nimbly in the common way, and ſeizes its prey, without having recourſe to ſuch ſtratagems. The body of the Lion-puceron is longer than that of the formica leo, and is flat; the breaſt is the thickeſt and broadeſt part of it, and from this it gradually tapers off to a point at the tail. It has two legs fixed to the breaſt, the other four to the anterior rings of the body, and, when it moves, the poſterior end of the body ſerves it in the place of a ſeventh leg, for it always bends it downward, and draws it along the ſurface it walks upon. The back of this creature is not ſmooth or gloſſy, but is every-where rough, and full of wrinkles, and ſeems as if every ring of it was compoſed of ſeveral other ſmaller rings.

Mr. Reaumur put twenty of theſe creatures together into a box, where they had no other food, and where they could not eſcape one another, and theſe were very ſoon reduced to three or four. It is eaſy to conceive that a creature, which feeds ſo very faſt, muſt ſoon arrive at its full growth; and this is the caſe with theſe animals, for, within five or ſix days of their being hatched from the egg, they are ready for their final transformation, or the putting on the form of the animals to whoſe eggs they owed their origin. In order to this, the creature leaves the place where he has hitherto fed, and ſeeks the folds of a leaf, or ſome other ſuch convenient receptacle, where it ſpins a web of very fine ſilk, every way ſurrounding its body with it, and, under this cover, paſſes the ſtate of a nymph or chryſalis. The ſilk of this web is not only very ſtrong, but the threads are very cloſely laid together, ſo that it is much firmer than the webs of any of the caterpillar kind. It is of a roundiſh figure, and is ſomewhat ſmaller than a pea.

The eggs of this fly are a very ſingular object, and cannot have eſcaped the eye of any perſon who is converſant among the inſects which live on trees; though, of the many who have ſeen them, perhaps few or none ever found what they really were. It is common to ſee on the leaves and pedicles of the leaves of the plum-tree, and ſeveral other trees, as alſo on their young branches, a number of long and ſlender filaments, running out to about an inch in length, and being of the thickneſs of a hair; ten or twelve of theſe are uſually ſeen placed near one another, and a vaſt number of theſe cluſters are often found on the ſame tree. The end of each of theſe filaments is terminated by a ſort of ſwelling or tubercle of the ſhape of an egg. People who have obſerved theſe, have generally ſuppoſed them to be of vegetable origin, and that they were a ſort of paraſitical plants, growing out of others, as the miſletoe, moſſes, &c. from the oak and other trees. They very much reſemble in figure thoſe ſpecies of mouldineſs, which Malphigi and others have figured under the ſhape of little muſhrooms, only they are much larger than thoſe little plants, and bear the heat of the ſun and other accidents uninjured, which would deſtroy the tender plants of that kind. There is a time, when theſe egg-like balls, which terminate every one of theſe filaments, are found open at their ends, and in this ſtate they very much reſemble flowers; and they are in this ſtate figured by ſome authors, under the name of flowers of a ſingular kind, found on the leaves of the willow. All this, however, is wholly erroneous, and the purſuing the hiſtory of our Lion-pucerons ſhews their true origin to be from the fly of that creature. What theſe authors took for flowers of the willow, were only the eggs of this fly, out of which the young animals had been hatched, and had made their eſcape. The leaves and branches on which theſe eggs are found, are uſually ſeen covered over with the pucerons; and the creature, providing a place where her young ſhall find nouriſhment as ſoon as hatched, places her eggs in the midſt of theſe harmleſs and defenceleſs animals, fixing each on a ſlender pedicle, yet ſufficiently ſtrong to ſupport its weight. If theſe eggs be nicely examined, a worm may be diſcovered in them while yet whole; but the moſt certain way of judging them, is, to put ſeveral of them into a box, in which caſe every one of them is found at a proper time to hatch, and to give an inſect; which, when viewed by the microſcope, appears plainly to be a Lion-puceron in all its parts, and requiring only increaſe in ſize, without any change of ſhape, to be one of thoſe we have already deſcribed, as feeding ſo voraciouſly on the pucerons.

The manner in which the parent fly places her eggs in this ſingular way on the trees, is a ſubject that greatly excited the curioſity of Mr. Reamur. He often watched the animals in vain, in order to ſee them employed in it; and, in fine, ſhut up ſeveral of them in boxes. The conſequence of which was, that they fixed their eggs on long pedicles, to the ſides of the box, in the ſame manner that they before had to the ſides of the branches, or leaves of trees; but he never could find them employed about it. The manner in which he ſuppoſes it done, however, appears very rational, and is as follows:

The egg is ſuppoſed, while in the body of the inſect, to be covered with a tough glutinous matter, capable of drying very ſuddenly in the air. The creature, when the egg begins to come forth, applies the extremity of it to ſome ſolid body, as a leaf, or ſtalk of a plant; and, then drawing herſelf away, there follows a thread or filament of this viſcous matter, which is faſtened at one end to the leaf, and at the other to the egg in her body. When ſhe has drawn this out, to an inch in length, ſhe ſtops a moment, and the whole will harden into a ſolid matter; and, on her next motion, will draw out the egg from her body, and will become a pedicle to it. In this condition it will remain till the egg is hatched, and then the young inſect needs only to deſcend downward on the leaf, on which the pedicle is fixed, and it will find itſelf in the midſt of plenty of food. *Reaumur's Hiſt. Inſ.*

LI'ONESS, *leæna*, a female lion. See LION.

The Lioneſs has no mane, or long hairs upon the neck and breaſt, which ſo remarkably characteriſes the lion. The noſe alſo is longer in the Lioneſs, and the head more flatted in the upper part; the claws alſo much ſmaller than thoſe of the male lion. This creature, when full grown, is about three feet high, from the fore feet to the ridge of the back; and about five feet long from the end of the noſe to the inſertion of the tail, which is about two feet and a half long. The claws are of a fibroſe texture, the fibres being very hard in themſelves, but eaſily ſeparable from one another. In other particulars, the Lioneſs very little differs from the lion. See *Plate* XXXII. *fig.* 6.

LIPOTHY'MIA, in medicine, the name of a diſeaſe uſually confounded with the ſyncope, but really different from it in many particulars.

The Lipothymia is a very conſiderable abolition of the vital and animal faculties, at leaſt to appearance: and the ſyncope is a plenary or total abolition of them, as far as appears to us at the time. It is eaſy to ſee, however, that theſe are only two different ſtages of the ſame diſtemperature. The lipothymy is ſometimes an idiopathic, ſometimes a ſymptomatic diſeaſe, and moſt frequently attends the ſcurvy, malignant fevers, and other diſorders; the ſyncope is idiopathic, and attacks perſons in health as well as thoſe that are diſeaſed. The lipothymy is always eaſily diſtinguiſhed from a convulſed ſtate of the body, by this, that the limbs are all flaccid in it. The ſyncope differs from death only in degree; and the body being flaccid in this, and growing rigid under the laſt convulſions in death, is the only diſtinction of them in extreme caſes.

Anodyne mineral LIQUOR, the name given by Hoffman to a liquor of his own invention, famous at this time in Germany, and ſuppoſed by Burggrave to be made in this manner: take oil of vitriol and Indian nitre, of each four ounces; diſtil the ſpirit gradually from this by a retort; pour two ounces of this ſpirit cautiouſly and ſucceſſively into fifteen ounces of ſpirit of wine highly rectified; diſtil this, and there comes over a very fragrant ſpirit. This is to be again diſtilled, to render it perfectly pure, adding firſt to it a ſmall quantity of oil of cloves, and a quantity of water, equal to that of the ſpirit; after this, as ſoon as the watery vapours begin to ariſe, the whole proceſs is to be ſtopped, and the ſpirit kept alone in a bottle well ſtopped. This has great virtues, as an anodyne, diaphoretic, antiſeptic, and carminative. It is not certain, that it is exactly the ſame with Hoffman's, that author having never publiſhed his manner of making it; but it appears the ſame to the ſmell and taſte, and has the ſame virtues.

LI'QUORICE (*Dict.*)— The ground deſigned for Liquorice muſt be well dug, and dunged the year before, that the dung may be thoroughly rotted in it; and, juſt before it is planted, the earth is to be dug three ſpades deep, and laid very light. The plants to be ſet ſhould be taken from the ſides or heads of the old roots, and each muſt have a very good bud, or eye, or otherwiſe they are ſubject to miſcarry; they ſhould alſo be about ten inches long, and perfectly ſound. The beſt ſeaſon for planting them is the end of February, or the beginning of March, and this muſt be done in the following manner: the rows muſt be marked by a line drawn a-croſs the bed, at two feet diſtance; and the plants muſt be ſet in theſe by making a hole of their full depth, and ſomething more, that the eye of the root may be an inch below the ſurface: they muſt alſo be ſet two feet diſtance from each other in the rows. When this is done, the ground may be ſowed over with onions, which, not rooting deep, will do the Liquorice roots no injury for the firſt year. In October, when the ſtalks of the Liquorice are dead, a little very rotten dung ſhould be ſpread over the ſurface of the ground. Three years after the time of planting, the Liquorice will be fit to take up for uſe; and this ſhould be done juſt when the ſtalks are dead off; for, if taken up ſooner, the roots are very apt to ſhrink greatly in their weight. The roots about London look browner than thoſe which have been propagated in a leſs rich ſoil, but then they are much larger, and grow quicker to their ſize. *Miller's Gard. Dict.*

LIS, *or Notre Dame de Lis*, an order of knighthood of Navarre, inſtituted, in 1408, by Garcius IV, king of Navarre, upon occaſion of an image of the bleſſed virgin found in a flower-de-luce at Nagera, and whereof he declared himſelf and his ſucceſſors the ſovereigns. The order conſiſted of 38 knights, of noble extraction, that took a vow to oppoſe the Moors, the enemies of the kingdom. They wore upon their breaſts an embroidered flower-de luce of ſilver, and, on ſolemn feſtivals, a collar, interlaced with divers Gothic M's, with a flower-de-luce of gold, enamelled white, and ſpringing from a green plat, hanging at the end of it, and a great M over it. *Favin. Hiſt. de Navarre, & Theatr. de Honneur & de Cheval.*

LI'TÆ, Λιταὶ, according to Homer, are goddeſſes, the daughters of Jupiter, whoſe office was to procure for men the good things they deſired either of God, or of other men. Homer repreſents them to be lame, ſquint-eyed, and wrinkled, the allegorical meaning whereof is not to be rejected. Theſe Litæ are nothing elſe but our prayers and ſupplications; for that is the ſignification of the Greek word λιτὴ, whence comes the word λιτανεὶα, or litany, and the Latin word litare, which imports the offering up an acceptable ſervice or prayer to God. Now our prayers are repreſented lame, to denote, that God doth not immediately grant men their deſires, and therefore the need we have of fervour and perſeverance in our prayers; they are ſquint-eyed, to repreſent the corrupt and ſelfiſh reſpects of our prayers, as in them we commonly do not purely and directly regard the glory of God; and they are wrinkled and ſhrivelled, to ſet out to us the weakneſs, ſtaggerings, and doubtings wherewith they are accompanied, as commonly wanting the ſtrength, vigour, and liveline ſs of faith. If we would apply this picture of prayer to thoſe petitions we addreſs to men, they alſo are lame, to declare to us the difficulty we have to approach perſons of whom we would deſire any favour or kindneſs. They are ſquint-eyed, by reaſon of the diſſimulations, flatteries, by-ways, and ſiniſter reſpects we are fain to make uſe of, to obtain of them what we deſire; and they are wrinkled, to give us an idea of the trouble, diſappointment, grief, and vexation it coſts us, either before we can reſolve to deſire any thing of men, and, when we have deſired it, before we can obtain it.

LITHAN'THRAX, in natural hiſtory, is uſed as the name of the common pit-coal

LITHI'DIA, in natural hiſtory, the name of a large claſs of foſſils, including the flint and pebble kinds.

LITHO'LABON, a name given by ſome chirurgical writers to an inſtrument uſed in the operation of lithotomy; it is a forceps intended for taking hold of the ſtone.

LITHONTR'IPTICON *Tulipii*, the name of a famous diuretic medicine, invented by Tulipus, and given with great ſucceſs in caſes of the ſtone, but requiring great judgment and caution in the adminiſtring it.

The preparation is this: take a drachm of cantharides without their wings, and a drachm of leſſer cardamoms without their huſks; powder them fine, and pour upon them an ounce of rectified ſpirit of wine, and half an ounce of ſpirit of nitre: ſet them to infuſe, without heat, for five or ſix days, ſtirring them from time to time. The phial muſt not be ſtopped cloſe; becauſe, if it be, the continual fermentation will burſt it. The doſe is from fourteen to fifteen, or twenty drops, in a glaſs of wine and water; it is to be taken in a morning, an hour after the eating a meſs of broth, and may be repeated for three or four days.

It is remarkable, that this mixture never ceaſes fermenting for many years; but, if it be too faſt corked, will break the glaſs; if but ſlightly ſtopped, it only throws out the cork with an exploſion. *Mem. Acad. Par.*

LITHO'PHYTON, *coral*, in botany; ſee CORAL.

LITHOPHO'SPHORUS *ſublenſis*, in natural hiſtory, a name given by ſome authors to a ſpecies of ſpar, which, when it has been heated over the fire, retains a property of giving light in the dark. This is a quality that ſeems more or leſs in degree to be inherent in ſeveral ſorts of ſpars.

LI'TTER.—When a horſe comes tired into a ſtable, freſh Litter has the virtue always to occaſion him immediately to ſtale. This is known to be a very great advantage to a horſe in a tired ſtate; and when the Litter is old and dirty, it never has any ſuch effect upon him. If the owner knew how refreſhing it is to a horſe to diſcharge his urine on his return from labour, they would be more careful in giving him all means and occaſions of it than they do. This ſtaling, after fatigue, prevents thoſe obſtructions in the neck of the bladder or urinary paſſages, which horſes are ſubject to; the bladder being often inflamed by the long retention of the heated urine in it, and the creature periſhing by it. Some of our farmers act wrong in this caſe of the Litter, not through careleſſneſs or accident, but by principle; they order the old Litter to be left a long time in the ſtables, that it may be impregnated with more and more of the urine, &c. of the animal, and be made richer for the fields. It is not to be doubted but the manure is greatly improved by this; but the damage done to the horſe, by it, is greatly over-proportioned to the benefit. The heat which the dung acquires, by thus lying together, ſpoils the feet of the creature, and makes it unfit for any ſervice, and occaſions many diſtempers, which are ignorantly continued and increaſed by the continual addition of heat in the fermenting dung, till at length the horſe periſhes.

LI'VER (*Dict.*)— From the ſtructure of the Liver, duly conſidered, it will be eaſy to underſtand the diſtempers to which this organ is ſubjected in a particular manner: the firſt, and moſt acute of theſe, is an inflammation, called hepatitis; which, perhaps, occurs more frequently than is generally apprehended; but, however, not ſo often as one would be ſubject to imagine, from the conformation of the part, unleſs it were conſidered, that the hepatic artery is not very large, and, therefore, cannot convey to the Liver a great quantity of blood; and that the force of the blood, circulating through the ramifications of the vena portæ, is not ſo conſiderable as to ſubject this organ very much to inflammations.

An inflammation of the Liver is ſeated in the extremities of the ramifications of the vena portæ, or hepatic artery; and it is evident, from the diſpoſition of theſe veſſels, that an inflammation in either of them muſt ſoon be ſucceeded by one in the other.

The antecedent cauſes of both theſe ſpecies of inflammation are the ſame as the general cauſes of inflammations (ſee INFLAMMATION) determined to this organ. But there are other cauſes, which are local, and relate more immediately to the particular part: thus an extraordinary degree of fatneſs, in the omentum, may raiſe an inflammation in the Liver, not only by compreſſing it, but this fat may alſo diſſolve by exerciſe, motion, and heat, and, being abſorbed by the veſſels, and conveyed to the Liver in too large quantities, may there cauſe an inflammation.

This effect may, alſo, be produced by an atrabilarious temperament of the blood or bile; for when ſuch a temperament is induced by an intimate union of the earth and oil, and a diſſipation of the ſpirituous and aqueous particles of the blood or bile, either of theſe humours become ſubject to form concretions and ſtagnations in the minute extremities of the branches of the hepatic artery, or vena portæ.

The Liver, alſo, ſuffers from diſorders in remote parts of the body; for, if acrimonious pus, ichor, or a ſcorbutic ſanies, is depoſited in any other organ or member, theſe, upon the acceſſion of heat, a fever, violent motion, an improper diet, ill-applied medicines or poiſons, are colliquated, moved, returned into the circulation, and; by this means, conveyed to, and depoſited in, the Liver.

Beſides theſe cauſes, the bile, when pinguious, acrimonious, and exalted, or what the ancients called aduſt, if put in motion by adequate cauſes; a ſtone, chalky concretions, a ſcirrhus, callus, ſteatoma, abſceſs, or worms, occupying any part of the Liver, gall-bladder, or biliary ducts, upon the acceſſion of any cauſe ſufficient to put them in motion, by compreſſing the ſmall ramifications of the hepatic artery and vena portæ, excite therein an inflammation.

Cold, alſo, applied to the Liver, when, by any means overheated, contracts the veſſels, inſpiſſates the fluids, and thus produces an immediate inflammation; and this cold has much the ſame effect, whether it is applied by means of the air, liquors drank, or bathing.

An abſtinence from diluting liquors, during exceſſive motion, great heat, and profuſe ſweating, will alſo cauſe an inflammation of the Liver; for, when the blood is deprived of its aqueous parts, without a freſh ſupply, it becomes thick, and, conſequently, inclining to ſtagnate in the capillary veſſels. Abſtinence, likewiſe, eſpecially from drink, in burning fevers, will, for the ſame reaſon, produce a like effect: and the ſame diſorder may be brought on by violent paſſions and perturbations of the mind, which induce ſpaſmodic ſtrictures in the veſſels of the Liver, and an irregular circulation; as it frequently happens, in ſome degree, during hyſteric diſorders, as Sydenham remarks.

Among the cauſes of an inflammation in this organ, exceſſive motion, excited by emetics, muſt, farther, be reckoned as one; for, by theſe, ſome veſſels in the Liver may be ruptured; or the blood, contained in all the abdominal viſcera, may be impelled with violence into the vena portæ, and thence being conveyed, in too large quantities, into the Liver, or too forcibly, or both, in either caſe excite an inflammation.

Laſtly, inveterate hypochondriac diſorders will produce inflammations of the Liver.

The effects of inflammations of the Liver, ariſing from any of theſe cauſes above ſpecified, are various, and determined by the various preceding diſpoſitions of the Liver, the variety of the matter which is moved and fixed upon the Liver, the material cauſe of the inflammation, and the different cauſes which excite the matter to action, and impel it upon the Liver.

When the caſe is only a ſimple inflammation, the ſmall veſſels are obſtructed; and, in conſequence of this, the fluids, which ought to circulate through them, are ſtopped in the part: hence a tumor ariſes, which compreſſes the adjacent parts, and, by that means, propagates the tumor to them; thus it proceeds, till almoſt the whole organ is affected, which then compreſſes the ſtomach, and is again compreſſed by the ſtomach when full; which compreſſion is attended with pain in the inflamed Liver. It alſo affects the diaphragm, and ſometimes excites pain and inflammation in that part by compreſſing it, on account of its near ſituation. Beſides, all the blood received by the cœliac artery, and the two meſenteric arteries, is intercepted and ſtopped at the Liver; and, in conſequence of this, the circulation of all the venous, arterial, and lymphatic fluids, in the principal viſcera of the abdomen, is utterly obſtructed; and the generation, ſecretion, excretion, and circulation of the bile are entirely hindered. Hence a jaundice is produced, with all its conſequences; putrefactions of the abdominal viſcera, together with their contained fluids; and a great number of ill conſequences, which are obvious; for the uſes of the bile, and the functions of the parts are thus deſtroyed.

LI'VERWORT; ſee LICHEN in the Dictionary and Supplement.

LIXI'VIUM *martis*, a new form of medicine introduced into practice in the late London Diſpenſatory. The manner of preparing it is to ſet the matter remaining in the retort after the ſubliming the flores martis, in a damp place, where, by means of the moiſture of the air, it will run into a liquor. *Pemberton's Lond. Diſ.*

LIXIVIUM *tartari*, the name given in the London Diſpenſatory to the liquor called, by moſt authors, oil of tartar per deliquium. This is made of tartar which is to be calcined to a whiteneſs, and then ſet in a damp place, where it will liquify by the moiſture of the air. The liquor thus procured is more pure, than if the calcined tartar were diſſolved directly in water. *Pemberton's Lond. Diſ.*

LI'ZARD *lacertus*, in zoology, the name of a large genus of animals, comprehending all thoſe quadrupeds which are oviparous, and have long tails continued from their bodies. The term oviparous is to be underſtood however in a larger ſenſe, expreſſing ſome among theſe, which, though they have true and proper eggs within them, yet never depoſit them as ſuch, but keep them in their bodies till they are hatched, and bring forth living young ones. Some of the ſerpents, as well as ſome of the Lizards, are of this kind, and the obſervation is as old as Ariſtotle, who calls the creatures, whoſe generation is of this kind, internally oviparous, externally viviparous. *Ray's Syn. Quad.*

LOAD, in mining, is uſed, eſpecially in the tin mines, for a vein of ore.

In Cornwall and Devonſhire the Loads all hold their courſe from eaſtward to weſtward, though, in other parts of England, they frequently run from north to ſouth. The miners report, that the ſides of the Load never bear in a perpendicular, but always over-hang either to the north or ſouth. The mines ſeem to have been ſo many channels, through which the waters paſs within the earth, and, like rivers, they have their ſmall branches opening into them, in all directions; theſe are by the miners termed the feeders of the Load. Moſt mines have ſtreams of water running through them, and, when they are found dry, it ſeems owing to the water having changed its courſe, which it ſeems ſometimes to have been compelled to by the Load's having filled up the courſe, and ſometimes to have fallen into other more eaſy channels. *Philoſ. Tranſact.* N°. 401.

LOAM, in huſbandry, a common ſuperficial earth, that is a mixture of ſand and clay, commonly of a yellowiſh colour, though there is ſome Loam that is blackiſh. Some call Loam the moſt common ſuperficial earth met with in England, without any regard to the proportion it bears to ſand or clay; but moſt generally the appellation of the Loam is applied to a ſoft fat earth, partaking of clay, but eaſy to work.

It is found by experience, that plants of all ſorts will grow in it; and, where-ever it is found, it appears to be a more beneficial ſoil to plants than any other. A clay uſed in grafting is alſo called Loam.

LO'CKSPIT, among miners, is the ſmall cut or trench made with a ſpade of about a foot wide, to mark out the firſt lines of a work.

LO'CRIAN, in ancient muſic, the ſeventh ſpecies of the diapaſon. It was alſo called hypodorian and common.

LOCU'LAMENTS, in natural hiſtory, little diſtinct cells, or partitions, within the ſeed-veſſels of plants.

LO'CUSTS, *locuſtæ*, a genus of inſects, comprehending the Locuſt, ſimply ſo called, the ſeveral ſpecies of other Locuſts and graſhoppers, with the crickets of the houſe and field.

Willughby obſerves, that in theſe animals there are always more males than females, which is contrary to the order of nature in other inſects, where the females are much the moſt numerous; and Swammerdam obſerves, that it is only the males that make a noiſe, which he ſays they do by a ſwift vibration of their wings, either againſt one another, or againſt their legs.

The nympha, or worm of the Locuſt, ſcarce at all differs from the creature in its perfect ſtate. It moves and eats in the nymph ſtate, and all the viſible difference is, that the wings are not expanded as in the perfect Locuſt, but are gathered up in a ſmall compaſs, and form four little buttons on the ſhoulders. Swammerdam obſerves, that the want of attention to this particular, in former writers, had been the occaſion of a very unneceſſary multiplication of names; as Aldrovand, Johnſon, Mouffet, and others, have deſcribed theſe Locuſts in the nymph ſtate under the names of bruchi, attebali, and aſelli, ſuppoſing them to be ſo many diſtinct ſpecies of animals. It is obſerved, that towards the end of ſummer the males are very tender of the females, three or four of them being frequently ſeen gathered about one of that ſex, and ſeeming to do her all the kind offices in their power, fluttering about with their wings, and rubbing her with their fore legs. The males are always more briſk and nimble than the females; and, amongſt all the kinds of Locuſts, there are a great many naturally imperfect; particularly, many have only one hinder leg, yet theſe hop almoſt as well as the reſt.

The country of the Coſſacks or Ukrain is, in dry ſummers, much infeſted with ſwarms of Locuſts driven thither by an eaſt or ſouth-eaſt wind. The number of theſe inſects is ſo great, that they darken the air, and devour all the corn of the country. They lay their eggs in autumn, and then die. It is ſaid that each of theſe creatures lays two or three hundred eggs, which hatching the enſuing ſpring, produce ſuch a number of Locuſts, that they do far more miſchief than before, unleſs the rains fall, which kill both the eggs and the inſects, or unleſs a ſtrong north or north-weſt wind ariſes, which drives all into the Euxine ſea. The hogs of the country are fond of theſe eggs, and devour great quantities of them. In the night, when theſe inſects reſt on the ground, they cover it to the height of three or four inches. If a wheel paſſes over them, they emit an intolerable ſtench. *Phil. Tranſ.* N°. 8.

Water LOCUST, *locuſta aquatica*, the name given by authors to a ſpecies of water inſect, ſomewhat reſembling the Locuſt kind in ſhape. It is about three inches long, its tail an inch and a quarter, and its legs are of different lengths; the anterior pair being ſhorteſt of all. Its body is ſlender, and its fore legs are always carried ſtraight forward, ſo as to reach beyond the head in the form of antennæ. Theſe, as well as the other legs, end each in two claws. The eyes are ſmall and not very prominent, and the upper wings are cruſtaceous, the under ones membranaceous, thin, and tranſparent. The middle joint of the leg is ſuch, that the creature can only move them upwards, not downwards; and there runs an acute tongue or proboſcis under the belly, as is the caſe in the water ſcorpion and notonecta. *Ray's Hiſt. Inſ.*

LOG, in the Jewiſh antiquities, a meaſure which held a quarter of a cab, and conſequently five ſixths of a pint. There is mention of a Log, 2 Kings VI. 25, under the name of a fourth part of a cab. But, in Leviticus, the word Log is often met with, and ſignifies that meaſure of oil, which lepers were to offer at the temple after they were cured of their diſeaſe.

Dr. Arbuthnot ſays, that the Log was a meaſure of liquids, the ſeventy-ſecond part of the bath or ephah, and twelfth part of the hin, according to all the accounts of the Jewiſh writers.

To rectify the LOGA'RITHMIC *Curve.* Let it be required to find the length of the Logarithmic arc E *e* (*Plate* XXX. *fig.* 1.) draw the perpendiculars L L A, *e l a*, to the aſymptote, and having drawn the tangents E F, *e f*, take A L equal to the exceſs of the tangent above the ſub-tangent A F; and *a l* equal to the exceſs of the tangent *e f* above *a f*; then having drawn L M, *l m*, parallel to the aſymptote, if the difference of the tangents E F — *e f* be added to the difference of the parallels *l m* — L M, the aggregate will be equal to the arc E *e*. *Cote's Harm. Menſ.*

LO'GARITHMS (*Dict.*)—Under this article in the Dictionary, we have ſhewn, that if the infinite root be extracted out of any number, the difference between that root and unity will be the Logarithm of that number.

But becauſe the infinite root of $1 - x|^{\frac{1}{2}}$ or $\overline{1-x}|^{\frac{1}{n}}$, is $1 - \frac{1}{n}x - \frac{1}{2n}x^2 - \frac{1}{3n}x^3 - \frac{1}{4n}x^4$, &c. therefore $\frac{1}{n}$ multiplied into $x + \frac{1}{2}x^2 + \frac{1}{3}x^3 + \frac{1}{4}x^4 + \frac{1}{5}x^5$, &c. will be the Logarithm of the ratio of 1 to $1 - x$, or the Logarithm of a number leſs than unity; and, whereas the infinite index n may be taken at pleaſure, the ſeveral ſcales of Logarithms to ſuch indexes will be reciprocally as $\frac{1}{n}$, or the ſeveral indices, and if the index be taken 10000000, &c. the reſpective Logarithms will be, ſimply,

$$x \mp \frac{1}{2n}x^2 + \frac{1}{3n}x^3 \mp \frac{1}{4n}x^4 + \frac{1}{5n}x^5, \text{ \&c.}$$

Let a repreſent the leaſt of any two given numbers, and b the greateſt, z the ſum of the two numbers, and d the difference; and let us ſuppoſe the ratio of a to b to be divided into that of a to $\frac{1}{2}z$, and of $\frac{1}{2}z$ to b; that is, into the ratio of a to the arithmetical mean between the two numbers and the ratio of the ſaid arithmetical mean to the greater number b; then, becauſe $\frac{a}{\frac{1}{2}z} \times \frac{\frac{1}{2}z}{b} = \frac{a}{b}$, the log. of $\frac{a}{\frac{1}{2}z}$ + log. $\frac{\frac{1}{2}z}{b}$ = log. $\frac{a}{b}$, or becauſe $\frac{\frac{1}{2}z}{a} \times \frac{b}{\frac{1}{2}z} = \frac{b}{a}$, the log. of $\frac{\frac{1}{2}z}{a}$ + log. $\frac{b}{\frac{1}{2}z}$ = log. $\frac{b}{a}$, that is, the ſum of the Logarithms of theſe two ratio's will be Logarithms of the ratio of a to b; and to find the value of each of theſe ratio's, in the terms of 1 and $1 \pm x$, we muſt ſay, $\frac{1}{2}z : a :: 1 : 1 - x$, whence $x = \frac{\frac{1}{2}z - a}{\frac{1}{2}z} = \frac{d}{z}$, and again as $\frac{1}{2}z : b :: 1 : 1 + x$, whence $x = \frac{b - \frac{1}{2}z}{\frac{1}{2}z} = \frac{d}{z}$ and ſubſtituting $\frac{d}{z}$ in the room of x, in each of the former ſeries, we ſhall have $\frac{1}{n} \times \frac{d}{z} + \frac{d^2}{2z^2} + \frac{d^3}{3z^3} + \frac{d^4}{4z^4} + \frac{d^5}{5z^5}$, &c. for the Log. of the ratio of a to $\frac{1}{2}z$, and $\frac{1}{n} \times \frac{d}{z} - \frac{d^2}{2z^2} + \frac{d^3}{3z^3} - \frac{d^4}{4z^4} + \frac{d^5}{5z^5}$, &c. for the Logarithm of the ratio of $\frac{1}{2}z$ to b; and conſequently the ſum of theſe two ſeries $\frac{1}{n} \times \frac{2d}{z} + \frac{2d^3}{3z^3} + \frac{2d^5}{5z^5}$, &c. or $\frac{1}{n} \times 2 \times \frac{d}{2} + \frac{d^3}{3z^3} + \frac{d^5}{5z^5} + \frac{d^7}{7z^7} + \frac{d^9}{9z^9}$, &c. will be the Logarithm of the ratio of a to b, whoſe difference is d, and ſum z; whence, to find the Logarithm of any prime number, we have this general rule:

To the given number add 1 for a denominator or diviſor, and ſubtract 1 from the ſame given number for a numerator or dividend; then, of the vulgar fraction thence reſulting, compoſe all the odd powers thereof, theſe will form a ſeries of numbers, which being divided by their reſpective exponents, viz. 1, 3, 5, 7, 9, &c. will produces a ſeries of quotients, whoſe ſum will be the natural Logarithm of the number propoſed, according to Neper's form.

This rule is not only very eaſy to be retained in the memory, but very proper for the practice of making Logarithms, which it performs with very great expedition, as will appear hereafter; and is ſo very plain that it may be taught to perſons of a mean capacity.

It was firſt publiſhed by Mr. James Gregory, in a treatiſe of his, written by himſelf, and printed in the year 1668, wherein that excellent geometrician has ſhewn the analogy between the Logarithms and certain hyperbolic ſpaces, and by ſhewing us how to ſquare the one, has taught us how to conſtruct the other; and the truth of the ſame law has long ſince that time been demonſtrated independent of the hyperbola, from a conſideration of the properties of the Logarithms only, and by the help of Sir Iſaac Newton's general theorem, for extracting of roots and raiſing of powers.

Let it be required to find the Logarithm of 2, the firſt prime number.

Becauſe $a = 1$, and $b = 2$, therefore, $d = b - a = 2 - 1 = 1$, and $z = a + b = 1 + 2 = 3$; wherefore $\frac{d}{z} = \frac{1}{3}$, and $\frac{d^2}{z^2} =$:

Hence $\frac{1}{3} + \frac{1}{3} \times \frac{1}{27} + \frac{1}{5} \times \frac{1}{243} + \frac{1}{7} \times \frac{1}{2187}$, &c. equal to $\frac{1}{3} + \frac{1}{81} + \frac{1}{1215} + \frac{1}{5209}$, &c. will be the natural Logarithm of 2, and conſequently $\frac{2}{3} + \frac{2}{81} + \frac{2}{1215} + \frac{2}{15309}$, &c. will be the Logarithm of the ſame number in Neper's form, wherefore if the ſeveral fractions be added together, and reduced into an equivalent decimal, we ſhall have the Logarithm of the number given; but becauſe to multiply by $\frac{1}{9}$, and divide by 9, will produce the ſame effect, if the firſt fraction be reduced into a decimal fraction, and that be divided by 9, and each ſucceſſive quotient by the ſame, we ſhall have a ſeries of quotients, which being divided by the ſeveral co-efficients 1, 3, 5, 7, 9, &c. the ſum of theſe laſt quotients will give the Logarithm of the number given; and in order to obtain the Logarithm true to any number of places, it is neceſſary to continue the fraction to one or two more places than the intended number of places the Logarithm is to conſiſt of; ſo that, to have the Logarithm true to 10 places, it will be convenient to find the value of $\frac{1}{3}$ in decimals to 11 or 12 places.

The operation is as follows.

$\frac{1}{3}$ =	333·333·333·333 =		333·333·333·333·	+
$\frac{1}{9}$	37·037·037·037	its $\frac{1}{3}$ =	12.345·679·012	+
$\frac{1}{9}$	4.115·226·337	its $\frac{1}{5}$	823·045·268	—
$\frac{1}{9}$	— 457·247·371	its $\frac{1}{7}$ —	— 65·321.053	
$\frac{1}{9}$	— 50.805·263	its $\frac{1}{9}$	— — 5·645·029	+
$\frac{1}{9}$	— 5·645·029	its $\frac{1}{11}$ —	— 513·185	—
$\frac{1}{9}$	— 627·225	its $\frac{1}{13}$ —	— 48.248	
$\frac{1}{9}$	— 69.691	its $\frac{1}{15}$ —	— 4·646	
$\frac{1}{9}$	— — 7·743	its $\frac{1}{17}$ —	— 456	—
$\frac{1}{9}$	— 860	its $\frac{1}{19}$ —	— 45	+
$\frac{1}{9}$	— — 96	its $\frac{1}{21}$ —	— 5	—
The nat. Logarithm of 2 is			346·573·590.280 2	
The Neper's Log. of 2 is	—		693·147·180.560	

Hence 346. 573. 590. 280. the natural Logarithm of 2 being doubled, will give 693. 147. 180. 560. for the natural Logarithm of 4; and this again, being doubled, will give 1386. 294. 361. 120, &c. for the natural Logarithm of 16, &c. in like manner 1386. 294. 361. 120. the double of 693. 147. 180. 560. the Neper's Logarithm of 2 will give the Neper's Logarithm of 4, and this again, being doubled, will give 2772. 588. 722. 240. for the Neper's Logarithm of 16, &c.

Again, as the natural Logarithm of 2 being multiplied by 3, will produce 1039. 720. 770. 840. for the natural Logarithm of 8; ſo the Neper's Logarithm of 2 being trebled, will give 2079. 441. 541. 680. for the Logarithm of 8, &c.

Again, if the Logarithm of 8 be multiplied by the Logarithm of 1 $\frac{1}{4}$, we ſhall have the Logarithm of 10; and to find the Logarithm of 1 $\frac{1}{4}$, we have given $a = 1$, $b = 1\frac{1}{4}, = \frac{5}{4}$, whence $z = \frac{4}{9}$, and $d = \frac{1}{4}$, and conſequently $\frac{d}{z} = \frac{1}{9}$, and $\frac{d^2}{z^2} = \frac{1}{81}$

$\frac{1}{9}$ =	111.111.111.111 =			111.111.111.111
$\frac{1}{81}$	1.371·742.112	its $\frac{1}{3}$	—	457·247·371
$\frac{1}{81}$	— 16.935·087	its $\frac{1}{5}$	— —	3·387·017
$\frac{1}{81}$	— 209.075	its $\frac{1}{7}$	— —	29.868
$\frac{1}{81}$	— — 2.581	its $\frac{1}{9}$	— —	287
$\frac{1}{81}$	— — 32	its $\frac{1}{11}$	— —	3
The natural Log. of 1 $\frac{1}{4}$ =				111.571·775·657 2
The Neper's Log. of 1 $\frac{1}{4}$ =				223·143·551·314·

As 1039. 720. 770. 840. the natural Logarithm of 8 being added to 111. 571. 775. 657. will give 1151. 292. 546. 497. for the natural Logarithm of 10; ſo 2079. 441. 541. 680. the Neper's Logarithm of 8 being added to 223. 143. 551. 314. the Neper Logarithm of 1 $\frac{1}{4}$ will give 2302. 585. 092. 994. for the Neper's Logarithm of 10.

As theſe Logarithms which are called Neper's Logarithms, were thoſe that were firſt publiſhed by Neper the inventor himſelf, in the year 1614; ſo theſe that are called the natural

Logarithms were thoſe that were publiſhed, in the year 1619, by John Spidel, then a profeſſor of mathematics in London, to which they fixed tables of artificial ſines, tangents, and ſecants; but as theſe being found not ſo proper for the buſineſs as could be wiſhed for, the inventor himſelf, with the aſſiſtance of Mr. Henry Briggs, altered the form, and made the Logarithm of 10 to be 1,0000000000, &c. and not 2,30258509299, &c. that is, he made the number 10 the 10000000000th, &c. term in the ſeries, whence the Logarithm of 100 will be 20000000000, &c. that is, the number 100, will be placed in the 20000000000th place in the ſeries, and the Logarithm of 1000 will be the 30000000000, &c. that is, the number 1000 will be the 30000000000th term in the ſeries, &c. whence the Logarithms of all numbers between 1 and 10 will begin from 0, that is, they will have 0, for the firſt term towards the left hand, inaſmuch as they are each of them leſs than the Logarithm of 10, which has unity in the firſt place; in like manner the Logarithm of all numbers between 10 and 100 begin from unity, inaſmuch as they are all greater than 1,0000000000, &c. and leſs than 2,0000000000, &c. for the ſame reaſon, the Logarithms of all numbers between 100 and 1000 begin from 2, ſince they are all greater than the Logarithm of 100, which is fixed at 2, and leſs than the Logarithm of 1000, which is made equal to 3; after the ſame manner the Logarithms of all numbers between 1000 and 10000 will begin from 3, and the Logarithms of all numbers between 10000 and 100000 will begin from 4, that is, they will have a 4 for the firſt figure towards the left hand, &c. The firſt figure of every Logarithm towards the left hand, which is ſeparated from the reſt by a point, is called the index or characteriſtic of that Logarithm, inaſmuch as it ſhews or points out the higheſt or remoteſt place of that number from the place of unity in the infinite ſcale of proportionals towards the left hand. Thus, if the index of the Logarithm be 1, it ſhews that its higheſt place towards the left hand is the tenth place from unity. If the index be 2, it ſhews that its higheſt place towards the left hand from the place of unity is the hundredth place; and as all the Logarithms that have 1 for their index will be found between the 10th and 100th place from unity, in the order of numbers; ſo all the Logarithms which have 2 for their index, will be found between the 100th and 1000th place, in the order of numbers, &c. whence the index or characteriſtic of any Logarithm is always leſs by one than is the number of figures, which correſpond or anſwer to the given Logarithm.

Now, inaſmuch as all ſcales of Logarithms are made up of ſimilar quantities, it will be eaſy from any ſcale of Logarithms whatſoever to form another ſcale of Logarithms in any given ratio, and conſequently to reduce any table of Logarithms into another of any given form, by ſaying, as any one Logarithm in the given form is to its correſpondent Logarithm in the new form; ſo is any other Logarithm in the given form to its correſpondent Logarithm in the required form; and hence we are taught how to reduce either Neper's or the natural Logarithms into the form of Briggs's and the contrary.

For as 2,302, 585, 092, 994, the Neper's Logarithm of 10, is to 1.0000000000, the Brigg's Logarithm of 10; ſo is any other Logarithm in Neper's form to the correſpondent tabular Logarithm in Briggs's form; and, inaſmuch as the two firſt numbers conſtantly remain the ſame, if the Neper's Logarithms of any one number be divided by 2.302, 585, &c. or multiplied by 434,294,481, 903, the ratio of 1,000,000, &c. to 2, 302, 585, &c. as is found by dividing 1,000,000, &c. by 2302, 58, &c. the quotient in the firſt caſe, and product in the laſt caſe, will give the correſpondent Briggs's Logarithm, and the contrary.

It has been already ſhewn, that $\frac{1}{n} \times x - \frac{1}{2}x^2 + \frac{1}{3}x^3 - \frac{1}{4}x^4$, &c. equal to $\overline{1+x}^{\frac{1}{n}} - 1$, will be the Logarithm of the ratio of 1 to $1+x$, where n repreſents an infinite index, and x any number taken at pleaſure. Now, if L be put for the Logarithm itſelf, then $\overline{1+x}^{\frac{1}{n}} - 1$ will be equal to L, conſequently, $\overline{1+x}^{\frac{1}{2}}$ will be equal to $L+1$, and $1+x$ equal to $\overline{L+1}^{n}$; and becauſe $\overline{L+1}^{n} = 1 + nL + \frac{nn-n}{2}L^2 + \frac{n^3+3n^2+2n}{6}L^3 + \frac{n^4-6n^3+11n^2-6n}{24}L^4$, &c. by the general theorem, when n is finite, when n becomes infinite to $\overline{L+1}^{n}$ will be equal to $1 + nL + \frac{1}{2}n^2L^2 + \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 + \frac{1}{120}n^5L^5 + \frac{1}{720}n^6L^6 + \frac{1}{5040}n^7L^7$, &c. $= 1+x$. In like manner, becauſe $\frac{1}{n} \times x + \frac{1}{2}x^2 + \frac{1}{3}x^3 + \frac{1}{4}x^4 + \frac{1}{5}x^5 + \frac{1}{6}x^6$, &c. equal to $1 - \overline{1-q}^{\frac{1}{2}}$ is the Logarithm of the ratio 1 to $\overline{1-x}$, $1 - \overline{1-x}^{\frac{1}{2}}$ will be equal to L, conſequently $\overline{1-x}^{\frac{1}{n}} = \overline{1-L}$, and $1-x = \overline{1-L}^{n}$, wherefore, by the ſame general theorem, $1-x = \overline{1-L}^{n}$ will be equal to $1 - nL + n^2L^2 - \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 - \frac{1}{120}n^5L^5 + \frac{1}{720}n^6L^6 - \frac{1}{5040}n^7L^7$, &c.

Whence $1 \pm x = 1 \pm nL + \frac{1}{2}n^2L^2 \pm \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 \pm \frac{1}{120}n^5L^5$, &c. which is a general theorem for finding the number from the Logarithm given, of any form whatſoever.

And becauſe $n = 1000000$, &c. in Neper's form, $1 \pm x = 1 \pm L + \frac{1}{2}L^2 \pm \frac{1}{6}L^3 + \frac{1}{24}L^4 \pm \frac{1}{120}L^5$, &c. will give the number anſwering to any Logarithm in Neper's form.

Hence any one term of the ratio whereof L is the Logarithm, being given, the other term will be obtained readily; for, putting a for the leſſer of the two terms, and b for the greater, $a \times 1 + L + \frac{1}{2}L^2 + \frac{1}{6}L^3 + \frac{1}{24}L^4 + \frac{1}{120}L^5$, &c. will give the greater; and $b \times 1 - L + \frac{1}{2}L^2 - \frac{1}{6}L^3 + \frac{1}{24}L^4 - \frac{1}{120}L^5$, &c. will give a the leſſer, in Neper's form. Or, $a \times 1 + nL + \frac{1}{2}n^2L^2 + \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 + \frac{1}{120}n^5L^5$, &c. $= b$: and $a \times 1 - nL + \frac{1}{2}n^2L^2 - \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 - \frac{1}{120}n^5L^5$, &c. $= a$, in any form.

Let d ſtand for the difference between the given Logarithm, and the next neareſt tabular Logarithm; then will $a \times 1 + d + \frac{1}{2}d^2 + \frac{1}{6}d^3 + \frac{1}{24}d^4 + \frac{1}{120}d^5$, &c. $=$ N. Or, $b \times 1 - d + \frac{1}{2}d^2 - \frac{1}{6}d^3 + \frac{1}{24}d^4 - \frac{1}{120}d^5$, &c. $=$ N, the number required in Neper's form. Or, $a \times 1 + nd + \frac{1}{2}n^2d^2 - \frac{1}{6}n^3d^3 + \frac{1}{24}n^4d^4 - \frac{1}{120}n^5d^5$, &c. $=$ N. And, $b \times 1 - nd + \frac{1}{2}n^2d^2 - \frac{1}{6}n^3d^3 + \frac{1}{24}n^4d^4 - \frac{1}{120}n^5d^5$, &c. $=$ N, the correſpondent number in Logarithms of any ſpecies.

Let it therefore be required to find the number anſwering to 7.5713740282 in Briggs's form.

Becauſe 7.5713710453, the neareſt tabular Logarithm to this, is leſs than the given number, put 37271000 the number anſwering to it, equal to a, and the difference between the two Logarithms 0000029827 equal to d, then will n equal to 230258, &c. multiplied by d, produce 0000068683; which being increaſed by 1, and multiplied by 37271000, the next neareſt number in the table will give 37271255.988 for the number anſwering to the given Logarithm: or, if 0000068683 be multiplied by a, equal to 37271000, the product 255.998 increaſed by a, equal to 37271000, will give 37271255,988 for the number required, and after the ſame manner may the number anſwering to any given Logarithm be found.

Hence, and from the general theorem, may the number anſwering to any Logarithm be found, and conſequently an antilogarithmic canon be conſtructed, ſhewing the natural numbers anſwering to every Logarithm, ſet down in a natural order from 1 to 100.000, whence the number anſwering to any Logarithm might be found with the ſame eaſe as we find the Logarithm for any number in the logarithmic canon.

Imaginary LOGARITHM, is uſed for the Logarithm of negative and imaginary quantities, ſuch as $a - \surd - a$, &c. Thus alſo the fluents of certain imaginary fluxionary expreſſions, ſuch as $\frac{x}{x\surd -1}$, $\frac{ax}{2bx\surd -1}$, &c. are imaginary Logarithms.

The expreſſion $\frac{\dot{x}}{x}$ repreſents the fluxion of the Logarithm of x, and the fluent thereof $\frac{\dot{x}}{x}$ is the Logarithm of x; but no Logarithm can repreſent the fluent of $\frac{\dot{x}}{x\surd -1}$, which is therefore called an imaginary Logarithm.

However, when theſe imaginary Logarithms occur in the ſolutions of problems, they may be transformed into circular arcs or ſectors; that is, the imaginary Logarithm, or imaginary hyperbolic ſector, becomes a real circular ſector.

LONGITU'DINAL *Veſſels*, in plants, are ſuch as are extended in length through the woody part of trees and plants, into which the air is ſuppoſed to enter, and mix with the juices of the plant, and thereby augment its bulk.

LONI'CERA, *upright honeyſuckle*, in botany, a genus of plants, whoſe characters are:

The flower is tubulous, and of one leaf, which is deeply cut into ſeveral ſegments, which are reflexed: from the empalement ariſe ſix long ſtamina, ſurrounding the pointal, which are extended the length of the petals: the ovary reſts on the empalement, which afterwards turns to a berry, in which are included one or two compreſſed ſeeds, ſurrounded by a glutinous pulp.

LOOL, in metallurgy, a veſſel made to receive the waſhings or ores of metals. The heavier or more metalline part of the ores remaining in the trough in which they are waſhed; the lighter, and more earthy, running off with the water, but ſettling in the Lool. *Ray's Engliſh Words.*

LOOME, at ſea. If a ſhip appears big, when ſeen at a diſtance, they ſay ſhe Loomes, or appears a great ſail.

LOOP, in the iron works, is a part of a ſow or block of caſt iron broken or melted off from the reſt, and prepared for the forge or hammer. The uſual method is, to break off the Loop of about three quarters of a hundred weight. This Loop they take up with their ſlinging tongs, and beat it with iron ſledges upon an iron plate near the fire, that ſo it may not fall to pieces, but be in a condition to be carried under the hammer. It is then placed under the hammer, and, a little water being drawn to make the hammer move but ſlowly, it is beat very gently, and by this means the droſs and foulneſs are forced off, and after this they draw more and more water by degrees, and beat it more and more till they bring it to a four-ſquare maſs, of about two feet long, which they call a bloom. *Ray's Engliſh Words.*

LOO'PING, in metallurgy, a word uſed by the miners of ſome counties of England, to expreſs the running together of the matter of an ore into a maſs, in the roaſting, or firſt burning, intended only to calcine it ſo far as to make it fit for powdering. This accident, which gives the miners ſome trouble, is generally owing to the continuing the fire too long in this proceſs. *Ray's Engliſh Words.*

LO'PPING.—It is very obſervable that moſt old trees are hollow within; which does not proceed from the nature of the trees, but is the fault of thoſe who have the management of them who ſuffer the tops to grow large before they lop them; as the aſh, elm, hornbeam, &c. and perſuade themſelves, that they may have the more great wood; but, in the mean time, do not conſider that the cutting off great tops endangers the life of a tree; or, at beſt, wounds it ſo, that many trees yearly decay more in their bodies, than the yearly tops come to; and, at the ſame time that they furniſh themſelves with more great wood, they do it at the loſs of the owner. And, indeed, though the hornbeam and elm will bear great tops, when the body is little more than a ſhell; yet, the aſh, if it comes to take wet at the head, very rarely bears more top after the body of the tree decays. Therefore, if once theſe trees decay much in the middle, they will be worth little but for the fire; ſo that, if you find a timber-tree decay, it ſhould be cut down in time, that the timber be not loſt.

The Lopping of your trees, that is, at ten or twelve years old at moſt, will preſerve them much longer, and will occaſion the ſhoots to grow more into wood in one year, than they do in old tops at two or three. Great boughs, ill taken off, often ſpoil many a tree; for which reaſon they ſhould always be taken off cloſe and ſmooth, and not parallel to the horizon; and cover the wound with loam and horſe-dung mixed, to prevent the wet from entering the body of the tree.

When trees are at their full growth, there are ſeveral ſigns of their decay; as the withering or dying of many of their top branches; or if the wet enters at any knot; or they are anywiſe hollow, or diſcoloured; if they make but poor ſhoots; or if woodpeckers make any hole in them.

This Lopping of trees is only to be underſtood for pollard-trees; becauſe nothing is more injurious to the growth of timber-trees, than that of Lopping or cutting off great branches from them. Whoever will be at the trouble of trying the experiment upon two trees of equal age and ſize, growing near each other, to lop or cut off the ſide branches from one of them, and ſuffer all the branches to grow upon the other, will in a few years, find the latter to exceed the other in growth every way; and this will not decay near ſo ſoon.

All ſorts of reſinous trees, or ſuch as abound with a milky juice, ſhould be lopped very ſparingly; for they are ſubject to decay, when often cut. The beſt ſeaſon for Lopping theſe trees is ſoon after Bartholomew-tide; at which time they ſeldom bleed much, and the wound is commonly healed over before the cold weather comes on. *Miller's Gard. Dict.*

The Lopping of young trees, that is, of ſuch as are ten or twelves years old, will preſerve them much longer, and will occaſion the ſhoots to grow more into wood in one year, than they do in old tops in two or three. The taking off of large boughs in a careleſs manner deſtroys many a tree; they ſhould therefore always be lopped with great care, and the wound covered with ſome loam to keep it from rotting, and prevent the wet from entering and getting into the body of the trees.

All ſorts of reſinous trees, or ſuch as abound with a milky juice, ſhould be lopped but very ſparingly, for they are very ſubject to decay, when cut. The beſt ſeaſon for the Lopping theſe is the end of Auguſt, when they will not bleed very much, and the wounds will heal before the hard weather.

The generality of the world are againſt pruning timber trees at all, and, where they naturally grow ſtraight and regular, it is much better let alone. But all the common faults in ſhape may be regulated by this Lopping them while young, and it can be attended with no ill conſequence to the timber; for the cut not lying near the timber pith cannot affect it, when grown up, and ſquared in the working for beams and other uſes, or to be quartered; for all the defects, occaſioned by ſuch wounds, are in the ſuperficial parts, and all the four quarters are perfectly ſound within.

As to the large foreſt trees, they ſhould not be lopped at all, except in caſes of great neceſſity, and then the large boughs muſt not be cut, but only the ſide branches, and even theſe muſt be cut off cloſe, that the bark may ſoon cover the wound, and yet a little ſlanting, that the water may run off, not lodge upon the cut part.

If there is a neceſſity of cutting off a large bough, as by its being broken or cankered, let it be cut off ſlanting at about four feet diſtance from the body of the tree, and that if poſſible near ſome place where there is a young ſhoot from it, which may receive the ſap, and grow up in its place. No ſtump muſt be left ſtanding out farther than this, becauſe they are wounded parts which never can heal, and which will always be letting in the water, and will ſerve as pipes to convey that water into the heart of the body of the tree, and by degrees will utterly ſpoil it. All that grow upright, whether they be large or ſmall branches, muſt in cutting be taken off ſlanting, never evenly, for the ſame reaſon; thoſe boughs that bear from the head are to be cut with the ſlope on the lower ſide, and on any occaſion that great wounds are given to a tree, they ſhould be covered with a mixture of clay and horſe-dung, which will make them heal much ſooner than they otherwiſe would do. *Mortimer's Huſbandry.*

LO'RICA, a name given by ſome chemical writers to a peculiar lute made for the coating over veſſels, which are to bear a very vehement fire.

This is ordered to be made of the powdered glaſs of broken retorts mixed up into a paſte with potters clay by means of warm water: the retort, or other veſſel, to be loricated, is to be covered a third of an inch thick with this matter, and if it cracks in the drying, which muſt be done gradually before it is to be uſed, the cracks muſt be filled up with the ſame paſte, and this muſt be left to dry as the former. *Collect. Chym. Leyd.*

LO'RIMERS, one of the companies of London, that make bits for bridles, ſpurs, and ſuch-like ſmall iron ware.

LORE'TTO, the name of an order of knights, inſtituted by pope Sixtus V. in 1587, where he made the church of our lady of Loretto, a biſhop's ſee; during his papacy, he made no leſs than 260 of them; the popes conferred this order indifferently on ſword-men and lawyers, and honoured them with the titles of count palatines; they had all of them penſions, with a power of making doctors in all faculties, as alſo public notaries, and that of legitimating baſtards.

LOT, or LOTH, in mining, is the thirteenth diſh, meaſure, or part of the miner's ore, which the bar-maſter takes up for the king. *Houghton's Compl. Miner, in the explanation of the term.*

LO'TION, *lotio ſaponacea*, the ſaponaceous Lotion, the name of a form of medicine preſcribed in the late London Pharmacopœia, being properly ſoap in a liquid form. It is ordered to be made thus: take damaſk roſe water, three quarters of a pint; oil of olives, a quarter of a pint; ley of tartar, half an ounce in meaſure; rub the ley and oil together till they are mixed, and then gradually add the water. *Pemberton's Lond. Diſp.*

LO'TUS, *bird's-foot trefoil*, in botany, a genus of plants, whoſe characters are:

It hath a papilionaceous flower: the ovary, which riſes out of the flower cup, afterward becomes a pod; ſometimes diſtinguiſhed, as it were, into cells, by tranſverſe partitions, which are full of ſeeds, for the moſt part roundiſh: to which may be added, the leaves grow by threes, but have two wings or little leaves at the origin of their foot-ſtalks.

There are two or three varieties of this bird's-foot trefoil, which grow wild in moſt parts of England: when theſe are upon dry gravelly and chalky land, they are very low humble plants, ſpreading on the ſurface of the ground: but in rich moiſt land they grow much larger; and one of the ſorts will ſometimes produce branches near two feet in length: the ſeeds of theſe plants have been ſold, and recommended as profitable to ſow for fodder, by ſome huſbandry-quacks, by the name of ladies-finger-graſs: but I never could yet find any animal that would eat it, either green or dry.

LOVE *Apple*, is the Engliſh name for the fruit of the lycoperſicon, a plant cultivated in gardens with us, for the ſingularity of its appearance. The Portugueſe call it tomato, and eat the fruit, either raw or ſtewed, as do alſo the Jew families in England.

LOW'ERING, is the diſtillers buſineſs, a term uſed to expreſs the debaſing the ſtrength of any ſpirituous liquor by mixing water with it. The ſtandard and marketable price of theſe liquors is fixed, in regard to a certain ſtrength in them called proof; this is that ſtrength, which makes them, when ſhook in a phial, or poured from on high into a glaſs, retain a froth or crown of bubbles for ſome time. In this ſtate ſpirits conſiſt of about half pure, or totally inflammable ſpirits and half water; and, if any foreign or home ſpirit is to be expoſed to ſale, and is found to have that proof wanting, ſcarce any one will buy it, till it has been diſtilled again, and brought to that ſtrength; and, if it be above that ſtrength, the proprietor uſually adds water to it, to bring it down to that ſtandard. This addition of water, to debaſe its ſtrength, is what is called Lowering it. People well acquainted with the goods will indeed buy ſpirits at any ſtrength, only Lowering a ſample to the proof ſtrength, and by that judging of the ſtrength of the whole; but the generality of buyers will not enter into this, but muſt have it all lowered for them. *Shaw's Eſſay on Diſtillery.*

There is another kind of Lowering in practice among the retailers of ſpiritous liquors to the vulgar; this is the reducing it under the ſtandard of proof. They buy it proof, and afterwards increaſe their profit upon it, by Lowering it with water one eighth part. The quantity of ſpirit is what they generally allow themſelves for the addition of water; and whoever has the art of doing this, without deſtroying the bubble proof, as this is eaſily done by means of ſome addition, that gives a greater tenacity to the parts of the ſpirit, will deceive all that judge by this proof alone; that is, very nearly all who are concerned in the ſpirit trade. Such an additional quantity of water, as one eighth, makes the ſpirit taſte ſofter and cooler, and will make many prefer it to the ſtronger ſpirit which is hotter and more fiery; but, unleſs the ſpirit, thus lowered, were tolerably clean, or the proof be ſome other way preſerved, the addition of the water lets looſe ſome of the coarſe oil, which makes the liquor milky, and leaves a very nauſeous taſte in the mouth. *Shaw's Eſſay on Diſtillery.*

LO'XIA, in zoology, the name of a bird, called in Engliſh the croſs bill, and in ſome places the ſhell apple, ſuppoſed to be the tragon of the ancients.

LU'CERNE, in huſbandry, the name of a plant frequently cultivated by our farmers in the manner of clover. It is the ſame plant which the ancients were ſo fond of under the name of medica, and in the culture of which they beſtowed ſuch great care and pains.

Its leaves grow three at a joint, like thoſe of the clover; its flowers are blue, and its pods of a ſcrew-like ſhape, containing ſeeds like thoſe of the broad clover, but longer, and more kidney-ſhaped.

The ſtalks grow erect, and, after moving, they immediately grow up again from the parts where they were cut off. The roots are longer than thoſe of the ſaint-foin, and are not ſingle, but ſometimes they run perpendicularly in three or four places from the crown.

It is the only plant in the world, whoſe hay is preferable to the ſaint-foin for the fattening of cattle; but its virtues, in that reſpect, are ſo great, that they are not to be credited by any that have not tried the plant. It is the ſweeteſt graſs in the world, but muſt be given to cattle with caution, and in ſmall quantities, otherwiſe they will ſwell and incur diſeaſes from it.

Though the common method of huſbandry will not raiſe Lucerne to advantage; yet, the horſe-hoeing huſbandry will raiſe it annually, increaſing in value to the owner, and make one of the moſt profitable articles of his buſineſs.

The ſoil to plant it on muſt be either a hot gravel, or a very rich and dry land, or ſome other rich and dry land that has not an under ſtratum of clay, and is not too near ſprings of water. The natural poorneſs of gravel may be made up by dung and the benefit of the hoe, and, the natural richneſs of the other lands being increaſed by hoeing and cleanſing them from graſs, the Lucerne will thrive with leſs heat; for what is wanted in one of theſe qualities muſt be made up in the other. The beſt ſeaſon for planting it in England is early in the ſpring, the earlier the better; for then there is always moiſture enough in the earth to make it grow, and not ſo much heat as would dry up its tender roots, and kill it after the firſt ſhooting. About a pound and a half of ſeed will be enough for an acre; and, if this be ſown in February, though ſome of the young plants will be deſtroyed by the froſts in March, yet there will be enough left of them for the making as thick a crop as is neceſſary. The planting it in autumn might do very well in hotter countries, but with us the long winters would kill a great part of the tender plants, and greatly ſtunt and injure thoſe they did not kill.

The number of Lucerne plants ſhould be leſs than thoſe of ſaint-foin to an acre, becauſe they grow much larger in this way of management, and each occupies a greater ſpace of ground, and produces a larger quantity of hay. The quick growth of this plant requires that it ſhould have large ſupplies of nouriſhment, and good room to grow in; and it is better in all things of this kind to err in ſetting the plants too far diſtant, than in ſetting them too near.

The moſt fatal diſeaſe incident to Lucerne is ſtarving; for this reaſon, good culture is neceſſary to it, and the often turning the earth with the hoe all about it. By this means, a plant, that in the common way of ſowing, would not have been more than four or five inches high, will be three feet, and will ſpread every way, ſo as to produce a quantity of hay, more like the cutting of a ſhrub than a plant.

The plants ſhould ſtand at five inches diſtance in ſingle rows, and the intervals between theſe rows muſt be left wide enough for the uſe of the hoe plough.

The rows of Lucerne plants muſt not be thinned till they are grown up to ſome height; for, while young, they are ſubject to be eaten by the fly, like turnips; and, if this deſtroyer ſhould ſeize them, after they are reduced to only a competent number, the crop would be rendered much too thin. The hoe plough is the only inſtrument that can bring this plant to perfection, and it muſt be frequently had in proportion to the number of crops it produces; but then it muſt be ſtill ſome years, leſt the plowed ground injure the hay that is made upon it; and when it is come to a turf, and the Lucerne wants renewing, the four-coultered plough is the only inſtrument that can prepare the turf to be killed, and cure the Lucerne. This plough muſt be uſed in the following manner: turn its furrows towards one row, and from the next; that is, plow round one row, and that will finiſh two intervals; and ſo of the reſt. The next plowing muſt be towards thoſe rows from which they were turned the firſt time, and care muſt be taken that the firſt furrows do not lie long enough on the rows to kill the plants, which will be much longer in winter than in ſummer.

Lucerne is to be made into hay in the ſame manner as ſaint-foin; but this is to be obſerved, that it is always to be cut, juſt before it comes to flower. The richeſt Lucerne hay of any is that cut while the ſtalks are ſingle, without any collateral branches, and in this caſe there uſually is not ſo much as the bud of a flower to be ſeen on the plants.

Lucerne can never be expected to ſucceed well any where, let the ſoil be ever ſo good, unleſs it be kept clean from natural graſs. *Tull's Huſbandry.*

LU'CIUS, in zoology, the name of the common river fiſh, called in Engliſh the jack, or pike, and by ſome the pickerel.

LUCIUS *terreſtris*, the land pike, in zoology, the name of a very ſingular ſpecies of American lizard, which has the ſhape, ſcales, &c. of the pike fiſh. In the place of the fins of that fiſh it has four legs, but theſe are ſo weak and ſlender that it makes no uſe of them in walking, but crawls along upon the ground in the manner of a ſnake, and draws its legs after it. It grows to about fifteen inches long, with a proportionable thickneſs. It is all over covered with ſmall, ſtrong, and gloſſy ſcales, of a ſilvery grey. In the night they retire into holes and caverns, and make a very diſagreeable and loud noiſe, much louder than the croaking of frogs. They ſeldom ſtir out of their holes, unleſs in the duſk of the evening; and, if they are ever met with in the day time, their ſtrange motion ſurprizes all that ſee them. *Rochefort's Hiſt. Inſ. Antill.*

LU'FFA, *Egyptian cucumber*, in botany, a genus of plants, whoſe characters are:

It hath a bell-ſhaped flower, conſiſting of one leaf, which is divided into five parts to the center: there are male and female flowers on the ſame plant: the male flowers are produced on ſhort foot-ſtalks, having no embryo's; but the female flowers reſt on the top of the embryo's, which afterwards becomes a fruit like a cucumber to outward appearance, but is not fleſhy, the inner part conſiſting of many fibres, which are elegantly netted: and there are three cells, which are filled with ſeeds, which are almoſt of an oval ſhape.

This plant may be propagated after the ſame manner as cucumbers and melons, by ſowing the ſeeds on a hot-bed the beginning of March: and, when the plants are come up, they muſt be pricked into a freſh hot-bed to ſtrengthen the plants, obſerving to let them have freſh air every day in warm weather, and to refreſh them frequently with water.

The fruit, when it is young, is by ſome people eaten, and made into mango's, and preſerved in pickle; but it hath a very diſagreeable taſte, and is not accounted very wholſome: wherefore theſe plants are ſeldom cultivated in Europe, except by ſuch perſons as are curious in botany, for variety. *Miller's Gard. Dict.*

LUGS, the Engliſh name for a peculiar ſpecies of inſect, found in great plenty on the ſhores of Cornwall. It is of the nature of the ſcolopendra, and is called by Mr. Ray vermis ſcolopendroides. It grows to twelve inches long, and has inſtead of legs nineteen pair of ſtiff briſtles; theſe all ſtand towards the head part of the creature, the tail being of at leaſt five inches long when full grown, and having no mark of them. Its body is rounded, and much reſembles the body of the common earth worm, and is of a fleſh colour, or of a pale red; it has no forceps.

LUME'LLA, in the glaſs trade, the round hole in the floor of the tower of the leer, which is directly over the working furnace, and by which the flame is let into the tower. *Neri's Art of Glaſs.*

LU'MPUS, in zoology, the name of a thick and ſhort ſea fiſh, called in Engliſh the lump fiſh, and ſea own, and by the Scotch the cock paddle.

LUNA'RIS *Cochlea*, in natural hiſtory, the name of a genus of ſhells of the ſnail kind, the diſtinguiſhing character of which is their having a perfectly round mouth. Theſe are univalve, umbilicated ſhells, with a depreſſed clavicle, and a ſurface ſometimes ſmooth, but more frequently ſtriated, furrowed, laciniated, or covered with tubercles.

LU'PIA, in ſurgery, a name given by ſome authors to that ſort of ſwelling, called by others talpa and teſtudo; this is an encyſted tumor, more diſtinguiſhed by its ſituation than by its nature, ſince of whatever kind it be, whether aſteatomatous, or atheromatous, &c. if ſituated under the ſcalp, it is called by theſe names. *Heiſter's Surgery.*

LU'PUS, *the wolf*, in zoology. This is a beaſt of prey, but wholly of the dog kind, and the largeſt and fierceſt of that race of animals. It is extremely like the domeſtic dog in ſhape, and, if the head did not differ a little in figure, one would be apt to declare it the very ſame animal. It has a very fierce look about the face, its eyes are glaring and ſavage, and its teeth and the opening of its mouth fierce and frightful. The ancients had an opinion, that the neck of the wolf was all of one ſolid bone ; but, on the contrary, this creature is able to turn and twiſt about better than the dog kind. *Ray's Syn. Quad.*

LUPUS, is alſo the name given by authors to a peculiar claſs of ſpiders, from the manner of their taking their prey, which is by open hunting and running down, and not by means of webs as the common ſpiders do theirs. Theſe are diſtinguiſhed into two kinds, the one properly the Lupus, or wolf ſpider ; the other the crab ſpider.

All the ſpiders of the Lupus kind have large eyes and four ſmall ones. Their hinder pair of legs are longer than any of the others ; and they uſually live upon the ground, ſeldom climbing into trees. Of the firſt kind, or the Lupi, properly ſo called, there are four principal ſpecies. Firſt, the black ſpider. This is of a middle ſize, the male and female are both black, the head is ſmall, and the legs are beautifully ſpotted. Secondly, the brown ſpider, with oblique ſtreaks upon the body : this is of a middle ſize, and has a black head. Thirdly, the plain yellowiſh ſpider, with a long-ſhaped pointed body. This is a very large ſpider, and its legs are long and robuſt ; it lives among buſhes. Fourthly, the livid ſpider, with a long-pointed body undulated with white. This is a very larger ſpecies, and lives among trees and under hedges. *Ray's Hiſt. Inſ.*

LUPUS *marinus*, the ſea wolf, a voracious ſea fiſh, caught ſometimes in our ſeas, but more frequently in the Mediterranean, and very fierce and voracious. Its head is larger, in proportion to its ſize, than that of the ſhark and rounder. This, as alſo the back, ſides, and fins, are all of a bluiſh colour. The belly is white, the ſkin is ſmooth and ſoft, but his teeth ſo remarkably hard and ſtrong, that, if he bites againſt an anchor of a ſhip, or other iron ſubſtance, they make a loud noiſe, and leave their mark in the iron. In the rim of his under jaw, he has ten ſharp and round teeth diſpoſed in two rows, and twelve grinders on each ſide behind theſe, diſpoſed in the ſame manner in two rows. The upper jaw has twelve ſharp and round teeth before, and there are three orders or rows of grinders in his palate ; the middle one conſiſting of twelve teeth, as the others, and having them harder than the human teeth, and running farther towards the jaw, and in the upper jaw he has two roughs and ſharp bones ; to which a rough part near the roof of the tongue anſwers, and this like thoſe is beſet with ſharp teeth. *Willughby's Hiſt. Piſc.*

LUSTRA'TION (*Dict.*)—Lomeir has a volume expreſs on the Luſtrations of the ancients: Joh. Lomeieri Zutphanenſis Epimenides, ſive de veterum Gentilium Luſtrationibus ; firſt printed at Utrecht in 1681, and ſince, with additions, in 1702, in quarto.

All perſons, ſlaves only excepted, he ſhews, were miniſters of ſome ſort of Luſtration.—When any one died, the houſe was to be ſwept after a particular manner, by way of purification ; the prieſt threw water on new-married people, with the like intention.—To purify themſelves, people would even ſometimes run naked through the ſtreets ; ſuch was their extravagance. And, as if fancy was not fertile enough in inventing modes of Luſtration, they even uſed inchantments to raiſe the dead, in order to get inſtructions what they muſt do to purge themſelves of their ſins. Add, that they frequently raiſed the opinion of the ſanctity of their expiations by fictitious miracles. The birds, ſay they, practiſe Luſtration, both by waſhing themſelves, and throwing water on their neſt. The hen takes ſtraw, and uſes it to purify her chickens. — There was ſcarce any action, at the beginning and the end of which the Gentiles did not perform ſome ceremony to cleanſe themſelves, and appeaſe the gods. When they had no animals to ſacrifice, they made the figure of the beaſt they would offer in dough, metal, or other matter ; and thus ſacrificed in effigy.

Some expiations were performed in the water ; for which reaſon, certain fountains and rivers were in great reputation : others were performed in the air. — A certain heathen cauſed himſelf to be ſeriouſly ſifted in a ſieve, as we now ſift corn : another hung himſelf by a cord, and was toſſed backwards and forwards : another ſhut his eyes, and ſet himſelf blindfold to find out a noſegay tied to a cord : others played at ſee-ſaw, as a more efficacious way of appeaſing the gods.

Fire was much uſed for expiation : ſometimes the penitents were caſt into the fire ; at others, only brought to the flame, or ſmoke.

It was common, on theſe occaſions, to ſhed human blood : The prieſts of Cybele, Bellona, and Baal, made cruel inciſions on themſelves. — Erectheus, king of Attica, ſacrificed his daughter to Proſerpina. Several had their throats cut at Rome, to obtain the emperor's health from the gods. Thoſe who commanded armies, offered one of their ſoldiers to appeaſe the anger of the gods, that he alone might ſuffer all the wrath the army deſerved.

All ſorts of perfumes, and odoriferous herbs, had place in Luſtration.—The egg was much uſed among them, as being the ſymbol of the four elements ; its ſhell, they ſay, repreſents the earth ; the yolk, a globe of fire ; the white reſembles the water ; and, beſides, it has a ſpirit which repreſents the air. For this reaſon it is, that the Bonza's, or Indian prieſts, believe to this day that the world came out of an egg.—There is ſcarce any pot-herb, pulſe, tree, mineral, or metal, which they did not offer the gods by way of expiation : nor did they forget milk, bread, wine, or honey: what is more, they made uſe of the very ſpittle and urine.

The poets had feigned that the gods purified themſelves, and they did not omit to purify their ſtatues.—They made a Luſtration for children, the eighth day after their birth.—When a man, who had been falſely reputed dead, returned home, he was not to enter his houſe by the door. — It was a ſettled cuſtom to offer no expiation for thoſe who were hanged by order of juſtice, or that were killed by thunder. Neither did they offer any for thoſe who were drowned in the ſea ; it being the common opinion, that their ſouls periſhed with their bodies. And hence it was, that perſons in danger of ſhipwreck ſometimes thruſt their ſwords through their bodies, that they might not die in the ſea ; where they thought their ſoul, which they ſuppoſed to be a flame, would be totally extinguiſhed.

The moſt celebrated expiatory ſacrifice was the hecatomb, when they offered an hundred beaſts ; though they commonly did not offer ſo many, but contented themſelves with killing twenty-five ; but, thoſe being quadrupeds, their feet came to an hundred.

Luſtrations and luſtratory ſacrifices were not only performed for men, but alſo for temples, altars, theatres, trees, fountains, rivers, ſheep, fields, and villages. When the Arval brothers offered a victim for the fields, their ſacrifice was called ambarvalia.

Cities were all to be purified, from time to time : ſome walked the victim round their walls, and then ſlew him.—The Athenians ſacrificed two men, one for the men of their city, and the other for the women. The Corinthians ſacrificed the children of Medea ſo ; though the poets ſay, Medea killed them herſelf. The Romans performed the ceremony of purifying their city every fifth year ; whence the name of luſtrum, given to the ſpace of five years.

Divers of the expiations were auſtere : ſome faſted ; others abſtained from all ſenſual pleaſures : ſome, as the prieſts of Cybele, caſtrated themſelves ; others, that they might live chaſte, eat rue, or lay under the branches of a ſhrub called agnus caſtus.

The poſtures of the penitents were different, according to the different ſacrifices : they ſometimes joined prayers to the ſolemnity ; at other times, a public confeſſion of ſins was made. —The Indians, when they ſacrifice to Hercules, call him a thouſand reproachful names ; and think they incur his anger, if any reſpectful term comes out of their mouth.

The prieſts changed their habits, according to the ceremonies to be performed : white, purple, and black, were the moſt uſual colours. They had their heads always covered, and long hair, except in the ſacrifices of Saturn, Hercules, Honour, and a few others : only the prieſts of Iſis were ſhaven, becauſe that goddeſs underwent the ſame operation, after the death of her huſband Oſiris. — In ſome ceremonies the prieſts were ſhod, in others barefoot : the poets expreſs the former by the word vincula. They had no girdles ; nay, they durſt not pronounce the word ivy, becauſe ivy cleaves to every thing.—In the ſacrifices of Venus, and the moon, every one took the habit of the contrary ſex.— Every thing was to be done by odd numbers ; becauſe they looked on an even number, which may be equally divided, as the ſymbol of mortality and deſtruction. The odd number was with them holy : hence Neptune's trident, Cerberus's three heads, and Jupiter's thunder-dart, with three points.

They caſt into the river, or at leaſt out of the city, the animals, or other things that had ſerved for a Luſtration or ſacrifice of atonement ; and thought themſelves threatened with ſome great misfortune, when by chance they trod upon them. —At Marſeilles, they took care to feed a poor man for ſome time ; after which, they charged him with all the ſins of the country, and drove him away : thoſe of Leucade faſtened a number of birds to a man charged with their ſins, and in that condition caſt him headlong from a high tower ; and, if the birds hindered his being killed, they drove him out of the country.

Part of theſe ceremonies were aboliſhed by the emperor Conſtantine, and his ſucceſſors ; the reſt ſubſiſted till the Gothic kings were maſters of Rome, under whom they expired ; except that ſeveral of them were adopted by the popes, and brought into the church, where they make a figure to this day : witneſs the numerous conſecrations, benedictions, exorciſms, ablutions, ſprinklings, proceſſions, feaſts, &c. ſtill in uſe in the Romiſh church.

LU'STRICUS *Dies*, among the ancients, the day on which young children underwent the ceremony of luſtration and received their names.

LUTE'OLA, in zoology, a name given by many to a ſmall bird, called by others aſellus, and by others regulus non criſtatus ; but this laſt is a name that has occaſioned ſome confuſion, as many have erroneouſly called our common wren the regulus, and, as it has no creſt, imagined it to be the bird meant by this name.

It is, excepting the creſted wren, the ſmalleſt of all European birds, and it very little exceeds that in ſize. Its head, neck, and back, are of a greeniſh brown ; the rump is greener than the reſt. It has a yellow line on each ſide, extended from the noſtrils, beyond the eyes, to the hinder part of the head. The breaſt, throat, and belly, are yellow, with a very faint caſt of green. The wings and tail are brown, and all their feathers are tipped with green at their ends: the under part of their wings has much of a very fine green. The beak is extremely ſlender, and half an inch long; the mouth yellow within. It makes a loud noiſe, like that of a graſshopper, and is principally found among willows: it is continually creeping, and ſinging among the branches of trees. It builds with ſtraw and feathers, and lays five eggs, which are white, and ſpotted with red. There is a conſiderable variation in the colours of theſe birds; ſome of them being much greener on the back, and much whiter on the belly, than others. *Ray's Ornitholog.*

LUTEOLA, *weld, would, yellow-weed*, or *dyer's-weed*, in botany, a genus of plants, whoſe characters are:

The leaves are oblong and intire: it hath an anomalous flower, conſiſting of many diſſimilar leaves: the fruit is globular, hollow, and divided into three parts.

The common weld is accounted a rich dyers commodity, and is of great advantage, conſidering the ſmall expence of its culture: it will grow upon the pooreſt ſort of land, provided it be dry; though, upon a middling ſoil, it will grow much larger. The ſeeds of this plant ſhould be ſown the beginning of Auguſt, ſoon after they are ripe; when it will come up with the firſt moiſt weather, and will grow very ſtrong the ſame autumn, provided it be ſown by itſelf; for moſt people ſow it with corn, which is very wrong; for that hinders its progreſs greatly, and occaſions the loſs of one whole year. When the plants are come up pretty ſtrong, you ſhould hoe them (as is practiſed with turneps) in order to deſtroy the weeds, as alſo to cut up the plants where they grow too thick, which will greatly improve them; and the ſucceeding ſpring, if the ground produces many weeds, you ſhould give it a ſecond hoeing in April, which will preſerve it clean from weeds; after that, the weld will grow, and prevent the weeds from coming to an head afterwards.

You muſt be very cautious, in the gathering of it, that the ſeed be not over-ripe, ſo as to fall out, and that neither the ſtalk or ſeed be under-ripe; becauſe, if it be, both will be ſpoiled. It muſt be pulled up and bound in little handfuls, and ſet to dry, as you do flax; and then houſe it carefully, that you ſhake not out the ſeed, which is eaſily beat out, and ſhould be ſown (as was before directed) ſoon after it is ripe.

This ſeed is commonly ſold for about ten ſhillings per buſhel, or more, a gallon of which will ſow an acre; for it is very ſmall. There are ſome who recommend the ſowing this ſeed in the ſpring, mixing it with a crop of barley or oats, and only harrowed in with a buſh, or rolled with a roller. But this is not a good method; for the barley or oats will ſtarve the weld, and make it very poor: and, many times, the ſeeds which are ſown in the ſpring do not grow or not come up, till the autumn following; whereas that ſown, in the beginning of Auguſt, rarely fails to come up ſoon after, and will be much ſtronger, and fit to pull the ſucceeding ſummer, when the other is always two years before it is pulled. The dyers uſe it for dying bright yellows and lemon colours. It is much ſown in Kent, eſpecially about Canterbury, and often yields, from forty ſhillings, to ten or twelve pounds an acre. This is ſuppoſed to be the plant that the ancient Britons dyed themſelves with. *Miller's Gard. Dict.*

LU'TRA, in zoology, *the otter*. See OTTER.

LY'CIUM, in the materia medica, the name of a fruit called by the French baye d'Avignon, the Avignon berry, and by many authors the pyxacantha. The ſhrub which produces it, is the Lycium ſive pyracancha of Gerrard. The fruit is about the ſize of a grain of wheat, and is not round, but of an angular form when dried, ſometimes of three, ſometimes of four angles, and ſometimes dented in at one end like a heart. It is of a yellowiſh green colour, and of a bitter and aſtringent taſte. It ſhould be choſen freſh dried, and large. There was formerly a rob, or inſpiſſated juice made from theſe berries, much in uſe in medicine; but this was generally adulterated with a rob made of the berries of the woodbind, privet, ſloe, or other ſhrub, and is now quite out of uſe. The dyers of France and Holland uſe it for a yellow; and the Dutch have another uſe for it, which is, that they boil it in alum-water, and, mixing it with whiting, form it into twiſted ſticks, which they ſell to the painters in water colours, under the name of ſtil de grain. *Lemery Dict. de Drog.*

LYCOPE'RSICON, *love-apple*, or *wolf's-peach*, in botany, a genus of plants, whoſe characters are:

It hath a flower conſiſting of one leaf, which expands in a circular order, as doth that of the night-ſhade: the ſtyle afterwards becomes a roundiſh ſoft fleſhy fruit, which is divided into ſeveral cells, wherein are contained many flat ſeeds.

LYCOPODIOI'DES, in botany, the name of a genus of moſſes, the characters of which are theſe: it produces ſeeds in ſpikes, in the manner of the lycopodium, or wolf's claw moſs, but that in two ways; for ſome of the capſules incloſe a powder, which ſeems only a farina; others ſeem to contain true ſeeds; theſe always ſtand to the number of three in each capſule. It differs from the lycopodium alſo, in its general appearance and manner of growth, the leaves being all placed in the ſame plane, and expanded in the manner of fins, with an intermediate ſeries of ſmall leaves, which cover the upper ſide of the middle rib, or ſtalk.

LYCOPO'DIUM, in botany, the name of a genus of moſſes, the characters of which are theſe: it produces capſules in the alæ of certain leaves, which are very unlike the capſules of the other moſſes, having neither calypha, operculum, nor pedicle. Theſe do not ſtand as thoſe of the ſelago, in all the alæ of the leaves, but are collected together into a ſort of ſpike of a ſcaly ſtructure, and one capſule ſtands under every ſcale, or leaf. Theſe capſules are of the ſhape of a kidney, and, when ripe, they ſeparate longitudinally into two parts, and throw out a powder, conſiſting of round globules. It has been ſuppoſed by many, that this powder is the farina of the flower; but, as there are no ſeeds found in any other part the plant for it to impregnate, it ſeems a much more probable opinion, that this powder, as well as that of the capſules of all the other moſſes, is the true and genuine ſeed of the plant. In moſt of the ſpecies of this plant, the ſpikes are compoſed of leaves of a different figure from thoſe of the reſt of the plant, and are therefore called ſcales; but in ſome they are made of leaves of the ſame figure with thoſe of the other parts of the moſs. See *plate* XXXII. *fig.* 1.

LYNX, in zoology, the name of a very fierce beaſt of prey called in Engliſh the ounce, and by many Latin authors the lupus cervarius, or dear wolf, from its loving to feed on deer. The hairs of this creature, as well ſuch as appeared reddiſh, as thoſe which were grey, when nicely examined, are all found to be truly of three colours in each ſingle hair; the middle part being of a reddiſh tawny, the bottom grey, and the top white; but thoſe which compoſe the black ſpots are only of two colours, there being no white at their ends.

This creature's eyes are extremely bright and vivid, and ſhew plainly that it has a very piercing ſight. Its ears are like thoſe of a cat, but have this peculiarity, which diſtinguiſhes the creature from all the animals of the ſame claſs: they have a fine pencil of black hairs growing out at their extremities, ſmooth, and of a deep black like velvet, and two fingers long. Its tongue is rough like that of the lion. The Lynx is found wild in Italy and Germany, but the greater number are in Aſia, and theſe are much finer-coloured than the European. They all differ conſiderably from one another, at times, in the number and diſpoſition of their ſpots. *Ray's Syn. Quad.*

LY'RA, the name of a beautiful ſea-ſhell of the genus of the concha globoſa, or dolium. There are three ſpecies of the lyra, or harp ſhell. Firſt, the common lyra, which has thirteen roſe-coloured ribs running along its body. Secondly, the eleven-ribbed Lyra. And, thirdly, the noble harp, or Lyra nobilis. This is a moſt elegantly variegated ſhell; its ground colour is a deep brown, and its variegations very elegant and black.

M.

MACA'W, or Macao, in zoology, the name of a large ſpecies of parrot, diſtinguiſhed alſo by the length of its tail. There are three different ſpecies of this bird brought over into Europe, which not only differ in ſize and other particulars, but alſo in colour. The firſt is the largeſt, and is finely variegated with blue and yellow. The ſecond is ſomewhat ſmaller than this, and is principally red and yellow; and the third is red and blue. It is not uncommon alſo to ſee the Macaw perfectly white, and it is to that particular colour we give the name of cockatoon; though with ſome it is made the ſynonymous name of all the Macaw tribe.

MA'CKAREL, the Engliſh name for the ſcombrus, or ſcomber. See the article Scomber.

Horſe Mackarel. See the article Horse-*Mackarel.*

MACRO'PTERA, in zoology, the name of a genus of birds of the hawk kind, remarkable for the length of their wings. The word is derived from the Greek μακρὸς, long, and πτερὸν a wing.

The hawks of this genus have their wings ſo long, that, when cloſed, they reach to the end of the tail, or nearly ſo. Of this genus are the bald buzzard, the kite, the hen harrier, the honey buzzard, and common buzzard, the ſacre, the jerfalcon, &c. *Willughby's Ornitholog.*

MACROTELO'STYLA, in natural hiſtory, the name of a genus of cryſtals, which are compoſed of two pyramids joined to the end of a column, both the pyramids, as alſo the column, being hexangular, and the whole body conſequently compoſed of eighteen planes. The word is derived from the Greek μακρὸς, long, τέλειος, perfect, and στύλος, a column; expreſſing a perfect cryſtal with a long column. See *Plate* XXXII. *fig.* 2.

MA'DDER, (*Dict.*) — The method of cultivating this uſeful plant, as practiſed by the Dutch, is as follows:

In autumn they plow the land, where they intend to plant Madder in the ſpring, and lay it in high ridges, that the froſt may mellow it; in March they plow it again; and at this ſeaſon they work it very deep, laying it up in ridges eighteen inches aſunder, and about a foot high; then about the beginning of April, when the Madder will begin to ſhoot out of the ground, they open the earth about their old roots, and take off all the ſide-ſhoots, which extend themſelves horizontally, juſt under the ſurface of the ground, preſerving as much root to them as poſſible: theſe they tranſplant immediately upon the tops of the new ridges, at about a foot apart, obſerving always to do this when there are ſome ſhowers, becauſe then the plants will take root in a few days, and will require no water.

When the plants are growing, they carefully keep the ground hoed, to prevent the weeds from coming up between them; for, if they are ſmothered by weeds, eſpecially when young, it will either deſtroy or weaken them ſo much, that they ſeldom do well after. In theſe ridges they let the plants remain two ſeaſons, during which time they keep the ground very clean; and at Michaelmas, when the tops of the plants are decayed, they take up the roots, and dry them for ſale.

This is what I could learn of their method of cultivating this plant; to which I will ſubjoin a few obſervations of my own, which I have ſince made upon the culture of Madder in England. And, firſt, I find there is no neceſſity for laying the ground up in ridges in England, as is practiſed by the Dutch (eſpecially in dry land) becauſe the places where I ſaw it, were very wet land, which is often floated in winter; ſo that, if the plants were not elevated upon ridges, their roots would rot in winter. Secondly, they ſhould be planted at a greater diſtance in England; the rows ſhould be at leaſt three feet diſtance, and the plants eighteen inches aſunder in the rows; for, as they extend themſelves pretty far under ground, ſo, where they are planted too near, their roots will not have room to grow. And, thirdly, I find, that, if all the horizontal roots are deſtroyed from time to time, as they are produced, it will cauſe the large downright roots to be much bigger, in which the goodneſs of this commodity chiefly conſiſts: for, if the upper roots are ſuffered to remain, they will draw off the principal nouriſhment from the downright roots, as I have experienced; for I planted a few roots upon the ſame ſoil and ſituation, which were of equal ſtrength, and rooted equally well: half of theſe I hoed round, and cut off the horizontal roots; and the other half I permitted the horizontal roots to remain on; and, when I took them all up, thoſe which I had hoed about, and kept clear from horizontal roots, were almoſt as large again as the other, and the roots were double the weight; which plainly proves it neceſſary to cut off thoſe ſuperfluous roots: ſo that, where this plant is cultivated in quantity, it will be an excellent method to uſe the hoeing-plough, to ſtir the ground, and deſtroy the weeds; for with this inſtrument a large quantity of ground may be kept clean at a ſmall expence: and, as this will ſtir the ground much deeper than a common hoe, it will cut the ſuperficial roots, and thereby improve the principal roots.

The crop of Madder ſhould be ſhifted into freſh land; for the ground which has had one crop, will not be fit to receive another in leſs than four years; during which time any other annual crop may be cultivated on the land.

The manner of drying and preparing theſe roots for uſe I am not acquainted with, having never had an opportunity of ſeeing that part, ſo can give no inſtructions concerning it: but whoever ſhall have curioſity enough to cultivate this uſeful plant, might eaſily inform themſelves, by going over to Holland at the ſeaſon of taking up the roots.

What I could learn from the people with whom I converſed in Holland on this affair, was, that they pared off the outſide rind of the roots, which is dried by itſelf, and is called mull-Madder. Then they pared off another fleſhy part of the root, which is made into another Madder, and is called number O: but the inſide, or heart of the root, is called crop-Madder. The firſt ſort is not worth above fifteen or ſixteen ſhillings per hundred weight: the ſecond ſort is ſold for about forty ſhillings; but the third ſort will ſell for five pounds per hundred. I have ſince been informed, that there is no neceſſity of dividing it into three ſorts for uſe; for, if the whole is dried and ground together, it will anſwer the dyer's purpoſe full as well. Theſe roots muſt be dried on a kiln, before they are ground to powder; for which purpoſe, I ſuppoſe, the ſame as are uſed for drying of malt might be made uſeful for this commodity.

By ſome few experiments which I made, I imagine that one acre of good Madder, when fit to take up for uſe, will be worth above one hundred pounds: ſo that if it were to ſtand three years in the ground, and to be planted on land of three pounds per acre, it would pay exceeding well; conſidering the annual culture (if performed by a plough) will be no great expence; the principal charge being in the firſt preparing of the land, and the planting: but whoever has a mind to cultivate this plant, might rent very good land for this purpoſe, for twenty-five or thirty ſhillings per acre, at a diſtance from London, but near ſome navigation.

MADRE'PORA, in botany, a genus of ſea plants intirely like the coral, as to its hardneſs, which is equal to bone or marble. Its colour is white, when poliſhed. Its ſurface is lightly wrinkled, and the wrinkles run lengthwiſe of the branches. Its inſide is of a particular organization, having in the center a ſort of cylinder, which is often pierced through its whole length by two or three holes.

From this cylinder are detached about 17 laminæ (*Plate* XXX. *fig.* 2. *k*, *k*) which run to the circumference in ſtraight lines, *m*, *m*, *m*, *m*.

Theſe laminæ are tranſverſely interſected by other laminæ, *q*, *q*, which form many irregular cavities throughout the whole plant. The branches (*fig.* 3. *g*, *g*) are conical; and the baſis of the cone is formed by the ſummit of the branch *e*, *e*. Every one of theſe ſummits has wrinkles on its outſide, which runs in the longitudinal direction of the branches (*fig.* 4. *c*, *c*) and each wrinkle anſwers to a lamina (*fig.* 5. *e*, *u*, *e*, *u*) and each lamina is of the ſhape of a priſm (*fig.* 6.) the baſis of which is warty, and faces the outſide (*fig.* 5. *e*, *u*) and its point is cut into teeth (*fig.* 6. *n*, *n*, *n*) and belongs to the inſide. The cellule (*fig.* 4. *a*, *a*, *a*, *c*, *c*, *fig.* 5. *e*, *e*, *u*, *u*) which is of the ſhape of a chalice, is compoſed of theſe laminæ ranged into a circle.

In every one of theſe cellules is found a little polypus, repreſented in *fig.* 7. but conſiderably magnified; the mechaniſm of which is this:

Three different parts, unlike each other, compoſe this animal; *viz.* the feet, *o*, *i*, a trough, and an head (*fig.* 8. *n.*) Each foot begins by two conical appendices (*fig.* 9. *o*, *o*, *o*, *fig.* 10. *o.*) By the union of theſe appendices a rounded part is formed, which, in ſome degree, reſembles the belly of a muſcle (*fig.* 9. *i*,) by means of which the foot is ſhortened and lengthened. To this part (*fig.* 10. *x*) is annexed a little cylinder (*fig.* 10. *n*, *fig.* 9. *c*) the length of which is indeterminate.

Theſe feet are ranged all around in great number, and annexed to the laminæ (*fig.* 4. *a*, *a*, *c*, *c*) and are all united to the trough (*fig.* 9. *c*) on the outſide of which are ſeen ten cavities, with an equal number of prominences *t*, *t*, *t*, *s*, *s*, *c*, and in theſe is lodged the animal's head (*fig.* 8.) which has prickly rays, the preciſe number of which I could not determine, on account of the extreme velocity of the continual oſcillatory motion of the head from right to left, and from left to right: yet I thought I could perceive the number of theſe rays to be eight, and the uſe of them may be for the animal to catch and hold its food. This part is not always to be obſerved, becauſe it ſometimes hides itſelf, by cloſing up the trough (*fig.* 9. *s*, *s*, *t*, *c*) about it; and, by thus covering itſelf, it is ſafe in its habitation.

As the figure of this animal bears no reſemblance to the urtica marina, I cannot ſee, how one could claſs the polypus of the madrepora with the urtica.

This animal is extremely tender, and generally tranſparent, and very beautiful for its variety of colours. I have obſerved it in ſpring and autumn in the neighbourhood of Rovigno and Orſera, where it is often fiſhed up. *Philoſophical Tranſactions*, Vol. XLVII.

MAGELLA'NIC *Clouds*, whitiſh appearances like clouds, ſeen in the heavens towards the ſouth pole, and having the ſame apparent motion as the ſtars.

They are three in number, two of them near each other. The largeſt lies far from the ſouth pole; but the other two are not many degrees more remote from it than the neareſt conſpicuous ſtar, that is, about eleven degrees.

Mr. Bóyle conjectures, that, if theſe clouds were ſeen through a good teleſcope, they would appear to be multitudes of ſmall ſtars, like the milky-way. *Boyle's Works abr.* Vol. I.

MA'GI (*Dict.*)—The prieſts of the Magi were the moſt ſkilful mathematicians and philoſophers of the ages in which they lived, inſomuch, that a learned man and a magian, became equivalent terms. This proceeded ſo far, that the vulgar, looking on their knowledge to be more than natural, imagined they were inſpired by ſome ſupernatural power. and hence thoſe who practiſed wicked and diabolical arts, taking upon themſelves the name of magians, drew on it that ill ſignification which the word magician now bears among us. The royal family among the Perſians, as long as this ſect ſubſiſted, was always of the ſacerdotal tribe. There is a remnant of theſe magians ſtill ſubſiſting in Perſia and India, called by the natives geberrs. See GEBERRS.

MA'GIC (*Dict*)—Pliny gives the reaſon why this ſcience, vain and deceitful as it is, ſhould have gained ſo much authority over men's minds. It is, ſays he, becauſe it has poſſeſſed itſelf of three ſciences of the moſt eſteem among men, taking from each all that is great and marvellous in it. No body doubts but it had its origin in medicine, and that it inſinuated itſelf into the minds of the people, under a pretence of affording extraordinary remedies. To theſe fine promiſes it added every thing in religion that is pompous and ſplendid, and that appears calculated to blind and captivate mankind. Laſtly, it mingled judicial aſtrology with the reſt, perſuading people, curious of ſearching into futurity, that it ſaw every thing to come, in the heavens.

MAGNI'FICAT, the name or title of an hymn uſed by the virgin Mary, after the ſalutation of the angel; in which ſhe expreſſes her great joy and gratitude for the great honour conferred upon her. It begins, Magnificat anima mea, &c. My ſoul doth magnify the Lord, &c. This hymn was ſo reſpected among the primitive Chriſtians, that they uſed it as a part of their devotions; and the chriſtian church has always retained it in her divine ſervice, as proper to expreſs the pious affections of godly and devout minds.

MAGNI'SSA, in minerology, a name given by ſome of the antients to the white pyrites, called by others leucolithos and argyrolithos. Many have ſuppoſed the Magniſſa to be the ſame with the magneſia, that is, magneſe, but this is an error; nor is there the leaſt ſimilitude between the two ſtones. It is plain, indeed, that the antients called a white and ſilvery-lookſtone alſo by the name magneſia; but neither does this appear to have been the Magniſſa here deſcribed, for Theophraſtus deſcribes it as a ſtone that artificers uſed for turning things out of, which is utterly impoſſible to be done with the pyrites; the ſhattery texture of which would make it fall to pieces, on the ſlighteſt attempt to cut it into ſhape by the wheel. The chemiſts of the preceding ages have plainly underſtood this word Magniſſa of the pyrites, and have made theſe two words and the ſory ſynonymous. Pliny mentions a gold-coloured and ſilver pyrites; theſe therefore were diſtinctions ſufficient for the white and yellow pyrites; but Dioſcorides has only mentioned one kind of the marcaſite or pyrites, which is the yellow or braſſy one, the moſt common of all the ſpecies. When the word pyrites, therefore, was only the name of this yellow ſtone, it is not wonderful that the white one ſhould be called by another name, as Magniſſa.

MAG'NETISM (*Dict.*)—The magnet can communicate directive and attractive qualities to iron, and we ought to conſider the iron which has imbibed theſe qualities, as a real magnet, which can communicate its virtue to other iron. A vigorous magnet will give virtue to a weak magnet, and render its effects as ſenſible and lively as thoſe of a good load-ſtone. It is in general ſufficient to touch, or even hold the pole of a good ſtone near the body, to which we deſign to communicate the magnetic virtue, and it immediately becomes magnetical: the iron indeed which only receives its virtue from a momentary touch of the load-ſtone, loſes it almoſt as ſoon as it is ſeparated from it; but its virtue may be rendered more durable by keeping the iron longer near the magnet, or heating it red-hot and ſuffering it to cool in that ſituation; in this caſe the part, preſented to the north pole of the magnet, becomes a ſouth pole, and would in like manner become a north pole, on the application of the ſouth pole of the magnet. But, as theſe ſimple means do not procure any great virtue, other means more efficacious are made uſe of.

1ſt. It has been diſcovered that iron, rubbed on one of the poles of the magnet, acquires much more virtue than when rubbed on any other part of the ſtone, and that the virtue, communicated to the iron by the pole, is ſtronger when the magnet is armed, than when it is naked. 2dly. The more ſlowly the iron is rubbed on the pole of the magnet, and the more it is preſſed upon it, the more it imbibes of the magnetic virtue. 3dly. It is better to render the iron magnetical on one pole of the load-ſtone, than ſucceſſively on both, becauſe the iron receives the magnetic virtue of both poles, in contrary directions, the effects of which deſtroy each other. 4thly. A piece of iron is better made magnetical by paſſing it uniformly and in the ſame direction on the pole of the magnet, its whole length, than by rubbing it only in the middle; and it is obſerved that the extremity retains moſt ſtrength, which touches the pole laſt. 5thly. A piece of poliſhed ſteel, or iron, receives more magnetic virtue than an unpoliſhed piece of the ſame figure; and, all other things being equal, a piece of iron which is long, thin, and pointed, imbibes more magnetic virtue, than one of any other form; as, for example, a piece of a blade of a ſword, or knife, imbibes much more virtue than a ſquare piece of ſteel of the ſame weight, which has no other points but its angles. A piece of iron or ſteel, as we have obſerved, only imbibes or retains the magnetic virtue to a certain degree, and it is evident that this quantity of magnetic virtue, imbibed, is determined by the length, breadth, and thickneſs of the magnetiſed piece of iron or ſteel. 6thly. Since iron receives the magnetic power in proportion to its length, it is neceſſary this length ſhould be ſomewhat conſiderable, if we would convey a great deal of the magnetic virtue to the iron or ſteel; the blade of a ſword therefore receives more virtue than the blade of a knife rubbed upon the ſame ſtone. But there are certain proportions of thickneſs and length, without which the iron receives leſs magnetic virtue; as, for example, we magnetiſed ſix iron laminæ, four inches long and about $\frac{1}{100}$ parts of an inch thick; their reſpective breadth was 1, 2, 3, 4, 5, and 6 lines; theſe were rubbed three times each, in the ſame manner, on the pole of an excellent load-ſtone, and we made an experiment of the different weights they could lift.

The firſt which was the leaſt raiſed	1	grain	$\frac{1}{4}$
The ſecond 2 lines broad	10		$\frac{5}{8}$
The third 3 lines broad	7		$\frac{5}{8}$
The fourth 5 lines broad	2		
The fifth 5 lines broad	1		$\frac{1}{2}$
The ſixth 6 lines broad	1		$\frac{1}{10}$

The following experiment will demonſtrate that the magnetic power, which a piece of iron receives from a load-ſtone, depends alſo on its length; we took an iron lamina $\frac{1}{100}$ part of an inch thick, five lines broad, 13 inches $\frac{1}{4}$ long; rubbed it three times on the pole of a magnet, and it carried 25 grains; we reduced the length to 10 inches, magnetiſed it three times more, and it carried 33 grains; when reduced to 9 inches, it carried 19 grains, to 8 inches 17 grains, to 4 inches 1 grain and $\frac{1}{2}$; from whence it is evident, that the length of the bar ought to be determined at 10 inches, or between 10 and 13 $\frac{1}{4}$, with the given breadth and thickneſs, to imbibe or receive the largeſt quantity of the magnetic virtue.

When a lamina of iron or ſteel of a certain breadth and thickneſs is too ſhort to receive a large quantity of the magnetic virtue by communication, it may be remedied by tying it on a longer piece of iron, nearly ſimilar in breadth and thickneſs, ſo that the whole may be of a proper length to receive the greateſt quantity of magnetic virtue poſſible, by rubbing it on the pole of a load-ſtone: you will then find, on ſeparating the little bar from the great one, that its magnetic force is conſiderably augmented: the following experiment plainly demonſtrated the increaſe of the magnetic force, by this method of application. The end of a ſword-blade one foot in length, being magnetiſed on another piece of a blade 2 feet, 7 inches, and eight lines in length, lifted 7 ounces, 3 drachms, and 36 grains, which, when magnetiſed alone, would lift no more than 4 ounces, 2 drachms, and 36 grains.

We muſt obſerve however, that two laminæ, being thus magnetiſed together, do not receive ſo much magnetic virtue, as one whole lamina of ſimilar dimenſions and equal length;

this was proved by dividing a bar into two equal parts, one of which was kept whole, the other ſawed into ſeveral ſquare pieces; theſe pieces we put as cloſe together as we could, to make the ſame length nearly equal to that before they were ſawed, and fixed them in this poſition; by the ſide of them was placed the half which had not been ſawed; theſe were both magnetiſed equally: we found the whole part received much more magnetic virtue than the other, and that the part which had been cut into pieces, received more or leſs of the virtue of the load-ſtone, as its parts were more or leſs contiguous.

Excluſive of theſe methods of communicating the magnetic virtue to iron by means of the load-ſtone, there are others which we have mentioned under the article *Artificial* MAGNET, in the Dictionary: but we cannot paſs over in ſilence a method of communicating a very conſiderable magnetic virtue to iron, and even increaſing that of weak magnets, to ſuch a degree as to make them very ſtrong. The learned Dr. Knight is the author of this diſcovery, though he has not yet made it public: the following experiments ſhew the great quantity of magnetic virtue he communicated to bars of ſteel, which could not have been procured by means of the beſt load-ſtones in the ordinary method. 1ſt. A ſmall bar of ſteel about 3 inches $\frac{7}{10}$ long, weight about half an ounce, took up at one of its ends eleven ounces, without being armed. 2dly. Another bar of ſteel in the form of a parallelopiped 5 $\frac{9}{10}$ of an inch long, $\frac{4}{10}$ of an inch broad, and $\frac{2}{10}$ of an inch thick, weighing 2 ounces 8 pennyweights and $\frac{1}{2}$, lifted 20 ounces at one of its extremities, without being armed. 3dly. Another bar of the ſame form, and 4 inches long, armed with ſteel like a load-ſtone, contained within a hoop of ſilver, weighing in all 1 ounce 14 pennyweights, took up, at the bottom of its mounting, 4 pounds. 4thly. A bar of ſteel in the figure of a parallelopiped, 4 inches long, $\frac{2}{10}$ broad, and $\frac{4}{10}$ thick, armed at its extremities with a braſs hoop to keep on the mounting, the whole weighing 14 ounces 1 pennyweight, took up, by the feet of the mounting, 14 pounds 2 ounces and $\frac{1}{2}$. He alſo made an artificial magnet, with twelve bars of ſteel armed in the common manner, which lifted, by the feet of the mounting, 23 pounds 2 ounces and $\frac{1}{2}$. Theſe 12 bars were each ſomewhat more than four inches long, $\frac{3}{10}$ of an inch broad, and $\frac{16}{100}$ of an inch thick; each of theſe laminæ weighed about 25 pennyweights, and were placed one upon another, ſo that they formed a parallelopiped of about two inches in height: all theſe bars were bound very tight with cramps of braſs, and, mounted in ſteel in the ordinary method, the whole weighed 20 ounces. Dr. Knight's particular method of communicating the magnetic virtue, in a ſurprizing manner, is not confined to iron and ſteel; he alſo increaſes the virtue of a weak load-ſtone to ſuch a degree, as to make it become excellent; he exhibited one before the Royal Society, which, when it was mounted, weighed in all ſeven pennyweights fourteen grains, which could hardly lift two ounces; but, after he had magnetiſed it in his manner, it lifted almoſt 7 ounces. He communicates the magnetic virtue to a weak dead ſtone ſo powerfully, that he quite effaces the virtue of its poles, and ſubſtitutes new ones in their ſtead, which are more powerful and directly oppoſite; he changes the ſouthern into the northern pole, places the poles of a load-ſtone where the equator was before, and vice verſa. In a cylindrical magnet he places the northern pole, all round the circumference of the circle, which makes one of its baſes, and the ſouthern pole in the center of the ſame circle, ſo that all the circumference of the other baſis is a ſouthern pole, and the center a northern pole. He places the poles of a magnet at pleaſure in any part deſired, as, for example, he makes the middle of a ſtone the northern pole, and the two extremities the ſouthern pole: in a parallelopiped magnet he places the poles at the two extremities in ſuch a manner, that the upper half of the ſurface becomes the ſouthern pole, and the lower half the northern pole; the upper half of the other extremity is the northern, and the lower half the ſouthern pole.

Theſe experiments are performed by the help of large artificial magnets, of his own making, whoſe magnetic virtue prodigiouſly exceeds that of the natural load-ſtone.

The communication of the magnetic virtue does not ſenſibly exhauſt the magnet from which the virtue is borrowed; whatever number of pieces of iron are magnetiſed by the ſame ſtone, it loſes nothing of its ſtrength; though inſtances have been known of a magnet's communicating power to a piece of iron, of a greater weight than the magnet itſelf could raiſe, yet the power of the ſtone has not appeared at all leſſened.

Neither is the iron at all enriched at the expence of the load-ſtone, whatever virtue it acquires, as the niceſt ſcales have proved. It is obſerved thoſe magnets which lift the greateſt weights, do not communicate the greateſt virtue; experience has taught us that ſome magnets, though very weak in themſelves, yet communicate great virtue; it is true, ſome kinds of iron imbibe very little virtue from a good ſtone, while others imbibe a great deal. But this truth is moſt evident in artificial magnets, which in general communicate a great deal of virtue, though they lift but a ſmall weight of iron.

MAGNO'LIA, *the laurel-leaved tulip-tree*, in botany, a genus of plants, whoſe characters are:

The flower hath no empalement, but is compoſed of an uncertain number of petals, which expand in a circular order; and greatly reſembles the flower of the water-lily; having a great number of ſtamina cloſely embracing the conical pointal, which is ſituated in the center of the flower: the pointal afterwards becomes a conical fruit, having many ſcaly protuberances, each being a cell including a large flattiſh ſeed, which, when ripe, fall out, and are ſuſpended by threads.

MA'HOMET *Pigeon*, the common Engliſh name of a ſpecies pigeon, called by Moore the columba Numidica alba. It is of the ſame ſhape and ſize with the Barbary pigeon, and has all the characters of that ſpecies, but is always perfectly white, which gives the red circle about the eyes a more lively look. *Moore's Columbarium.*

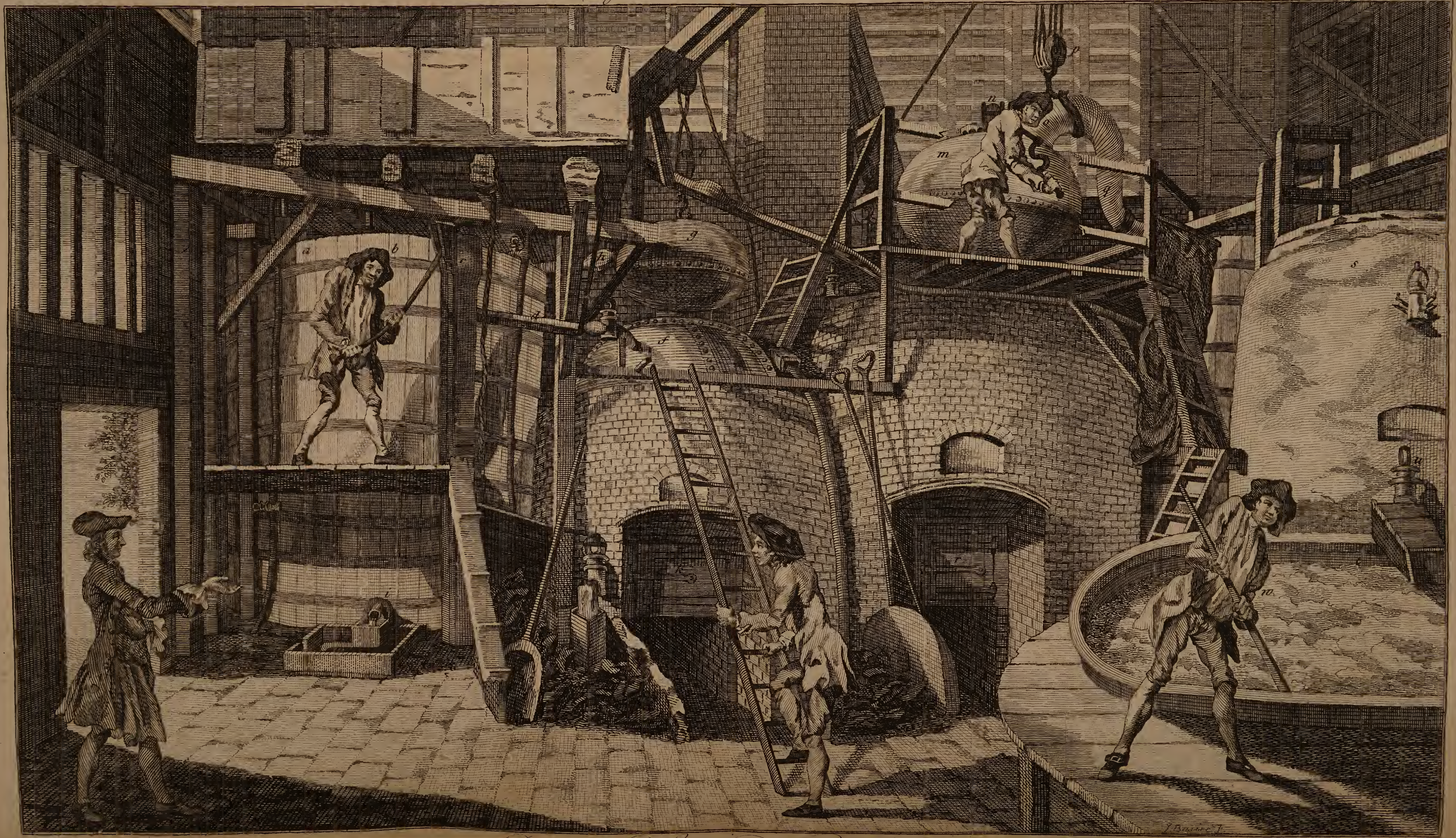
MAHO'METANS, (*Dict.*)—The Mahometans divide their religion into two parts, viz. faith, or theory; and religion, or practice. Faith, or theory, is contained in this formulary, There is but one God, and Mahomet is his prophet. This conſiſts of ſix diſtinct branches, viz. belief in God, in his angels, his ſcriptures, his prophets, in the reſurrection and judgment, and in God's abſolute decrees. They reckon five points relating to practice, viz. prayer, waſhings, alms, faſtings, and pilgrimage to Mecca. The Mahometans have very juſt notions of God and his attributes, as appears very plain from the koran itſelf, and the writings of the Mahometan divines; notwithſtanding what ſome ſuppoſe, that their God is only a fictitious deity or idol. They believe the angels to have pure and ſubtile bodies, created of fire, and that they have various forms and offices: they aſſign to each perſon two guardian-angels. Mahomet borrowed his whole doctrine concerning the angels from the Jews, who had it of the Perſians. As to the ſcriptures, the koran teaches, that God, in divers ages of the world, gave revelations of his will in writing to ſeveral prophets. They reckon 104 ſacred books, which, however, are all loſt, except the pentateuch, pſalms, goſpel, and koran; and the three firſt of theſe, they ſay, have undergone ſo many alterations and corruptions, that very little credit is to be given to the preſent copies of them: as to the koran, God has promiſed to take care of that, having left the others to the care of men. They reckon they have 224,000 prophets, of whom 313 were apoſtles, ſent with ſpecial commiſſions to reclaim mankind; and ſix of them brought new laws or diſpenſations, which ſucceſſively abrogated the preceding; theſe were Adam, Noah, Abraham, Moſes, Jeſus, and Mahomet. The Mahometans have a high opinion of Chriſt. They allow that he was a greater prophet than Moſes; that he was the ſon of a virgin, who conceived by the ſmell of a roſe preſented to her by the angel Gabriel: they believe that he never ſinned; nay, in their koran, they term him the breath and word of God; they puniſh all that blaſpheme him; and no Jew is capable of being a Turk, but he muſt be firſt made a Chriſtian: they believe a general reſurrection, and a future judgment; but, before theſe, they think there is an intermediate ſtate both of the ſoul and body after death. Mahomet borrowed his doctrine of the reſurrection from the Jews: he alſo taught, that the body is intirely conſumed by the earth, except only the rump bone, which is to ſerve as a baſis of the future edifice of a new body, or as a ſeed from which the whole is to be renewed. This is to be effected by a forty days rain, which will cover the earth to the height of twelve cubits, and cauſe the bodies to ſprout forth like plants. For this likewiſe he is beholden to the Jews, who ſay the ſame thing of the bone luz. The ſixth great point of the Mahometan faith is God's abſolute decree and predeſtination of good and evil. Of this doctrine Mahomet made great uſe for the advancement of his deſigns, as it was one of the ſtrongeſt motives to induce his followers to fight without fear, and even deſperately, for the propagation of the faith. The koran forbids the drinking of wine and ſtrong liquors, and alſo gaming: indeed the Mahometan caſuiſts except cheſs, becauſe it depends wholly on ſkill and management, and not at all on chance. They comply better with the prohibitions of gaming, than that of wine. The koran prohibits the eating blood and ſwine's fleſh, and whatever dies of itſelf, or is ſtrangled, or killed by a blow, or by another beaſt; which prohibitions he plainly copied from the Moſaical law; as he did likewiſe that of uſury, which is ſtrictly forbidden.

MAJORA'NA, *marjoram*, a genus of plants whoſe characters are:

It is a verticillate plant, whoſe flower is compoſed of one leaf: the galea, or creſt, is upright, roundiſh, and divided into two parts: the barba, or beard, is cut into three ſegments, ſo as to appear almoſt like a quinquefid flower: the flowers are collected into a ſhort thick round head, and come out of a four-fold order of leaves, which are placed like ſcales or plates. Marjoram is an attenuant, diſſolvent, and detergent. It is good in nervous caſes, and diſorders of the breaſt and lungs. Its flowery tops, dried and powdered, and given a ſcruple for a doſe, are greatly recommended in epileptic caſes. The dried plant is only kept in the ſhops.

The common ſweet-marjoram, though a plant ſo commonly cultivated with us, never ripens its ſeeds in England: and, as it is an annual plant, we are obliged yearly to have a ſupply of its ſeeds from Marſeilles, and other places in the ſouth of France, where it grows wild in great abundance.

PLATE XXIX. *Engraved for the Supplement.* *Facing* Malt-*distillery.*



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MA'KING-UP, a term uſed by the diſtillers to expreſs the bringing ſpirits to a certain ſtandard of ſtrength by the additions of water.

MAIZ.—The Indians in New England, and many of our other ſettlements in America, had no other vegetable but Maiz, or Indian corn, for the making their bread of. They call it weachin; and, where our colonies are at this time numerous, there is yet much of the bread of the country made of this grain, not of the European corn.

The ear of the Maiz yields a much greater quantity of grain than any of our corn ears. There are commonly about eight rows of grains in the ear, often more, if the ground be good. Each of theſe rows contains at leaſt thirty grains, and each of theſe gives much more flour than a grain of any of our corn. The grains are uſually either white or yellowiſh, but ſometimes they are red, bluiſh, greeniſh, or olive-coloured, and ſometimes ſtriped and variegated.

The manner of planting Maiz is in rows, at equal diſtances, every way about five or ſix feet. They open the earth with a hoe, taking away the ſurface to five or ſix inches deep, and of the breadth of the hoe; they then throw in a little of the finer earth, ſo as to leave the hole four inches deep, or thereabouts; and in each of theſe holes they place four or five grains at a little diſtance from one another.

If two or three of theſe grow up, it is very well; ſome of them are uſually deſtroyed either by the birds or other animals. When the young plants appear, they hoe up the weeds from time to time; and, when the ſtalk gathers ſome ſtrength, they raiſe the earth a little about it, and continue this at every hoeing, till it begins to put forth the ears; then they enlarge the hill of earth, round the root, to the ſize of a hop-hill, and after this they leave it till the time of harveſt without any farther care.

When they gather the ears, they either immediately ſtrip off the corn, or elſe hang up the ears, tied in traces at diſtances from one another; for, if they are laid near together, they will heat and rot, or elſe ſprout and grow; but, kept cool and ſeparate, they will remain good all the winter. The beſt method of all others is to thraſh out the corn as ſoon as the harveſt is over, and then lay it up in holes of the ground, well lined with mats, graſs, or the like, and afterwards covered at top with more earth. The moſt careful among the Indians uſe this method, and this ſort of ſubterranean grainary always proves good.

The uſes of this plant among the Indians are very many. The great article is the making their bread of it; but, beſides this, the ſtalks, when cut up before they are too much dried, are an excellent winter food for cattle; but they uſually leave them on the ground for the cattle to feed on. The huſks about the ear are uſually ſeparated from the reſt, and make a particular ſort of fodder, not inferior to our hay. The Indian women have a way of ſlitting them into narrow parts, and they then weave them artificially into baſkets and many other toys.

The original way of eating the grain, among the Indians, was this: they boiled it whole in water till it ſwelled and became tender, and then they fed on it either alone, or eat it with their fiſh and veniſon, inſtead of bread. After this, they found the way of boiling it into a ſort of pudding, after bruiſing it in a mortar; but the way of reducing it to flour is the beſt of all. They do this by parching it carefully in the fire, without burning, and then beating it in mortars, and ſifting it. This flour they lay up in bags, as their conſtant proviſion, and take it out with them when they go to war, eating it either dry or with water.

MA'LOPE, *baſtard mallow*, in botany, a genus of plants, whoſe characters are:

The flower which is ſhaped like that of the mallow, hath a double empalement, the outer being compoſed of three heart-ſhaped leaves, and the inner is of one leaf cut into five ſegments: the flower is of one leaf, divided into five parts to the bottom, where they are joined; but it ſeems to have five leaves: in the center ariſes the pointal, having a great number of ſtamina ſurrounding it, which are joined cloſely, and form a ſort of column: the pointal afterward becomes a fruit compoſed of many cells, which are collected into an head; in each of which is lodged a ſingle ſeed.

MALPI'GHIA, *Barbadoes cherry*, in botany, a genus of plants, whoſe characters are:

It hath a ſmall quinquefid calyx, which conſiſts of one leaf, having bifid ſegments: the flower conſiſts of five leaves, which expand in form of a roſe, having ſeveral ſtamina collected in form of a tube: the ovary in the bottom of the flower-cup becomes a globular fleſhy ſoft fruit, in which is a ſingle capſule, containing three ſtony winged nuts.

As theſe plants are natives of the warmeſt parts of America, they will not live through the winter in England, unleſs they are preſerved in a warm ſtove: but, when the plants have obtained ſtrength, they may be expoſed in the open air, in a warm ſituation, from the middle or latter end of June, till the beginning of October, provided the weather continues ſo long mild; and the plants ſo treated will flower much better than thoſe which are conſtantly kept in a ſtove.

They are all propagated by ſeeds, which muſt be ſown upon a good hot-bed in the ſpring; and, when the plants are fit to tranſplant, they muſt be each put into a ſeparate ſmall pot filled with rich earth, and plunged into an hot-bed of tanner's bark, and muſt be treated in the ſame manner as hath been directed for other tender plants of the ſame country: and, for the two firſt winters, it will be proper to keep them in the bark-bed in the ſtove; but afterwards they may be placed upon ſtands in the dry ſtove in winter, where they may be kept in a temperate warmth, in which they will thrive much better than in a greater heat: theſe muſt be watered two or three times a week, when they are placed in the dry ſtove; but it muſt not be given to them in large quantities. *Miller's Gard. Dict.*

MALT (*Dict.*)—Almoſt every maſter has his ſecret of making Malt; but there are ſome neceſſary cautions to be obſerved by all, which will enſure ſucceſs in the work; as, firſt, that the barley be newly thraſhed, or at leaſt newly winnowed. Secondly, that the whole be of one kind, not mixed up with ſeveral ſorts. Thirdly, that it be not over ſteeped in the ciſtern, or ſo long as to make it ſoft. Fourthly, that it will be well drained. Fifthly, that it be carefully looked after in the wet couch, ſo as not to ſtop the firſt tendency of the blade to ſhooting. Sixthly, to turn the wet couch inſide outermoſt, if the barley comes, that is, ſhoots more in the middle than on the ſides. Seventhly, to keep it duly turning after it is out of the wet couch. Eighthly, to give it the proper heat in the dry heap. Ninthly, to dry and criſp it thoroughly on the kiln, but without a fierce fire, ſo as to be ſeveral days in drying a kiln of pale Malt. *Shaw's Lectures.*

Good Malt may be made of the grain of the maiz or Indian corn, but then a particular method muſt be taken for the doing it. Our barley Malt-makers have tried all their ſkill to make good Malt of it in the ordinary way, but to no purpoſe; that is, the whole grain will not this way be malted or rendered tender or floury, as in other Malt; for it is found, by experience, that this corn, before it be fully malted, muſt ſprout out both ways, that is, both root and blade, to a conſiderable length, that of a finger at leaſt, and, if more, the better. For this purpoſe, it muſt be laid in a heap a convenient time; and in this proceſs, if it be of a ſufficient thickneſs for coming, it will quickly heat and grow mouldy, and the tender ſprouts will be ſo entangled, that the leaſt moving of the heap will break them off; and the farther maturation of the grain into Malt, will be hindered by this means; and on the other hand, if it be laid thin, and often ſtirred and opened to prevent too much heating, thoſe ſprouts which have begun to ſhoot ceaſe growing, and conſequently the corn again ceaſes to be promoted to the mellowneſs of Malt. *Philoſ. Tranſ.* N°. 142.

To avoid all theſe difficulties, the following method is to be uſed: take away the top of the earth in a garden or field, two or three inches, throwing it up half one way, and half the other; then lay the corn for Malt all over the ground ſo as to cover it; the earth that was pared off is now to be laid on again, and nothing more is to be done till the field is all over covered with the green ſhoots of the plant. The earth is then to be taken off, and the roots of the grain will be found ſo entangled together, that they will come up in large cakes or parcels; it muſt be gently waſhed in order to take off all the dirt, and then dried on a kiln, or in a clean floor expoſed to the ſun. Every grain of the maiz will be thus tranſmuted into good Malt, and the beer brewed with it will be very pleaſant and very wholeſome, and of an agreeable brown colour, but very clear.

It may be worth trying whether the ſame proceſs is not with due care applicable to the malting of turneps, potatoes, carrots, parſneps, and the like. It might poſſibly be of ſervice alſo to attempt this leſs laborious way of making Malt of barley and other ſmall grains; the diſadvantages would be the not ſo eaſily ſeparating the dirt from the grain as in that larger kind; and as barley requires the root only, not the ear, to ſhoot in order to the making of Malt, it would be ſome difficulty to know the exact time of taking it up; but with all theſe diſadvantages, the method is worth a trial.

MALT-*diſtillery*, the art of converting Malt liquors into a clear inflammable ſpirit.

The reader will find every thing relating to brewing and fermenting Malt-liquors intended for diſtillation, under the articles BREWING, FERMENTING, and WASH.

Malt-waſh being of a mucilaginous or ſomewhat glutinous nature, requires a particular encheireſis to prevent its ſcorching, and to make it work kindly in the ſtill. If it ſhould happen to be burnt in the operation, this would give the ſpirit a moſt diſagreeable flavour, or empyreuma, that cannot be got off again, without the utmoſt difficulty, or ſome very particular treatment. To prevent any ſuch ill effect, 1. The waſh ſhould be made dilute; 2. The fire be well regulated; and, 3. The liquor kept in a conſtant agitation.

The conſtant agitation of the waſh, may be effected three different ways; viz. 1. By ſtirring it with a paddle or oar, till the liquor begins to boil, then immediately luting on the head. This is the common way. 2. By putting ſome moveable ſolid bodies into the ſtill. And, 3. By placing ſome proper matter at the bottom and ſides, or where the fire acts the ſtrongeſt.

1. The uſual method of ſtirring with the paddle is very defective, as being of no uſe after the ſtill is once brought to work; whereas it often burns in the working. This method is greatly improveable by an addition to the ſtructure of the ſtill; whence the agitation may be commodiouſly continued during the whole operation: and this though the waſh were made very thick, or wine-lees themſelves were to be diſtilled. The method is this: ſolder a ſhort iron or copper-tube in the center of the ſtill-head; and below, in the ſame head, place a croſs-bar, with a hole in the middle, correſponding to that a-top; through both which, is to run an iron-pipe, deep down into the ſtill; and through this an iron rod: to the bottom whereof wooden ſweeps are to be faſtened; ſo that, this rod being worked a-top, backwards and forwards, with a winch, they may continually rake and clear the bottom plate and adjacent ſides of the ſtill: the interſtices of the tubes being at the ſame time well crammed with tow a-top, to prevent any evaporation thereat.

2. The ſame effect may in good meaſure be ſecured by a leſs laborious way; viz. by placing a parcel of cylindrical ſticks lengthwiſe, ſo as to cover the whole bottom of the ſtill; or elſe by throwing in a parcel of looſe faggot-ſticks at a venture: for thus the action of the fire below, moving the liquor, at the ſame time gives motion to the ſticks, and makes them continually act like a parcel of ſtirrers upon the bottom and ſides of the ſtill, ſo as to prevent the liquor from ſcorching.

3. But a better method ſtill is upon a parcel of large cylindrical ſticks to lay looſe hay, to a conſiderable thickneſs; ſecuring it from riſing by two aſh-poles laid a-croſs, and preſſing hard againſt the ſides of the ſtill; which might, if neceſſary, be furniſhed with buttons or loops, to ſecure the poles from ſtarting. But care muſt here be had, not to preſs the hay againſt the ſides, for that would preſently make it ſcorch; which being otherwiſe defended by the ſticks, it is not apt to do.

Theſe are ſimple but effectual contrivances, which, in point of elegance, are eaſily improveable at pleaſure.

There is a farther inconvenience attending the diſtillation of Malt-ſpirit, when all the bottoms or groſs mealy feculent ſubſtance is put into the ſtill, along with the waſh: which thus coming to thicken a little, like ſtarch in the boiling, and loſing the thinner liquor, wherewith it was diluted, as the ſtill works off; the mealy maſs at length grows ſo viſcous, as ſometimes to ſcorch towards the end of the operation. To prevent this ill effect, it is very proper to have a pipe, with a ſtop-cock, leading from the upper part of the worm-tub into the ſtill; ſo that, upon a half or a quarter turn, it may continually ſupply a little ſtream of hot water, in the ſame proportion as the ſpirit comes off, by which means the operation will be no ways checked or hindered.

But in Holland, where they work their waſh thick, with all the Malt and meal along with it, they commonly uſe no art at all to prevent burning; only charge whilſt the ſtill is hot and moiſt, after having been well waſhed and cleanſed. And yet they very rarely ſcorch, unleſs it be now and then in the winter. When ſuch an accident happens, they are extremely ſollicitous to ſcrape, ſcrub, and waſh off the leaſt remains of the burnt parts; by which means they effectually avoid the danger there would otherwiſe be of burning a ſecond time.

But moſt effectually to prevent any accident of this kind, there is nothing comparable to the way of working by the balneum mariæ, if the diſtillers could have the addreſs to find their account in it.

All ſimple ſpirits may be conſidered in the three different ſtates of low-wines, proof-ſpirit, and alcohol: the intermediate ſtates being of leſs general uſe, and to be judged of according as they approach to or recede from theſe. Low-wines, at a medium, contain a ſixth part of totally inflammable ſpirit; five times as much water as perfect ſpirit neceſſarily riſing in the operation with a boiling heat. Proof-goods contain about a half of the ſame totally inflammable ſpirit, and alcohol entirely conſiſts of it.

Malt-low-wines, prepared in the common way, are exceeding nauſeous, fulſome, and diſagreeable. They have however a natural vinoſity, or pungent acidity, that would render the ſpirit agreeable, were it not for the groſs oil of the Malt, abounding therein. When this oil by ſuitable contrivances, as mentioned above, is kept from running in among the low-wines, they prove conſiderably ſweeter, both to the ſmell and taſte; and leſs thick and milky to the eye.

When diſtilled over gently, in order to their rectification into proof-ſpirit, they leave a conſiderable quantity of this groſs fœtid oil behind, with the phlegm, in the ſtill. But, if the fire be made fierce, this oil is again thrown over, mixed with the ſpirit; and, being now broke ſomewhat fine, impregnates it rather in a more nauſeous manner than at firſt. And this is the uſual fault commited not only by the Malt-ſtiller, but even the rectifier; who, inſtead of ſeparating and keeping back the foul parts, according to the deſign of the operation, really brings them over in greater vigour. Whence it is not unuſual, after repeated rectifications, as they call them, both ſimple and compound, to find the ſpirit much more nauſeous and diſagreeable than it came from the hands of the Malt-ſtiller. The remedy is, plainly, either gentle and ſoft working in the common engine, or the prudent uſe of the balneum mariæ.

Malt-low-wine, when brought into proof-ſpirit, appears bright and clear, without the leaſt cloud or milkineſs; no more oil being contained in the mixture than is perfectly diſſolved by the alcohol, weakened with its own quantity of phlegm. Its taſte alſo is much cleaner for the ſame reaſon; viz. becauſe no groſs parts of the oil can, in their own form, hang upon the tongue, but now paſs readily and ſlightly over it: which is not the caſe in low-wines and faints, where the oil remains diſtinct and undiſſolved.

When proof Malt-ſpirit is diſtilled over again, in order for alcohol, if the fire be raiſed when the faints begin to come off, a very conſiderable quantity of oil will be brought over, and run in the viſible form of oil, from the noſe of the worm. Though this is not peculiar to Malt-ſpirit, but others alſo, and even French brandies do the ſame; ſo that ſometimes half an ounce or more of this oil may be collected from a ſingle piece of brandy.

Malt-ſpirit, more than almoſt any other, requires to be brought into the form of alcohol, before it can be uſed internally; eſpecially, as it is now commonly made up, with as much fulſome oil in it as will give it the ſtrongeſt proof. On which account it is, that in all compound waters, not excepting thoſe of the apothecary, an indifferent judge will eaſily find the predominant flavour of this fulſome ſpirit, through that of all their ingredients. For this reaſon, it ought at leaſt to be rectified, in balneo mariæ, to a perfect alcohol, before it is uſed in the finer compoſitions.

And, when once brought, with a due care and art, to a perfect alcohol indeed, it is then preferable to the French brandies for all curious internal uſes; as being a much more uniform, hungry, taſteleſs, and impregnable ſpirit than thoſe uſually are.

This alcohol ought to be kept in cloſe earthen vaſes or jars; not only to prevent its evaporation, but alſo its colouring itſelf with the reſinous parts of the oak, which it diſſolves powerfully, when preſerved in caſks.

The quantity of pure alcohol obtainable from a certain quantity of Malt differs according to the goodneſs of the ſubject, the manner of the operation, the ſeaſon of the year, and ſkilfulneſs of the workman: according to which variations, a quarter of Malt may afford from eight or nine, to thirteen or fourteen gallons of alcohol; which ſhould encourage the Malt-ſtiller to be careful and intelligent in this buſineſs. As, after each operation in the common way, there is always a remainder of faints, which never ought in their foul ſtate to be mixed among the cleaner ſpirit; they ſhould either be converted to other uſes, or treated in a particular manner, ſo as to make a pure alcohol: the uſes they are otherwiſe fit for being principally external, or, when rediſtilled to a proper height, burning in lamps: for which purpoſe they may have their diſagreeable odour corrected by proper aromatics, or other ingredients, uſed in diſtillation.

But to make them into pure and perfect alcohol is a work of greater difficulty; yet practicable, though not perhaps to advantage. One way of effecting it is by ſlowly rectifying them from water into water; by which operation ſeveral times repeated, a pure alcohol may be obtained from the fouleſt and moſt oleaginous faints. But of this method, and others for the like purpoſe; ſee RECTIFICATION.

The œconomical uſe of the ſtill-bottoms of the Malt-waſh is ſufficiently underſtood by the Malt-ſtiller; and, being ſo profitable an article, may, perhaps, render him leſs ſollicitous about the improvement of the other branches of the buſineſs.

But theſe bottoms might have ſome farther, if not more advantageous uſes than feeding of animals. Thus, in particular, they might, in a chemical way, afford a large proportion of an acid ſpirit, an oil, a fewel, and a fixed ſalt; and, with ſome addreſs and good management, a vinegar or a tartar. Beſides this, one uncommon uſe thereof has been already touched upon, where the refuſe waſh is obſerved to be very advantageouſly employed, inſtead of water, in the next brewing: as more readily diſpoſing the ſubject to ferment; giving the ſpirit a vinoſity, and ſomewhat increaſing its quantity. But the proportion for this purpoſe ſhould not exceed that of a fifth or ſixth of the whole liquor employed.

The liquor left behind in the ſtill, upon rectifying the low-wines, is little more than mere phlegm or water, impregnated with a few acid and ſome oily parts, not worth ſeparating, unleſs for curioſity. And the ſame is to be underſtood of the liquor left behind upon diſtilling proof-ſpirit into it.

Explanation of *plate* XXIX, being a ſection of part of a Malt ſtil-houſe.

a, A worm-tub, or refrigeratory belonging to the ſtill *f*, *g*.
b, A man pumping water into the ſtill *f*.
c, A common pump.
d, A pipe which conveys the water from the pump into the ſtill *f*.
e, A cock to the pipe *d*.
f, The body of a ſtill.
g, The head of the ſtill *f*.
h, The noſe or beak of the ſtill-head, by which the vapour ariſing by diſtillation is conveyed into the worm, where it is condenſed into a fluid.
k, An iron door, which confines the fire under the ſtill.

l, A tackle for lifting off the ſtill-head *g*,

m, The head of another ſtill.

n, A machine for ſtirring the liquor, or, as the brewers call it, waſh, in the ſtill.

o, A man tunning the machine.

p, A tackle for lifting off the ſtill-head *m*.

q, The beak or noſe of the ſtill *m*.

r, The door to the fire-place belonging to the ſtill *m*.

s, A copper for brewing the waſh for diſtillation.

t, A maſh tun, which receives the liquor from the copper *s*.

u, A cock, by which the liquor is let out of the copper *s* into the maſh-tun *t*.

w, A man maſhing, or ſtirring the Malt in the maſh-tun.

MALT-*duſt*.—This is accounted a great enricher of barren ground: it contains in it a natural heat and ſweetneſs, which gives the earth whereon it is laid a proper fermentation, as thoſe who live in malting countries have found by experience. Some are of opinion, that there is not a greater ſweetener than Malt-duſt, where the grounds are natural clay, and have contracted a ſourneſs and auſterity, whether by reaſon of its having lain long untilled, and unexpoſed to the air, or by reaſon of water having ſtood long thereon.

MA'LVA, *mallows*. See MALLOWS, in the Dictionary.

MALVA *marina*, *the ſea mallow*, in botany, a name not very judiciouſly given by ſome writers to a ſpecies of ſubmarine plant, ſuppoſed, in ſome degree, to reſemble the common mallow. It is very common in the places where they fiſh for coral, and grows to the rocks without any regular roots; it is found at different depths, but moſt uſually far from the ſurface, and its height is uſually about two inches. It is of a duſky greeniſh colour, with an admixture of a faint yellow; it is compoſed of ſeveral leaves of about half an inch broad, and a little more than that in length. Each of theſe is faſtened to a pedicle of about an inch and a half long; the leaves are of a fine thin membranaceous ſubſtance, but their ſtalks or pedicles are thick and tough like horn. When examined by the microſcope, many glandules diſcover themſelves upon the ſurfaces of the leaves, but the ſtalks or pedicles are entirely covered with glandules in form of ſmall protuberances, which make it as rough in thoſe parts as the common chagrine. The ſtalks, when cut tranſverſly, ſhew an infinite number of pipes or veſſels running up to every part of the leaves. Count Marſigli has given an elegant figure of this, both as it appears to the naked eye, and by the microſcope. *Marſigli, Hiſt. de la Mer.*

MA'LVA *roſea*, *roſe mallow, or hollyhock*; the characters are:

It hath a large and more expanded flower than the mallow, which cloſely adheres to the ſtalk; and in many ſpecies, the flowers are double, where the petals occupy the place of the ſtyle: it is in every reſpect larger than the common mallow: the leaves are rougher, and the plant grows almoſt ſhrubby.

Theſe plants are propagated from ſeeds, which ſhould be ſown upon a bed of freſh earth in April: and when the plants are come up pretty ſtrong, they muſt be tranſplanted out into nurſery-beds at about eight inches diſtance from each other, obſerving to water them until they have taken root; after which they will require no farther care until the Michaelmas following, but only to keep them clear from weeds; at which time they ſhould be tranſplanted into rows two feet aſunder, and a foot diſtance in the rows; in which place they may continue until they flower, when you ſhould mark all thoſe with double flowers, which have good colours, with ſticks, that they may be tranſplanted into the borders of large gardens at Michaelmas, where they will remain four or five years, and produce their flowers very ſtrong: but when the roots are much older, they begin to decay, and do not produce their ſtems ſo ſtrong, nor are their flowers ſo large; wherefore there ſhould always be a ſupply of young plants raiſed from ſeeds every third or fourth year, in order to have the flowers in perfection: but it is the better way to change the ſeeds every three or four years, with ſome perſon of integrity who lives at a conſiderable diſtance, and is exact to ſave ſeeds from none but double flowers, and ſuch as are well coloured, by which means you may preſerve the ſorts well from degenerating: but if you conſtantly ſave the ſeeds in the ſame place, they will in a few years become of little worth.

MA'LUS, *the apple*. See APPLE.

MA'MEI, *the mammee-tree*; a genus of plants, whoſe characters are:

It hath a roſaceous flower, which conſiſts of ſeveral leaves placed in a circular order; from whoſe cup ariſes the pointal, which afterwards becomes an almoſt ſpherical fleſhy fruit, containing two or three ſeeds incloſed in hard rough ſhells.

MA'MMOTH'*s Teeth*, or MAMMOUT *Bones*, in natural hiſtory, a name given by travellers and other writers to certain foſſil teeth, and other bones, found in Ruſſia and ſome other parts of the world, and that uſually at great depths in the earth. The Ruſſians and other people give them this name, ſuppoſing them to have belonged to an animal which they deſcribe as being of a monſtrous ſize, and living in caverns under ground. But the true account of them is, that they are in reality the teeth and other bones of elephants, there being no ſuch beaſt as theſe people deſcribe.

MA'NDARINES (*Dict.*)— There are in China nine orders of Mandarines, or nine degrees of nobility, which have as many different animals for their characteriſtics. The firſt is diſtinguiſhed by a crane, the ſecond by a lion, &c. There are in all 32 or 33,000 Mandarines in China. There are Mandarines of arms, and Mandarines of letters, who are judges; they both paſs ſeveral examinations. They are ſo much reſpected, that no body ſpeaks to them but on the knee. They are diſtinguiſhed from each other by different ſorts of precious ſtones in their caps and girdles; and there are great lords who are ſuperior to theſe Mandarines, who are alſo known by round jewels in their girdles, and a ſapphire in the middle.

The Chineſe alſo call the learned language of the country the Mandarine tongue; this is, in China, what the Latin is in Europe, and is common to all the learned men in the empire. Their public officers, as notaries, lawyers, judges, &c. write and ſpeak the Mandarine.

MANDRA'GORA, *mandrake*, in botany, a genus of plants, whoſe characters are:

The flower is monopetalous, bell-ſhaped, and multifid; the fruit is ſoft, globular, and contains ſeeds, which are for the moſt part kidney-ſhaped.

The mandrake has a large browniſh root, ſometimes ſingle, and ſometimes divided into two or three parts, growing deep in the earth, from which ſpring ſeveral large dark green leaves, a foot and more in length, and four or five inches broad, ſharp-pointed at the ends, of a fœtid ſmell; from among theſe ſpring the flowers, each on a ſeparate foot-ſtalk, about the height and bigneſs of a primroſe, of a whitiſh colour, of one bell-faſhioned leaf, cut into five ſegments, ſtanding in a large five-cornered calyx; and are ſucceeded by ſmooth round fruit, about as big as a ſmall apple, of a deep yellow colour when ripe, and of a very ſtrong ſmell. It grows wild in Spain, Italy, and Turkey, but in cold countries only in gardens. The leaves and roots are uſed.

This plant is rarely uſed inwardly, many eſteeming it to be a narcotic, and of a poiſonous nature; though others deny it and ſay, that the fruit may be eaten without any ill effects. Outwardly, it is uſeful in all kinds of inflammations, hot tumors, and ſcrophulous ſwellings: the juice, dropped in the eyes, is good to take away their heat and redneſs. It is ſeldom to be met with; and, though an ingredient in the unguentum populeon, its place is generally either ſupplied by henbane, or Engliſh tobacco. *Miller's Bot. Off.*

The mandrake is commonly reckoned among narcotics and hypnotics; whether this be true of the bark of the root, which is the part uſed in the ſhops, I am not certain; but the fruit is without doubt unjuſtly ſuſpected. Caſpar Hoffman confeſſes himſelf unable to determine, whether the apple, either with or without the rind, may be eaten with ſafety or not. Aetius ſeems to aſcribe all the malignity to the ſeeds, as if the pulp, without them, was harmleſs, unleſs eaten in an exceſſive quantity. That the pulp, however, may be eaten together with the ſeeds, without injury, appears from the example of I. Faber Lynceus, profeſſor of botany at Rome, who, as we are aſſured by J. Torrentius, in his Notes on Hernandez de Plantis Mexicanis, before his auditors, eat up a large mandrake apple, ſeed and all, in the morning faſting, without any conſequent ſleeping, or any the leaſt ill ſymptom. And that the experiment might be the ſurer, he continued, he ſays, without taking any thing elſe till dinner-time, which was ſome hours. J. Torrentius ſays, he has very often tried the ſame experiment.

MA'NGANESE, *magneſia*, in natural hiſtory, a very poor kind of iron ore.

It is a denſe, ponderous, and heavy ſubſtance, in its pureſt pieces, approaching greatly to the texture of the lapis hæmatites, being compoſed of regular parallel ſtriæ, diverging from a center to the circumference. This kind, however, is rare; beſides this, there is another ſomewhat of a leſs pure kind, of an iron grey colour, and irregularly ſtreaked like the ſteel-grained lead ores. But the common Manganeſe is of a perfectly irregular ſtructure. It is very heavy, moderately hard, and of a deep duſky grey, approaching to black, though ſometimes of a ferrugineous brown. It is found in large maſſes of no determinate ſhape, and of a rude, rugged, and unequal ſurface. Manganeſe gives fire but difficultly with ſteel, and makes no effervеſcence with aqua-fortis. It is found in many parts of England and Germany.

This ſubſtance is of vaſt uſe in the glaſs trade, but neither the induſtrious Neri, nor any others who have written of the art, can ever deliver the true proportions in which it is to be mixed with the glaſs metal on the ſeveral occaſions. The ſame thing is alſo to be obſerved in regard to zaffer, another ſubſtance in continual uſe among them. And the reaſon of this is, that there is vaſt difference in the quality of theſe bodies, ſome which are ſold being very pure and rich, others good for almoſt nothing, and much of middle degrees of purity between theſe. For this reaſon there is no determining how much of each is to be added to the glaſs, but the conciator adds them at ſeveral times, and in ſmall quantities, and takes frequent proofs by his eye, till he knows that they are properly proportioned. *Merret's Notes on Neri.*

MA'NGO *Tree*, in botany, the name of a vaſt tree, forty feet in height, and eighteen in thickneſs, and ſpreads its numerous branches all around at a great diſtance, being always green, and bearing fruit once or twice a year, from ſix or ſeven years old to an hundred. It is propagated by inſition, or ſowing the ſeed, in Malabar, Goa, Bengall, Pegu, and many other countries in the Eaſt-Indies.

The fruit is of a round oblong figure, flat, ſlightly ſinuated, or hollowed at the ſides, and ſhaped much like a kidney, bigger than a gooſe egg, ſmooth, ſhining, firſt green ſpeckled with white, then inclining to yellow, and at laſt of a gold-colour: it has a yellowiſh and ſucculent pulp, not unlike that of a peach; or rather a plum, firſt acid, then acido-dulcid, and pleaſant to the taſte. Within the pulp is contained an oblong, compreſſed, and languanous ſtone, thin, yet very hard and tenacious, and including a callous oblong kernel, very like an oblong almond, and of the ſame bigneſs, and of a bitteriſh, though not unpleaſant taſte.

There are various ſorts of this fruit, as there are of our apples and pears, which are very different, according to the countries where they grow: that ſpecies, which is without a ſtone, and is very grateful to the palate, ſeems to us only a variety, or a degenerate fruit The fruit is cut into ſlices, and eaten either without wine, or macerated in wine; it is alſo candied, in order to its preſervation. Sometimes they open it with a knife, and fill up the middle with freſh ginger, garlic, muſtard, and ſalt, with oil or vinegar, that they may eat it with rice, or after the manner of pickled olives.

As to its temperament, this fruit is cold and moiſt, though the Indian phyſicians affirm the contrary. We make uſe of pickled Mangoes, which are imported to us, as we do of pickled cucumbers, for ſauce to roaſted meat. The ſtones roaſted are ſaid to cure a looſeneſs, which Garcias found to be true. The wood of the tree, with cinders, is uſed for burning the carcaſes of the pagans, as being conſecrated to this rite; whence it ſerves alſo for coffins, in which they repoſit their dead; but it is but of a ſoft ſubſtance, and of ſhort duration.

The ſtalks ſupply the place of arequa or caunga, in the chewing of betel; the ſame, calcined and reduced to powder, take away warts. Of the tender leaves, with the bark of the avanacoe, that is, the ricinus, the ſeed of cummin and parpadogam, is made a decoction, which is highly beneficial in the cough, aſthma, and other affections of the thorax. The bark of the tree pulveriſed, and taken in chicken-broth, is an excellent diſſolvent of extravaſated and coagulated blood, occaſioned by a fall, in any part of the body. The juice of the bark, with the white of an egg, and a very little opium, taken inwardly, is a preſent remedy againſt the diarrhœa, dyſentery, and teneſmus. Of the gum of the tree, and the flowers of rice, with the addition of a ſmall quantity of opium and pepper, are prepared pills, which alſo cure all ſorts of fluxes of the belly. Of the flower of the dried kernels the natives have the art of preparing various kinds of food.

MANIFE'STO (*Dict.*)— Manifeſto's were ſubſtituted in the room of that auguſt and ſolemn ceremony, by which the ancients introduced the divine Majeſty in declarations of war, as witneſs and avenger of the injuſtice of thoſe who undertook war without reaſon and neceſſity. Motives of policy have, beſides, rendered theſe Manifeſto's neceſſary, in the ſituation of the princes of Europe with regard to each other, united by blood, alliances, and leagues. Prudence requires the prince who declares war againſt his enemy, to avoid drawing upon him the arms of all the allies of the power he attacks. It is to prevent theſe inconveniences that Manifeſto's are publiſhed.

MANU'RING.— Sea ſand is often made uſe of by way of manure, in ſome parts of Cornwall, near the ſea ſhore. When the ſand is notably ſhelly, that is, much mixed with the broken pieces of ſea ſhells, it is reckoned beſt. It is ſpread upon ſuch land as is intended for wheat, or uſually in the firſt crop of four, whatever be the grain; for, after four crops, it is the cuſtom, in Cornwall, to leave the land ſix or ſeven years for paſture before it is tilled again, and the graſs will be ſo good the firſt year, where this manure is uſed, as to be fit for mowing: this is called mowing of gratten by the people there. The Corniſh acre is eight ſcore yards, at eighteen feet to the yard. In one of theſe acres, the farmers beſtow, according to the diſtance from the ſea ſhore, from three hundred ſacks to one hundred, each ſack containing thirteen gallons, which is called a horſe-load, the roads in many parts of this country being ſo bad, that they are forced to carry the ſand on horſeback from the water-ſide to the land, though eight or ten miles diſtant. In this caſe the ſand coſts them in the whole about eight pence per load. Where the land lies very diſtant from the ſhore, and from all water carriage, they beſtow very little of this manure, but they do not care to be any where wholly without it. In ſome of theſe places they lay twenty loads on an acre, and find a proportionable advantage from it. Where much ſand is uſed, the corn is large and plentiful, and the ſtraw little. Hence has grown the old Corniſh phraſe of a buſhel of corn to a peck of ſtraw; which is not miraculous in a place where the ears of barley are frequently found as long or longer than the ſtalks they grow on.

Where little of this ſand is uſed, there is generally a great deal of ſtraw, and but little and hungry ears of ſmall grain. After the corn is taken off, the graſs that naturally comes up is a white clover; and, where the land is any thing deep, a red kind comes up among it. This is uſually but ſhort the firſt year, but it grows thick, and affords good feeding for the cattle; and they are found to thrive better, and give better milk, than when they are fed on the high graſs, which generally ſucceeds where there has been leſs ſand uſed.

Another great advantage of the lands where much ſand is uſed, is, that no ſnow lies upon them; there is a continual winter ſpring, and an early harveſt, uſually ſix weeks before the neighbouring lands that do not uſe it in proper quantities; ſo that all the expence of procuring it in quantities is many ways amply repaid to the farmers.

We have, about Erith, and many other places, the ſame ſort of ſand in great abundance in the Thames, that is uſed with this great advantage in Cornwall; and, if it ſhould be found on trial to anſwer as well, probably there would be found few places where this river would not afford it at ſome depth, or in ſome part of its bed. The coral ſand of Falmouth is dredged up from under a ſtratum of ouze of about a foot in thickneſs; and perhaps in the Thames, where the bottom ſeems of another nature, the ſame ſand, or ſome of equal efficacy, may be found underneath. The ſand taken up out of the Thames at Erith is uſed by the brick-makers, and they obſerve that the graſs always grows particularly freſh and ſtrong about the edges of their heaps of it, and that clover naturally grows there among the other graſs. *Phil. Tranſ.* N°. 113.

MA'PLE-*tree*, *acer*, in botany, the name of a tree common in moſt parts of England.

Theſe trees are eaſily propagated by ſowing the ſeeds, ſoon after they are ripe, in an open bed of common earth, covering them about half an inch thick, with ſandy light earth: the ſpring following they will appear above ground, and, if kept clear from weeds, will grow above a foot high the firſt ſummer: the Michaelmas following, if they are thick in the ſeed-bed, you may take out a part of them, and tranſplant into a nurſery, in rows at three feet diſtance, and two feet aſunder in the rows; in which place they may remain three or four years, when, they will be large enough to plant out for good.

The timber of the common Maple is far ſuperior to the beech for all uſes of the turner, particularly diſhes, cups, trenchers, and bowls; and when it abounds with knots, as it very often doth, it is highly eſteemed by the joiners for inlayings, &c. and alſo, for the lightneſs of the wood, is often employed by thoſe that make muſical inſtruments; and, for the whiteneſs of the wood, is in great requeſt for tables.

Egyptian MA'RBLE, a name given by our artificers to a very beautiful green and white Marble, greatly in uſe among us, and brought in great quantities from Egypt and other places. It was alſo in frequent uſe, and in great eſteem among the Romans, who received it alſo from Egypt, and diſtinguiſhed too lightly two kinds of it, from the different diſpoſition and order of its variegations, and honoured them with the names of two of their emperors, in whoſe reigns they were firſt brought into uſe. Theſe were the marmor Auguſteum and Tiberianum. Thoſe pieces, in which the variegations were waved and thrown into arches and circular figures, they called the Auguſtan; and thoſe, which were marked with more diffuſed and ſcattered veins, they called the Tiberian. Theſe were the whole differences between the two; and, if we were to acknowledge different ſpecies from ſuch differences as theſe, we muſt allow almoſt as many different ſpecies as we ſee blocks of Marble. *Hill's Hiſt. of Foſſ.*

Colouring of MARBLE.— The colouring of Marble is a nice art, and in order to ſucceed in it, the pieces of Marble, on which the experiments are tried, muſt be well poliſhed, and clear from the leaſt ſpot or vein. The harder the Marble is, the better it will bear the heat neceſſary in the operation; therefore, alabaſter, and the common ſoft white Marble, are very improper to perform theſe operations upon.

Heat is always neceſſary for the opening the pores of the Marble, ſo as to render it fit to receive the colours; but the Marble muſt never be made red-hot, for then, the texture of the Marble itſelf is injured, and the colours are burnt, and loſe their beauty. Too ſmall a degree of heat is as bad as too great; for, in this caſe, though the Marble receive the colour, it will not be fixed in it, nor ſtrike deep enough. Some colours will ſtrike even cold, but they are never ſo well ſunk in as when a juſt degree of heat is uſed. The proper degree is that which, without making the Marble red, will make the liquor boil upon its ſurface. The menſtruums, uſed to ſtrike in the colours, muſt be varied according to the nature of the colour to be uſed. A lixivium made with horſe's or dog's urine, with four parts quick-lime, and one part pot-aſhes, is excellent for ſome colours; common ley of wood-aſhes does very well for others: for ſome, ſpirit of wine is beſt; and, finally, for others, oily liquors, or common white-wine.

The colours which have been found to ſucceed beſt with the peculiar menſtruums, are theſe: ſtone-blue diſſolved in ſix times the quantity of ſpirit of wine, or of the urinous lixivium; and that colour which the painters call litmouſe, diſſolved in common ley of wood-aſhes. An extract of ſaffron, and that colour made of buckthorn berries, and called by the painters

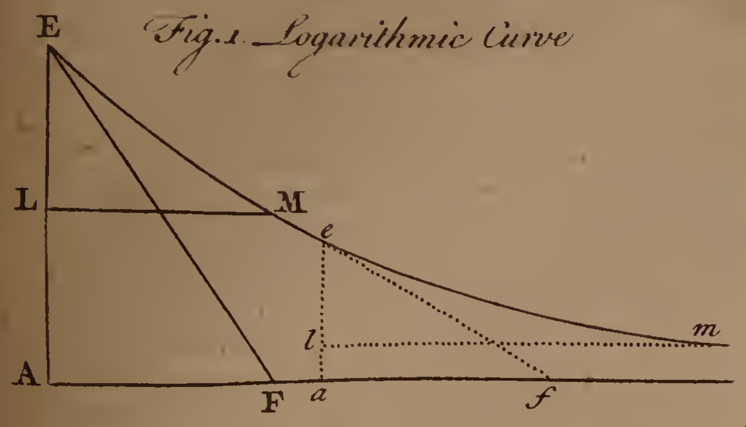


Fig. 1. Logarithmic Curve

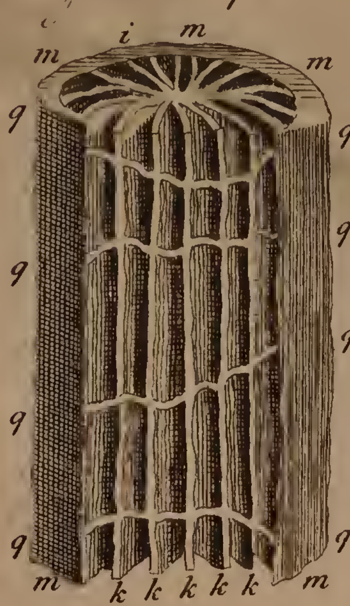


Fig. 2. Madrepora

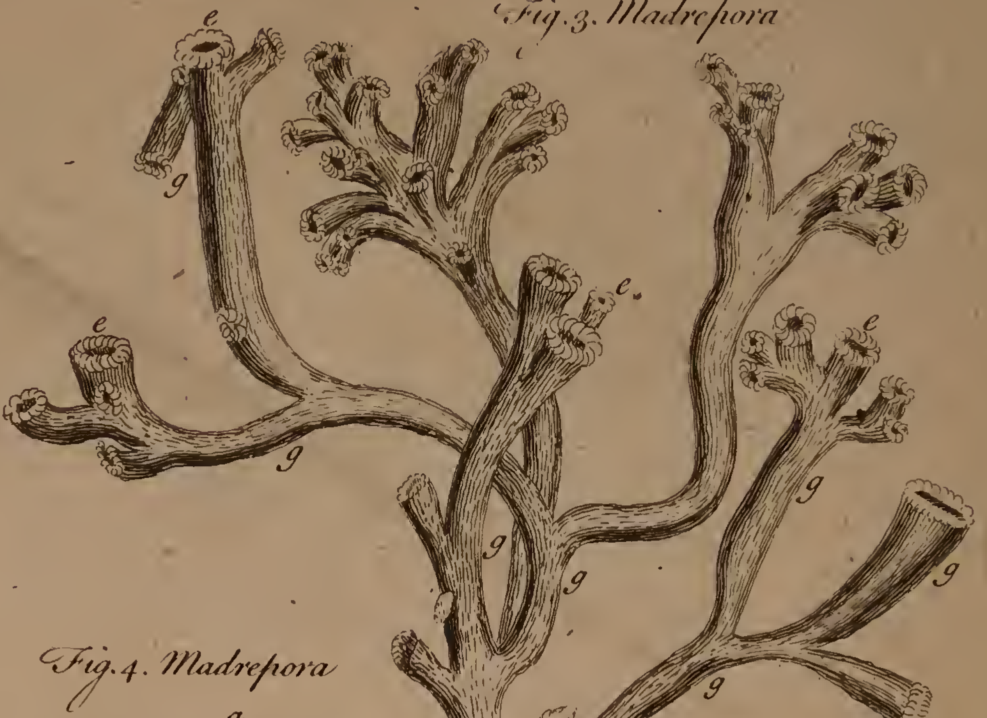


Fig. 3. Madrepora

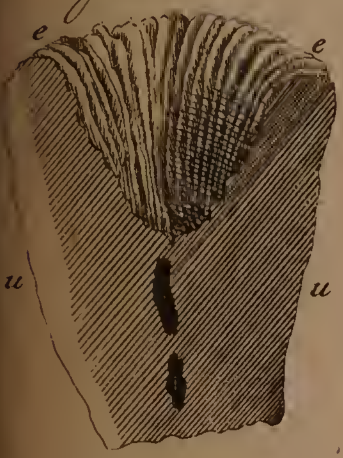


Fig. 5. Madrepora

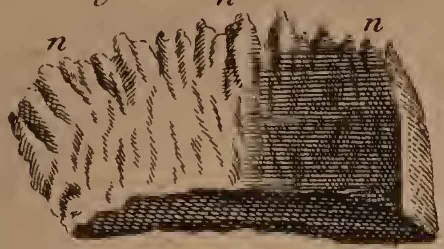


Fig. 6. Madrepora

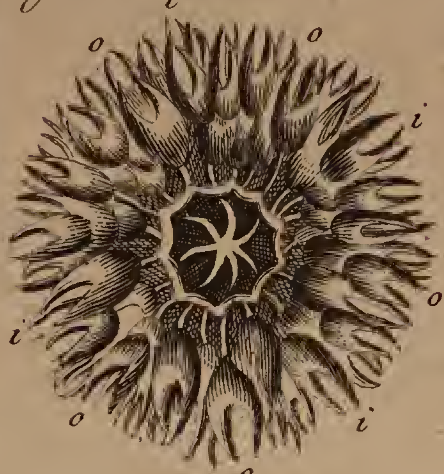


Fig. 7. Madrepora

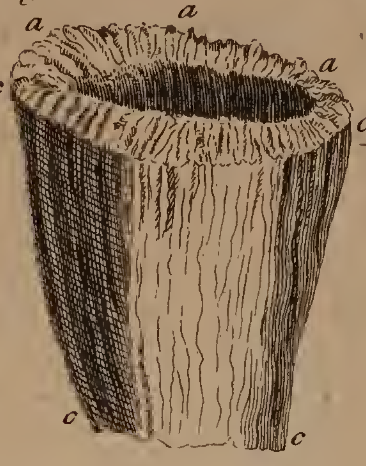


Fig. 4. Madrepora

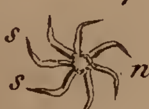


Fig. 8. Madrepora

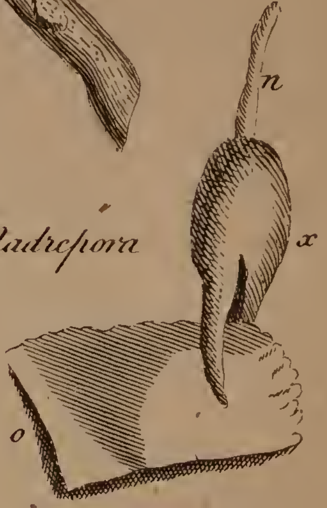


Fig. 10. Madrepora

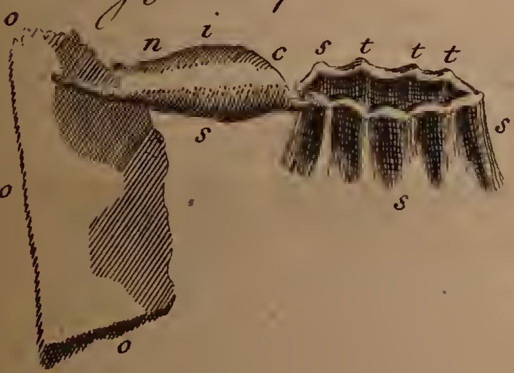


Fig. 9. Madrepora

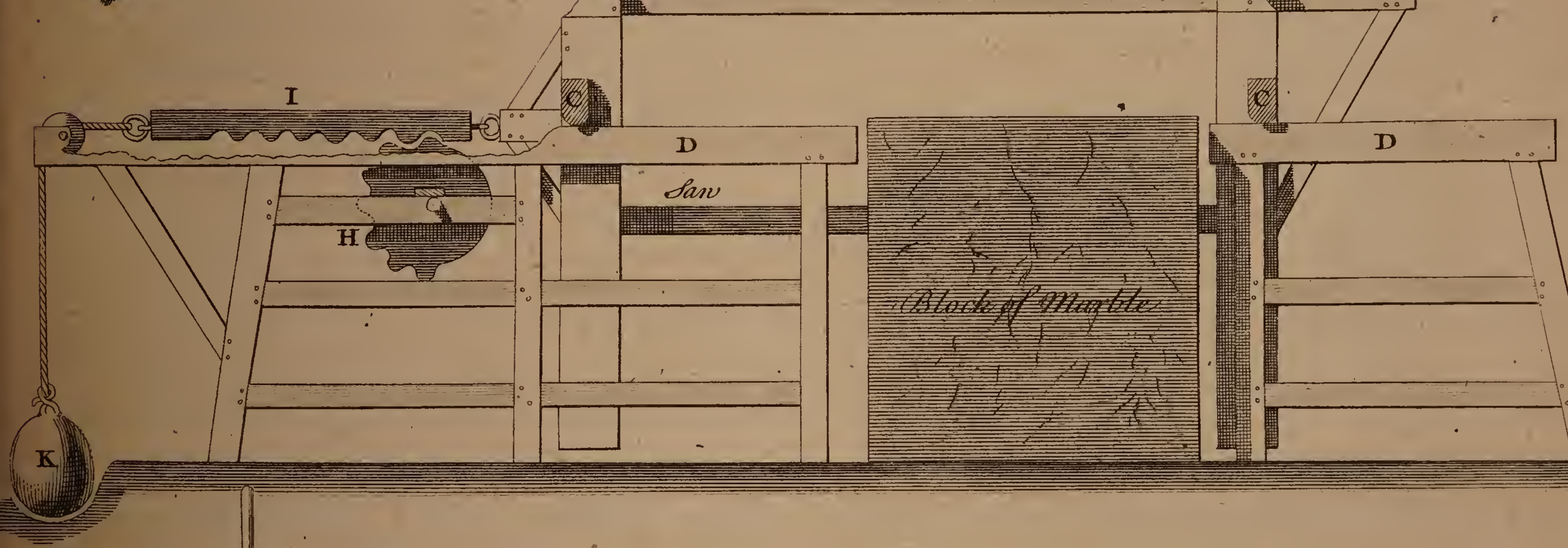


Fig. 11. Marble

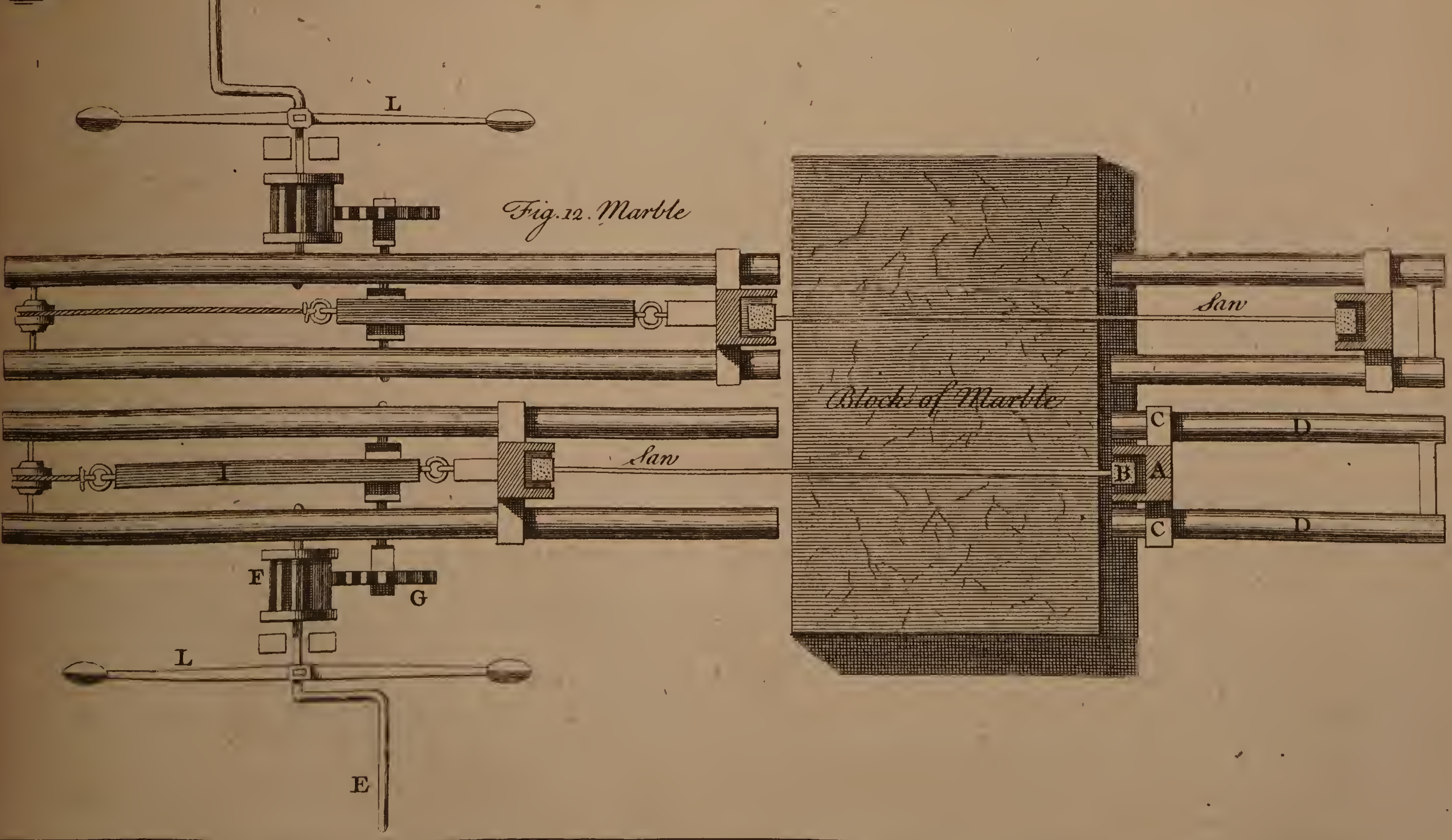


Fig. 12. Marble

Printed for T. Hinton in Newgate Street.

ſap green, both ſucceed well diſſolved in urine and quick-lime, and tolerably well in ſpirit of wine. Vermilion, and a fine powder of cochineal, ſucceed alſo very well in the ſame liquors. Dragon's blood ſucceeds very well in ſpirit of wine, as does alſo a tincture of logwood, in the ſame ſpirit. Alkanet root gives a fine colour, but the only menſtruum to be uſed for this is oil of turpentine; for neither ſpirit of wine, nor any lixivium, will do with it. There is another kind of ſanguis draconis, called dragon's blood in tears, which, mixed with urine alone, gives a very elegant colour. *Philoſ. Tranſact.* N°. 268.

Beſides theſe mixtures of colours and menſtruums, there are ſome colours which are to be laid on dry and unmixed. Theſe are dragon's blood, of the pureſt kind, for a red; gamboge for a yellow, green-wax for a green, common brimſtone, pitch, and turpentine for a brown colour. The Marble, for theſe experiments, muſt be made conſiderably hot, and then the colours are to be rubbed on dry in the lump. Some of theſe colours, when once given, remain immutable; others are eaſily changed or deſtroyed. Thus the red colour given by dragon's blood, or by a decoction of logwood, will be wholly taken away by oil or tartar, and the poliſh of the Marble not hurt by it.

A fine gold colour is given in the following manner: take crude ſal armoniac, vitriol, and verdigreaſe, of each equal quantities; white vitriol ſucceeds beſt, and all muſt be thoroughly mixed in fine powder.

The ſtaining of Marble to all the degrees of red or yellow, by ſolutions of dragon's blood or gamboge, may be done by reducing theſe gums to powder, and grinding them, with the ſpirit of wine, in a glaſs mortar; but, for ſmaller attempts, no method is ſo good as the mixing a little of either of theſe powders with ſpirit of wine, in a ſilver ſpoon, and holding it over burning charcoal. By this means a fine tincture will be extracted, and, with a pencil dipped in this, the fineſt traces may be made on the Marble, while cold, which, on the heating it afterwards, either on ſand, or in a baker's oven, will all ſink very deep, and will remain perfectly diſtinct in the ſtone. It is very eaſy to make the ground colour red or yellow by this means, and leave white veins in it. This is to be done by covering the places where the whiteneſs is to remain, with ſome white paint, or even with two or three doubles only of paper, either of which will prevent the colour from penetrating in that part. All the degrees of red are to be given to Marble by means of this gum alone; a ſlight tincture of it, without the aſſiſtance of heat to the Marble, gives only a pale fleſh colour, but the ſtronger tinctures give it yet deeper; to this the aſſiſtance of heat adds yet greatly; and, finally, the addition of a little pitch to the tincture gives it a tendency to blackneſs, or any degree of deep red that is deſired.

A blue colour may be given alſo to Marble by diſſolving turnſol in a lixivium of lime and urine, or in the volatile ſpirit of urine; but this has always a tendency to purple, whether made by the one or the other of theſe ways. A better blue, and uſed in an eaſier manner, is furniſhed by the canary turnſol, a ſubſtance well known among the dyers: this needs only to be diſſolved in water, and drawn on the place with a pencil; this penetrates very deep into the Marble, and the colour may be increaſed by drawing the pencil, wetted afreſh, ſeveral times over the ſame lines. This colour is ſubject to ſpread and diffuſe itſelf irregularly; but it may be kept in regular bounds, by circumſcribing its lines with beds of wax, or any other ſuch ſubſtance. It is to be obſerved, that this colour ſhould be always laid on cold, and no heat given even afterwards to the Marble; and one great advantage of this colour is, that it is therefore eaſily added to Marble already ſtained with any other colours, and it is a very beautiful tinge, and laſts a long time. *Mem. Acad. Par.* 1732.

A deſcription of a machine for ſawing MARBLE, from a draught of M. Morel's. See *Plate* XXX. *fig.* 11, 12.

Few are ignorant of the common manner of ſawing blocks of Marble; they make uſe of a ſmooth ſaw without teeth, which ſometimes employs two men one on each ſide, who caſt fine ſand into the track of the ſaw frequently, to wear the Marble, and let water trickle into it to prevent the ſaw from heating. The frame of the ſaw is repreſented by the letter A. The arms of the ſaw are hollow in the form of cullices, about five feet in height, to anſwer to the biggeſt blocks of Marble; and as the ſaw cannot act upon the Marble, but by the efforts it makes to penetrate it, the extremities are both loaded with a cube of lead, the weight of which muſt be ſufficient to make the ſaw deſcend. Beſides the parts which compoſe it, this machine is alſo fortified with two ears C C to ſtrengthen it and make it ſlide on the treſſels D D placed in a right-line, and at ſuch a diſtance, that the frame of the ſaw may eaſily paſs between them.

Though ſeveral ſaws may be made to work at the ſame time, I ſhall only ſpeak of one of the two in the plan: the power muſt be applied to the handle E, whoſe crank is twelve inches, which continues to the trundle-head F eight inches in diameter, which communicates with the cog-wheel G ſixteen inches diameter; at the axis of the wheel G is another wheel H which can be ſeen only in the eleventh figure, being hid in the plan under the piece I. This wheel which is twenty inches radius to the extremity of the cogs, has cogs only on the half of its circumference, which indent with the notches in the piece I, fixed at one of its extremities to the frame of the ſaw; at the other is a cord, which, after having paſſed on a pulley, is faſtened to the weight K.

When the power turns the handle, the teeth of the wheel H, meeting thoſe of the piece I, force it, notwithſtanding the weight K, to move 30 inches from the left to the right, and the ſaw is impelled in the ſame manner, ſo that, when the wheel H has made an half-turn, as it preſents no more cogs to catch in the notches of the piece I, the ſaw is retracted from the right to the left by the action of the weight K; the handle therefore muſt be turned twice round to carry the ſaw once backwards and forwards, and in one of theſe turns it has plainly no reſiſtance but what proceeds from the friction of the parts.

The diameter of the trundle-head F being only half the diameter of the wheel G, the ſaw moving thirty inches at every half-turn of the wheel H, for which the handle is obliged to make a turn, the velocity of the acting power will be to that of the ſaw, in winding up, nearly as ſeventy-five to thirty, or as five to two; wherefore the reſiſtance of the ſaw will be in the ſame proportion as five to two, to the power applied to the handle.

As two men are generally wanted to move the ſaw, whoſe joint effort I ſuppoſe equal to fifty pounds, we may reckon, ſubtracting the weight K, the power applied to the handle ought to be twenty pounds; but as an equal power is required to bring the ſaw back again, as that which carried it forward, and the two cubes of lead with which it is loaded act with equal gravity, the weight K muſt be at leaſt fifty pounds: but this weight which renders the acting power of no effect, in one of the two turns of the crank, becomes contrary to it in the other, as it re-unites itſelf to the reſiſtance of the ſaw, which will be in winding up equal to 100 pounds, taking two-fifths of which for the power applied to the handle, there will remain forty pounds, for which two men are required; ſo that, hitherto, this machine ſeems of no advantage, becauſe two men muſt be employed at the machine as well as in the common method; unleſs you reckon the intervals when the weight K operates alone a benefit.

But this defect may be remedied by working two ſaws together inſtead of one, as may be ſeen in *fig.* 12, where are two handles on a common axis, but their cranks bent oppoſite. One ſaw may be made to go backward as the other goes forward, and, ſetting a man to each handle, they will divide between them the power neceſſary to impel one of the ſaws, while the weight K retracts the other; the reſiſtance will not exceed 40 pounds at moſt, which will be equally divided between them, becauſe, the two wheels H having their cogs diſpoſed contrarywiſe, as ſoon as one leaves its piece I, the other catches in his: thus two men may perform the work of four, by applying the machine to ſaw two blocks at once; it may be ſaid this machine is rather curious than uſeful, but we choſe to exhibit it, becauſe the principles of its conſtruction may be applied to ſeveral uſes.

Coralloide MARBLE, in natural hiſtory, the name given by authors to ſuch Marbles as have ſpecimens of the marine corals or bodies of that kind immerſed in them, as the ſea-ſhells are buried in, and make a part of the body of others.

MARBLE *colour.*— To give this variegated colour to glaſs is a very eaſy operation: there needs no more than to put cryſtal frit into a pot in the furnace, and to work it before it has ſtood the uſual time to purify in the fire. *Neri's Art of Glaſs.*

MA'RBLED *China ware*, a name given by many to a ſpecies of porcelain or China ware, which ſeems to be full of cemented flaws. It is called by the Chineſe, who are very fond of it, tſou tchi.

It is generally plain white, ſometimes blue, and has exactly the appearance of a piece of china which had been firſt broken, and then had all the pieces cemented in their places again, and covered with the original varniſh. The manner of preparing it is eaſy, and might be imitated with us. Inſtead of the common varniſh of the China ware, which is made of what they call oil of ſtone and oil of fern mixed together, they cover this with a ſimple thing made only of a ſort of coarſe agates, calcined to a white powder, and ſeparated from the groſſer parts by means of water, after long grinding in mortars. When the powder has been thus prepared, it is left moiſt, or in form of a ſort of cream, with the laſt water that is ſuffered to remain in it; and this is uſed as the varniſh. Our cryſtal would ſerve fully as well as theſe coarſe agates, and the method of preparation is perfectly eaſy. *Obſ. ſur les Cout. de l' Aſie.*

MARLE (*Dict.*)— It is a very material circumſtance in the marling of land, to find out how much the land requires of this manure; and, till experience has thoroughly ſhewn this, it is better to err in laying on too little, than too much; becauſe the latter is a fault not to be remedied. It is to be obſerved alſo, that Marle never makes ſo great an improvement on land the firſt year, as it does afterwards.

In Staffordſhire they lay two hundred loads of Marle upon an acre of land of the common kind; but, where the ſoil is black, looſe, and ſandy, or full of worms, they will lay on three or four hundred loads to an acre; it being a rule with them, that this ſort of ſoil cannot be marled too much. If the mould be thin, the leſs Marle does; if deep, it muſt have the more.

It is beſt ſowing of marled lands under furrow; becauſe, if theſe lands are well huſbanded, they will be very mellow and hollow, which will occaſion the earth's ſinking from the roots of the corn, if it ſtand too high. If Marle fattens land, or makes it ſtiff or binding, it muſt be well dunged, and laid down for graſs. In Staffordſhire, after their land is marled, their way is to take the crops following. After the firſt crop of wheat is off, they plow in the wheat ſtubble in December, and, if the weather proves froſty, to mellow it, they do not plow it again till April. They then ſow it with barley, allowing three buſhels of ſeed to an acre. The common produce of this is thirty buſhels. After this they ſow peaſe, for which they plow once in the February following, allowing only three buſhels of ſeed to an acre, as in the barley. Next after this, if they intend ſix crops, they ſow wheat again upon the peaſe-crop; the fifth crop is barley again; and the ſixth year's is red oats. Some ſow two or three crops more, when the ground has been well marled, but that is much better let alone.

In digging for the Marle, they uſe in manuring their lands, in Ireland, they meet with foſſil horns, and other curious foſſils. The Marle always lies in the bottom of low bogs. It is never met with in any other places, and is found by boring with augres made for that purpoſe. It uſually lies at five, ſeven, or nine feet depth. The obtaining it in many places is attended with very conſiderable expences, in draining off the water. The manner of digging it is this: they employ ſix able labourers and a ſupernumerary; and theſe cut up a hole of twelve feet ſquare; which is ſuppoſed a pit that this number of men can manage in a day. Two men dig, two throw it up, and two throw it by, and the ſupernumerary ſupplies defects on all occaſions. For the firſt three feet they dig through a fuzzy earth, fit for making a turf for fuel. Under this lies a ſtratum of gravel, of about half a foot. Under this often, for three feet more, there is a more kindly moſs, which would make better fuel. This lower ſtratum of turf is always full of foſſil wood, which is uſually ſo ſoft, that the ſpade cuts as eaſily through it, as through the earth it lies in. Under this, for about three inches, is found a ſeries of leaves, principally of the oak; theſe appear very fair to the eye, but fall to pieces on touching; and this ſtratum is ſometimes interrupted with vaſt heaps of ſeed, which ſeem to be of the broom or furz. In ſome places there appear berries of different kinds; and in others, ſeveral ſpecies of ſea plants, all lying in the ſame confuſed manner as the oak leaves. Under this vegetable ſtratum, there lies one of blue clay, half a foot thick, and uſually full of ſea ſhells. This blue clay is not ſo tough as the common ſort, but is thrown carefully up, and uſed as Marle in ſome places. Under this always appear the right Marle; the ſtratum of this is uſually from two to four feet thick, and ſometimes much more. *Philoſophical Tranſactions.* N°. 394.

Dice MARLE, in huſbandry, a name given by the people of Staffordſhire to a reddiſh Marle, that breaks into ſmall ſquare pieces like dice, or elſe into thin flakes, in the manner of lead ore, and looks ſmooth on the ſurface.

MARI'NE *Remains*, a term uſed by many authors to expreſs the ſhells of ſea fiſhes, and parts of cruſtaceous and other ſea animals, found in digging of great depths in the earth, or on the tops of high mountains. Their being lodged in theſe places is an evident and unqueſtionable part of the ſea's having once been there, ſince it muſt have covered thoſe places where it has left its productions.

It has been a favourite ſyſtem with many, and particularly with the late Dr. Woodward, that all theſe Marine bodies were brought, to the places where they now lie, by the waters of the univerſal deluge; which, as we are informed by holy writ, covered the whole ſurface of the globe, and even the higheſt mountains. But, though this is a very ready expedient to account for many of the natural phænomena, yet there are evident proofs that it cannot have been the cauſe of all that is attributed to it, and there muſt neceſſarily have been ſome other cauſe of many of theſe remains having been placed where we now find them. Neither does the opinion of ſome particular authors, that partial inundations of different places have left theſe Marine bodies behind them at the receſs of the waters, ſeem ſufficient to account for the multitudes of theſe remains, many of which we find thrown upon places inacceſſible to ſuch floods. *Moro de Cruſtaceis in Montib. deprehenſ.*

Signior Moro has attempted to account for theſe phænomena on a new plan of reaſoning. He obſerves, that it is the beſt baſis of argument to begin from facts, and that, if we can certainly find how ſome part of theſe animal remains come to be depoſited at ſuch great diſtances from their natural reſidence, we may very rationally conclude, that by the ſame means, be they what they will, all the reſt were alſo brought thither. He adds, that the earth, once the bottom of the ſea, or the level ſurface of a plain, may be, and frequently has been, in the memory of man, raiſed up into a mountain by ſubterranean fires, earthquakes, and volcano's. He mentions the famous inſtances of the new iſland raiſed out of the ſea near Santorini, in the year 1707, which became of circumference not leſs than ſix miles, and of the new mountain raiſed near Puzzuoli, in 1538.

Theſe, and many other like facts, prove that the origin of mountains and iſlands may have been ſuch, and that the matter they conſiſt of may have been the ſame with what was once the bottom of the ſea; and that the Marine bodies, found in theſe mountains, were ſuch as were living, or remaining of living fiſh, at the time when the iſlands or mountains were ſo raiſed above the ſurface of the water which before covered it.

This is no new opinion; but this author has ſet it in a new and much ſtronger light than it ever had appeared in before, by the inſtances and examples he has brought in proof of it. Some have been fond of believing that the bodies we call Marine remains, were never indeed any parts of living animals, but that they are mere luſus naturæ, formed in the places where they are found; but Fabius Columna proved this to be an error, ſhewing that the ſhark's teeth, or gloſſopetræ, of the iſland of Malta, when calcined by a ſtrong fire, yielded aſhes, the ſame as thoſe from animal bodies, and by no means of the ſame nature with thoſe produced from calcined ſtones.

MARMO'TTE, *marmotta*, the mountain rat, a creature very common in many parts of Europe, and frequently carried about as a ſhew by the poor Savoyards. It is of the ſize of a leveret, or between that of the hare and the rabbit; and is larger-bodied than the cat, but much ſhorter-legged. Its whole figure and appearance are like the common rat, whence it has its name.

They will play with one another in the manner of kittens, and make a ſoft and not diſagreeable noiſe on thoſe occaſions; but when they are provoked, or when they are affected, as they always are by change of weather, they make a very ſhrill and diſagreeable ſqueaking. They feed on vegetables, and are very fond of the roots of ſeveral plants; they are very fond alſo of milk, butter, and cheeſe. They ſit on their buttocks to eat, and uſe their fore-feet as hands to reach their food to their mouths, in the manner of the ſquirrel. They lie hid in the winter in holes which they dig in the earth, and ſleep away a great part of that ſeaſon. They make their holes in a very nice and artful manner, and make themſelves a bed of ſtraw, and other ſoft matters, that they may lie the ſofter and the warmer. It is a creature eaſily bred up tame, and will be perfectly good-humoured and familiar, but it hates dogs.

MARRU'BIUM, *white hore-hound*, in botany, a genus of plants, whoſe characters are:

The leaves are wrinkled; the calyx is long, and generally furniſhed with five aculeated appendicula; the galea is erect, with two horns; the beard tripartite, with oblong ſlender fauces.

Horehound has ſquare, white, hoary ſtalks, about a foot high, having two leaves at a joint, which are rugged, white, and downy, roundiſh and blunt-pointed, and ſerrated about the edges, ſtanding on pretty broad foot-ſtalks: among theſe grow very thick whorles, of white, labiated, and galeated flowers, ſtanding in ſtiff hoary calyces, which end in nine or ten hard, and almoſt prickly, ſpinulæ; each calyx contains four ſmall longiſh ſeeds; the root is woody, hard, and full of fibres: it grows by the ſides of roads, and in lanes; and flowers in June. The leaves and tops are uſed.

They are hot and dry, pectoral, and good to free the lungs from hot viſcid phlegm, and thereby to help old coughs, eſpecially in cold moiſt conſtitutions; the juice being made into a ſyrup, with ſugar or honey, they open obſtructions of the liver and ſpleen, and are very ſerviceable againſt the dropſy, jaundice, green-ſickneſs, and obſtructions of the catamenia, and ſuppreſſion of the lochia, and other diſtempers of the female ſex; for which few herbs go beyond it. *Miller's Bot. Off.*

The leaves of the white horehound give no tincture of red to the blue paper; they are very bitter, and have a penetrating ſmell. It is probable, that in Flanders this ſmell may approach to that of muſk, for Dodonæus affirms it does ſo. The bitter natural ſalt of the earth, compoſed of marine ſalt, ſal ammoniac, and nitre, ſeem to be united in this plant, with a conſiderable quantity of ſulphur, phlegm, and terreſtrial parts.

This plant, by the chemical analyſis, yields a great deal of acid phlegm, oil, and earth; a little urinous ſpirit; ſome concreted, volatile, and fixed ſalt; a little lixivial.

Thus it is no wonder, if the white horehound ſhould be a great diſſolver, and a good aperitive, and excellent for thoſe who have the aſthma or jaundice. The juice of this plant is given to drink, from two ounces to ſix, for rheums and ſtubborn coughs: one glaſs-full of the infuſion in white-wine, and ſeveral glaſs-fulls of ptiſan, two pugils of the tops of white horehound, are ſufficient for one decoction: but the fat muſt firſt be taken off, by ſtraining it through a wet cloth, and diſſolving it in half a drachm of chalybeated ſoluble tartar, or twenty grains of the chalybeated flowers of ſal ammoniac; one or two ounces of the ſyrup of horehound, two drachms of the tincture of ſteel, and two ounces of orange-flower-water may be preſcribed for the ſuppreſſion of the menſes. *Martyn's Tournefort.*

MA'RSHY *Countries*.—It is to be obſerved, that neither canals, nor even large inundations, where the water is deep, are nearly ſo dangerous in regard to people's health, or exhale ſo much noxious vapours, as Marſhy grounds, or meadows that have been once floated, and but lately drained; and that fields, though dry in appearance, may nevertheleſs be moiſt, by the tranſpiration of ſubterraneous water.

By this exhalation, as well as by that of ditches and canals, in all which innumerable plants and inſects die and rot, the atmoſphere is filled, eſpecially during the latter part of the ſummer and autumn, with moiſt, putrid, and inſalutary vapours. Add to this, that, Marſhy countries being low, and without hills to receive the winds, or direct them in ſtreams upon the lower grounds, the air is apt to ſtagnate and corrupt. The common water too, being either collected from rains, and preſerved in ciſterns, or drawn from ſhallow wells, is, in hot and dry ſeaſons, ſoon corrupted; ſo that every thing conſpires, in ſummer, not only to relax the ſolids, but to diſpoſe the humours to putrefaction.

In Marſhy countries, rainy and moiſt ſeaſons differ greatly; ſince intenſe and continued heats occaſion the greateſt moiſture in the atmoſphere, by the immenſe exhalations they raiſe; whereas frequent ſhowers, during the hot ſeaſon, cool the air, check the exceſs of vapours, dilute and refreſh the corrupted ſtagnating water, and precipitate all putrid and noxious effluvia. But, if heavy rains, in the beginning of ſummer, are ſucceeded by great and uninterrupted heats, thoſe rains, by overflowing the meadows, ſerve only for matter of more exhalation, and to make the ſeaſon more ſickly, and the diſtempers more fatal.

The epidemic of the hot ſeaſon, and the great endemic of Marſhy countries, is a fever of an intermitting nature, commonly of a tertian ſhape, but of a bad kind; which in the damper places, and worſt ſeaſons, appears in the form of a double tertian, remittent, continued putrid, or even an ardent fever. Marſhy countries are likewiſe ſubject, more than any others, to the cholera morbus, dyſentery, and a kind of ſcurvy, peculiar to a moiſt and corrupted air; the ſymptoms of which laſt agree ſo much with the ſea-ſcurvy, that they may be accounted the ſame diſeaſe; the exhalations of the canals and Marſhes, in hot weather, acting like the vapours which riſe from the bildge-water of a ſhip.

As to the diet neceſſary in moiſt places, it may be obſerved in general, that thoſe who can afford to live above the common rate, keep freeſt from the diſeaſes of the Marſhes. For ſuch climates require dry houſes, the apartments raiſed from the ground, proper exerciſe, without labour in the ſun, or in the evening damps; a juſt quantity of vinous liquors, and victuals of good nouriſhment. Without ſuch helps, not only ſtrangers, but the natives themſelves, are extremely ſickly after hot and cloſe ſummers. *Pringle's Obſervations on the Diſeaſes of the Army.*

Marshy *lands*, a name given by our farmers to a ſort of paſture land, or grazing ground, which lies near the ſea, rivers, or fens.

As to lands lying near rivers, the great improvement of them is their being overflowed, which brings the ſoil of the uplands upon them, ſo that they need no other mending, though kept conſtantly mowed. The great inconveniency of theſe lands is their being ſubject to floods, which high hills near the ſides of rivers, and the long courſe of them, beſpeak to be frequent: and, though the richeſt land generally lies near ſuch rivers, yet there is the greateſt danger of the crops being ſpoiled, eſpecially, when they are not incloſed, and therefore cannot be fed with cattle. This, when feeding bears any thing of a price, would be the very beſt way of managing theſe uncertain lands; and incloſing them would be highly beneficial, on this account. *Mortimer's Huſbandry.*

The Marſh-lands in Lincolnſhire, and many other parts of England, produce a ſort of graſs, which feed ſheep in a better manner than that of almoſt any other land, in regard to their ſize, and the quantity of wool. The ſheep about Grimſby, and ſome other places in this county, produce ſuch luſty wool, or, as they call it, wool of ſo large a ſtaple, that three or four fleeces uſually make a tod of twenty-eight pounds weight. Several hundred loads of this wool are yearly carried from theſe places to Norfolk, Suffolk, and other parts of the kingdom, for the cloth manufacturers. They ſend this in large packs, which they call pockets, each containing about five and twenty hundred weight. *Philoſ. Tranſ.* N°. 223.

When Marſh lands lie flat, it is neceſſary for the owner to keep all the water he can from them. The ſea water, in particular, is to be kept from them as much as poſſible; and this is uſually done at a very great expence, by high banks and walls.

Two things greatly wanting in theſe lands, in general, are good ſhelter for the cattle, and freſh water. The careful farmer may, however, in a great meaſure, obviate theſe, by digging, in proper places, large ponds to receive the rain water, and by planting trees and hedges in certain places towards the ſea, where they may not only afford ſhelter for the cattle, but keep off the ſea breezes, which often will cut off the tops of all the graſs in theſe places, and make it look as if mowed.

Theſe lands fatten cattle the ſooneſt of any, and they preſerve ſheep from the rot. It would be of great advantage to them, if there were raiſed, in the middle of every large Marſh, banks of earth in a croſs, or in the form of two ſemi-circles, and theſe planted with trees; theſe would ſerve as a ſhelter for cattle, let the wind blow from what quarter it would, and would ſoon repay the expence of making.

There are, in different parts of England, very large quantities of land upon the ſea-coaſts that would be worth taking in, tho' no one has yet thought of doing it. The coaſts about Boſton, Spalding, and many other parts of Lincolnſhire, give frequent inſtances of this, where the ſea falls from the land, ſo that on the outſide of the ſea walls, on the owſe, where every tide the ſalt water comes, there grows a great deal of good graſs, and the owſe is firm to ride upon when the water is upon it.

This owſe, when taken in, hardly ſinks any thing at all, and they dig the walls from the outſide of it, all the earth they are made of being taken from thence, and the ſea, in a few tides, filling it up again: and, though the ſea, at high-water, comes only to the foot of the bank, yet, once in a year or two, ſome extraordinary tides go over the banks, though they are ten feet high. Theſe banks are fifty feet broad at the bottom, and three feet at the top; and the common price of making them is three ſhillings a pole, the earth being all carried in wheelbarrows, and face towards the ſea, where the greateſt ſlope is, being turfed. *Mortimer's Huſbandry.*

MARTEA′U, the name given by French naturaliſts to a peculiar ſpecies of oyſters, called alſo malleum by others. It is one of the moſt curious ſhells in the world. Its figure is that of a hammer, with a very long head, or rather of a pick-ax. It has a body of a moderate thickneſs, and two long arms. It is of a browniſh colour, with a beautiful tinge, of a violet blue. Notwithſtanding the ſtrange ſhape of theſe ſhells, they cloſe very exactly.

MA′RTES, *the martin, or martlet*, in the Hiſtory of Quadrupeds, the name of a creature of the weaſel kind, called alſo by ſome fogua. There are two ſpecies of this creature, the one called the Martes abietum; or fir martin, the other the Martes fagorum, or beech martin. The beech martin is diſtinguiſhed from the other by having a larger and blacker tail, and being all over of a darker colour, and being white on the throat, whereas the others are yellow; but the ſpecies are ſcarce kept up diſtinct, the creatures mixing with one another in the breed. When diſtinct, the beech martin is found to be a much tamer creature than the other, and may be kept about houſes like a cat; and often lives of its own accord about houſes, and among old walls. Their ſkins make a valuable fur; and that of the fir martin, or yellow kind, is much the moſt valuable. *Ray's Syn. Quad.*

MA′RTLET (*Dict.*) — Some heraldiſts ſay that this mark of diſtinction is more peculiarly applied to the fourth brother or family. See *plate* XXI. *fig.* 37. in the Dictionary.

MA′RVEL *of Peru*, a name given to the plant more uſually called jalap. See the article JALAP.

MA′RUM *Syriacum*, *Syrian maſtich*, in botany, a genus of plants, whoſe characters are:

It is a plant with a lip-flower, conſiſting of one leaf; but has no galea (or creſt) the ſtamina ſupplying the place of it; but the under lip is divided into five large ſegments, the middlemoſt of which is hollow like a ſpoon: theſe flowers are produced ſingle from the wings of the leaves: to which may be added, it has the appearance of a ſhrub, and an hot volatile ſmell.

This plant is propagated by planting cuttings, in any of the ſummer-months, upon a bed of freſh light earth, obſerving to water and ſhade them, until they have taken root; after which they may be tranſplanted either into pots or borders of the ſame freſh light rich earth: but the greateſt difficulty is, to preſerve it from the cats; which will from a great diſtance tear this plant in pieces, and from which there is ſcarcely any guarding it, eſpecially near towns and cities, where there are many of theſe animals, unleſs by planting large quantities of it: for it is obſervable, that, where there are but few of them, the cats will not leave them until they have quite demoliſhed them; whereas, when a large quantity of the plants are ſet in the ſame place, they will not come near them.

Thoſe plants which are put into pots, ſhould be ſheltered in winter; but thoſe in the full ground will abide the cold of our ordinary winters very well, provided they are planted on a warm dry ſoil; and may be clipped into pyramids or balls; in which figures I have ſeen ſome plants of this kind near three feet high, which have endured the open air ſeveral years without any covering.

The common herb maſtich is a cephalic, and is of ſervice in all diſorders of the nerves. It has alſo an aſtringency, by means of which it is of ſervice in hæmorrhages, of all kinds, particularly in profluvia of the menſes.

MA′RYGOLD, *caltha*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind; its diſk is compoſed of ſeveral floſcules, and its outer circle of ſemi-floſcules; theſe are all placed upon the embryo ſeeds, and contained in a common cup. The embryo's finally become flat, crooked, and marginated capſules, containing a long-ſhaped ſeed.

The flowers of the common marygold are cordial and alexipharmic; they promote ſweat, and are good to throw out the ſmall-pox, or any other eruption. They alſo promote the menſes, and are ſo far aperient, that they are found of ſervice in the jaundice, and indurations of the ſpleen. The midwives burn them under women whoſe labour does not come on properly, and ſuppoſe they are of great virtue in promoting the pains. They alſo diſtil a water from them, as a remedy for ſore eyes; but theſe laſt virtues are not ſo well warranted.

MA'SONS, the name of a mechanic trade, called alſo ſtone Maſons, or ſtone-cutters, whoſe buſineſs is the ſtone-work in buildings, tombs, broad pavements, &c. a moſt curious art, taken in all its parts, and not hard work; (for they have labourers under them, who ſaw and do the drudging part) and a lad, to be properly qualified for learning this trade, ought to have an inſight in geometry and architecture.

They take with an apprentice ten pounds, whoſe working hours are from ſix to ſix; a journey-man's wages fifteen or eighteen ſhillings a week; and to ſet up a maſter two hundred pounds will be ſufficient, though ſome employ a good deal more.

They are a ſociety ſo long as the year 1410, in the reign of king Henry the IVth, and with whom the marblers, or ſtatuaries, joined; but not incorporated into a company till 1677, by king Charles the IId. livery-fine five pounds.

Their hall is in Maſon's-alley, in Baſinghall-ſtreet; and their court-day on the firſt Thurſday after quarter-day.

They have alſo a ſtand in St. Paul's church-yard, in which they ſit, to attend the lord mayor, on the day of his inſtallation.

Arms. Azure, on a chevron argent, between three caſtles argent, a pair of compaſſes, ſomewhat extended, of the firſt. Motto. In the Lord is all our truſt.

MA'TCHING, in the wine trade, the preparing veſſels to preſerve wines and other liquors, without their growing ſour or vapid.

The method of doing it is this: melt brimſtone in an iron ladle, and, when thoroughly melted, dip into it ſlips of coarſe linen cloth; take theſe out, and let them cool. This is what the wine coopers call match. Take one of theſe matches, ſet one end of it on fire, and put it into the bunghole of a caſk; ſtop it looſly, and thus ſuffer the match to burn nearly out; then drive in the bung tight, and ſet the caſk aſide for an hour or two. At the end of this time examine the caſk, and you will find that the ſulphur has communicated a violently pungent and ſuffocating ſcent to the caſk, with a conſiderable degree of acidity, which is the gas, and acid ſpirit of ſulphur. The caſk may, after this, be filled with a ſmall wine, which has ſcarce done its fermentation, and, bunging it down tight, it will be kept good, and will ſoon clarify. This is a common and very uſeful method; for poor wines would ſcarce be kept potable, even a few months, without it. Nor could ſtums be prepared in large quantities without this help. *Shaw's Lect.*

MA'STER *Load*, in mining, a term uſed to expreſs the larger vein of a metal, in places where there are ſeveral veins in the ſame hill. Thus, it often happens, that there are ſeven, ſometimes five, but more uſually three veins or loads, parallel to each other, in the ſame hill. Of theſe, the middle vein is always greatly the largeſt. This is called the Maſter load; and the others which lie there, two, or one, on each ſide of this, are called the concomitants of the Maſter load.

The general breadth of the Maſter loads, in Cornwall, is from three to ſeven feet. They are ſeldom larger than this, except in certain peculiar places, as where all the veins meet together, as they ſometimes do, and form a knot, from which they ſeparate again, and each takes its peculiar courſe. The ſize of ſuch a knot is eaſily determined, and it is uſually very rich in tin, or the other metal of the mine. The ſeveral parts, even of the Maſter load, are not at all regular in breadth, but, from ſix feet, it will, in ſome places, dwindle to one, or even to an inch broad, in a very ſmall ſpace; but the miners are not diſheartened at this, for they know it will ſoon grow wider again, unleſs really worked out. *Phil. Tranſ.* N°. 69.

The Maſter load uſually lies in a hard rocky or ſhelfy ſtratum, made up of metalline matters, ſpars, mundic, and other unprofitable ſubſtances, or weeds, as the miners call them, and is, as it were, all along a continued rock; but has many veins and joints, as they are called. In ſome places the matter in which the ore lies is ſofter, and then it is much more eaſily worked. In Cornwall they uſually allow two ſhovel-men to three beele men or pickers; but, where the load runs in a ſofter ſubſtance, there muſt be a greater proportion of ſhovellers or carriers away.

There is generally water found about the loads of the metal. In moſt places it is met with at ſome feet deep from the loady ſurface; and it often runs through the heart of the load, not in a direct channel, but windingly, in and out, inſenſibly, through the veins and joints of the load. When the miners have followed a load to ſome depth, and the water begins to be troubleſome, as it generally ſoon is, if there be any in the work, they deſcend to the bottom of the hill, where they have that conveniency, and at the loweſt place begin as little adrift, as the convenience of working or driving will permit, ſcarce half ſo big as that for a load; they carry this on, on a level, till they come to the work itſelf. In this the uſe of the dial is needful, which they term plumming and dialling. By this means the exact place of the work is known, where to bring the adit, or to ſink down to make an air-ſhaft. Tho' the water is troubleſome in the loads, yet there is always ſome great convenience attending it, which is, that, where there is water, there is never want of air for the reſpiration of the miners, and the candles always burn well. But it is alſo to be obſerved, that, in a ſoft, looſe, quagmire country, the earth ſometimes falls in after the workmen, in ſuch a manner as, though it does not choak up the whole ſhaft, yet it ſo far ſtops it, as to render the current of air leſs free, and the miners find the utmoſt neceſſity of opening a ſhaft for air to reſpire from the ſurface. If the ſoil be ſo ſoft as not to be able to ſupport itſelf in the working, as is ſometimes the caſe in theſe wet clayey hills, it is neceſſary to prop it up, as they go on, with boards, poſts, and the like. This adds greatly to the expence of mining; but, in working a Maſter load, it is often worth while. When the miners are out of heart at the trouble of walling and propping, on this occaſion, it ſometimes happens, that a dipping of the load carries them down into a firmer ſtratum, and they are at once relieved from all that trouble and danger.

MATRICA'RIA, *feverfew*, in botany, a genus of plants whoſe characters are:

The root is annual and fibrous; the leaves are cut many ways, and by conjugations; the calyx is hemiſpherical and ſquamous; the flowers are collected into bunches, or form umbella's, and are generally marked with white rays.

The leaves of the feverfew are large and winged, divided into ſeveral ſections, uſually about ſeven, that at the end being the largeſt; they are deeply cut in, or laciniated, of a pale yellow green colour. The ſtalks are ſtiff, round, or ſtriated, two feet high, or more, cloathed with ſmaller leaves, and pretty much branched towards the top, on which grow large flat umbels of flowers, made of ſeveral white petals, broader and ſhorter than thoſe of the chamomile, ſet about a yellow thrum. The root is thick at the head, having many fibres under it; the whole plant has a very ſtrong, and, to moſt, an unpleaſant ſmell. It grows in hedges and lanes, and flowers in June and July. The leaves and flowers are uſed.

This is a herb particularly appropriated to the female ſex, being of great ſervice in all flatulent diſorders of the womb, and hyſteric affections; procuring the catamenia, and expelling the birth and ſecundines. The juice to the quantity of two ounces, given an hour before the fit, is good for all kinds of agues. It, likewiſe, deſtroys worms, provokes urine, and is good for the dropſy and jaundice. *Miller's Bot. Offic.*

MATTS, on board a ſhip, a kind of broad, thick clouts, wove out of ſpun yarn, ſinnet, or thrums; and uſed to preſerve the main and fore yards from galling againſt the maſts at the ties, and at the gunnel of the loof. They alſo ſerve to keep the clew of the ſail from galling there; as alſo to ſave the clews of the foreſails from doing ſo at the beak-head and boltſprit.

MAT'TAGESS, in zoology, the Engliſh name of the larger ſpecies of the lanius or butcher bird.

The word Mattageſs is borrowed from the Savoyards, and ſignifies the murdering pye; and has been given it from its ſavage diſpoſition, and its reſemblance to the magpye, in the ſhape of its tail.

It is barely of the bigneſs of a thruſh; its beak is moderately long, black, and hooked at the end, but ſtraight all the way to that. Its tongue is bifid and hairy, and there are ſeveral black and ſhort briſtles at the top of the beak. Its head, back, and rump are grey. Its chin and belly are white, and its throat and breaſt variegated with duſky ſtreaks. Its feet and legs are black; it is very common in Germany, and is ſometimes ſeen in the northern parts of England, but with us it is not very frequent. It lives among low buſhes, and builds in them; its neſt is made of moſs, wool, and ſoft herbs, and the tender branches of heath; it has ſeven young ones at a brood, which are of a greeniſh colour, and very little reſemble their parent; it feeds on thruſhes, and ſmaller birds, and is a very terrible deſtroyer among them. *Ray's Ornithology.*

MA'VIS, in zoology, the common name of the ſong thruſh, or throſtle, called by authors the turdus viſcivorus minor, to diſtinguiſh it from the larger ſpecies, called in Engliſh the miſſel bird; and uſually known among us alſo by the ſimple name thruſh. It is called viſcivorus by authors, from its reſemblance in colour to the viſcivorus, not from its feeding on the miſletoe berries, as that does.

It is much ſmaller than the miſſel bird, and of a middle ſize, between the fieldfare and red-wing. Its back is of a greyiſh brown, ſomewhat like the colour of the Spaniſh olives; its belly white, and its breaſt yellowiſh, and ſpotted with brown and blackiſh ſpots, and it is ſpotted round about the eyes; its under ſmall feathers of the wings are of a yellowiſh or reddiſh brown, and thoſe under the tail whitiſh; its legs are brown. It feeds on worms, ſnails, and ſmall inſects, and remains with us the whole year; it builds with moſs and ſtubble, and lines the neſt with mud. On this it lays five or ſix eggs, which are of a bluiſh green, variegated with a few black ſpots; it ſits on hedges and buſhes, and ſings very agreeably. *Ray's Ornithology.*

MAU'MY *Soil*, in agriculture, an earth conſiſting of a white marly clay, chalk, and ſand, which cauſes it to work very ſhort, as the farmers call it, when any thing dry. This ſort of land is uſually ſowed with wheat, miſcellan, or barley, and requires the ſame tillage that the clay land does, and muſt be kept dry and warm.

Its moſt proper manure is the rotteneſt dung: as they frequently ſow beans next after wheat in clayey grounds, ſo in theſe they chuſe to ſow peaſe, chuſing a fair and ſettled ſeaſon for their ſeed time; for, if there happen a ſmart ſhower ſoon after their ſowing, the earth will bind ſo firmly together after it, that moſt of the ſeed will be loſt. *Plot's Oxfordſhire.*

MEA'DOW.—There are two ſorts of Meadows in England, one of which is ſtiled water-Meadows, and the other are ſimply called Meadows.

Water-Meadows are thoſe which lie contiguous to rivers or brooks, from whence the water can be carried to overflow the graſs at pleaſure. Of theſe there are large tracts in ſeveral parts of England; which, if ſkilfully managed, would become much more profitable to their owners, than they are at preſent; as hath been already mentioned in another place: for nothing can be more abſurd than the common practice of flowing theſe low grounds all the winter; whereby the roots of all the ſweeteſt kinds of graſs are deſtroyed, and only ſuch graſſes left, as are natives of marſhes, which are coarſe and ſour; and, if people were curious to examine the herbage of theſe water-Meadows, they would find the bulk of them compoſed of bad weeds, ſuch as grow by the ſides of rivers, brooks, and ditches; of which the ſeveral ſorts of docks make no ſmall ſhare; and, although many of theſe Meadows produce a great burden of what the country-people call hay, yet this is only fit for cows, cart-horſes, and other animals, which by hard labour and hunger are driven to eat it; for horſes which have been accuſtomed to feed on good hay, will ſtarve before they will touch it: and after the graſs is mown off theſe Meadows, and cattle turned in to graze upon them, how common is it to ſee the land almoſt covered with theſe rank weeds, which the cattle never will eat? Which muſt always be the condition of ſuch Meadows, where the water is let over them in autumn and winter; for, as the ſides of rivers and brooks do every-where abound with theſe rank weeds, whoſe ſeeds ripen in autumn, falling into the water, they are carried by the ſtream, and depoſited on the land, where they grow, and fill the ground in every part: but ſo incurious are the generality of farmers in this reſpect, that, if the ground is but well covered, they care not what it is; few of them ever taking any pains to weed or clean their paſtures.

The method which I propoſe for the management of theſe Meadows is, never to flow them till the middle or latter end of March, excepting once or twice in winter, when there may happen floods, which may bring down a great ſhare of ſoil from the upper lands; at which times it will be of great ſervice to let water upon the Meadows, that the ſoil may ſettle there; but, the ſooner the wet is drained off, when this is lodged, the greater advantage the Meadows will receive by it: but, from the end of March to the middle of May, by frequently letting on of the water, the growth of the graſs will be greatly encouraged; and at this ſeaſon there will be no danger of deſtroying the roots of the graſs: and after the hay is carried off the ground, if the ſeaſon ſhould prove dry, it will be of great ſervice to the graſs, if the Meadows are flowed again; but, when this is practiſed, no cattle ſhould be turned into the Meadows, till the ſurface of the ground is become firm enough to bear their weight without poaching the land; for otherwiſe the graſs will ſuffer more from the treading of the cattle, than it will receive benefit by the flowing: but theſe are things which the country people ſeldom regard, ſo that theſe Meadows are generally very unſightly, and rendered leſs profitable.

I would alſo recommend the weeding of theſe Meadows twice a year; the firſt time in April, and again in October; at which times, if the roots of docks, and all bad weeds, are cut up with a ſpaddle, the Meadows will ſoon be cleared of this trumpery, and the herbage greatly improved.

Another great improvement of theſe lands might be procured by rolling them with a heavy roller, in ſpring and autumn. This will preſs the ſurface of the ground even, whereby it may be mown much cloſer; and it will alſo ſweeten the graſs: and this piece of huſbandry is of more ſervice to paſture, than moſt people are aware of.

As to thoſe Meadows which cannot be flowed, there ſhould be the ſame care taken to weed and roll them, as hath been directed for the water-Meadows: a ſalſo never to let heavy cattle graze upon them in winter, when they are wet; for the cattle will then poach them, and greatly injure the graſs: therefore theſe ſhould be fed down as cloſe as poſſible in the autumn, before the heavy rains fall to render the ground ſoft; and thoſe paſtures which are drier may be kept to ſupply the want of theſe in winter; and, where there are not cattle enough of their own to eat down the graſs in time, they had much better take in ſome of their neighbours, than ſuffer their fog (as it is called) to remain all the winter. When theſe Meadows are fed in the autumn, the greater variety of animals are turned in, the cloſer they will eat the graſs: and I am fully convinced, the cloſer it is eaten, the better the graſs will come up the following ſpring: therefore if, during the time while the cattle are feeding, the Meadows are well rolled, the animals will eat the graſs much cloſer, than they otherwiſe would.

MEA'SURE, (*Dict.*)—We have lately had ſome acute compariſons between ſome of the French weights and meaſures and thoſe of England, the reſult of which is, 1. The Paris half toiſe, as ſet off on the ſtandard kept by the Royal Society, contains of Engliſh inches, by the ſame ſtandard, 38,355; whence it appears, that the Engliſh yard and foot are, to the Paris half toiſe and foot, nearly as 107 to 114; for, as 107 to 114, ſo is 36 to 38. 35514.

2. The Paris two marc, or ſixteen ounce weight, weighs Engliſh troy grains 7560; whence it appears, that the Engliſh troy pound of twelve ounces, or 5760 grains, is to the Paris two marc, or ſixteen ounce weight, as 16 to 21; that the Paris ounce weighs Engliſh troy grains 472.5; and that conſequently the Engliſh troy ounce is to the Paris ounce, as 64 is to 63.

3. The Engliſh avoirdupoiſe pound weighs troy grains 7004; whence the avoirdupoiſe ounce, whereof ſixteen make a pound, is found equal 437.75 troy grains. And it follows, that the troy pound is to the avoirdupoiſe pound, as 88 to 107 nearly; for, as 88 to 107, ſo is 5760 to 7003.636; that the troy ounce is to the avoirdupoiſe ounce, as 80 to 73 nearly; for, as 80 to 73, ſo is 480 to 438. And, laſtly, that the avoirdupoiſe pound and ounce are to the Paris two marc weight and ounce, as 63 to 68 nearly; for, as 63 to 68, ſo is 7004 to 7559.873.

4. The Paris foot, expreſſed in decimals, is equal to 1.0654 of the Engliſh foot, or contains 12.785 Engliſh inches. *Philoſ. Tranſ.* N°. 465.

MECHA'NICS. (*Dict.*)—The term Mechanics has been formerly, and ſtill is uſed in a double ſenſe in very different ſciences, both with reſpect to their objects and principles. For the name Mechanics is applied equally to that ſcience which treats of the equilibrium and compariſon of powers, and to that ſcience, in which the nature, generation, and alteration of motion are explained. To avoid ambiguity, therefore, it would be proper to give the name ſtatics to the ſcience of equilibrium and compariſon of powers, and to reſtrain the term Mechanics to the ſcience of motion.

Theſe two ſciences not only differ as to their objects and principles, but alſo with reſpect to the times in which they have been cultivated. Some of the principles of ſtatics were eſtabliſhed by Archimedes; but Galileo laid the firſt foundation of Mechanics, when he inveſtigated the deſcent of heavy bodies; and, ſince his time, by the aſſiſtance of the new methods of computation, a great progreſs has been made, particularly by Sir Iſaac Newton in his Principia. This admirable work is now rendered more acceſſible to beginners by the learned comment of the fathers le Seur and Jacquier, printed, with the text, at Geneva, 1739, 4to, 1742, 4 Vols. 4to. We have alſo the ſciences of ſtatics and Mechanics treated of, under the name of phoronomia, by the late learned profeſſor Herman, Amſt. 1716, 4to. Mr. Euler's Mechanica, ſive de Motus Scientia, is ſufficiently recommended by the name of the author, well known as one of the moſt eminent mathematicians in Europe. This work, however, did not eſcape the cenſure of a late ingenious writer; but, granting the juſtneſs of his remarks, it may be ſaid, that a few inaccurate expreſſions, owing to analogies carried too far, and to the ſtyle of infiniteſimals, are but ſmall flaws in ſuch a work. As to ſtatics, the ſubject has been almoſt exhauſted by Varignon, in his Mecanique Paris, 1725, 2 Vols. 4to.

ME'DAL. (*Dict.*)—Impreſſions of Medals. A very eaſy and elegant way of taking impreſſions of Medals and coins, not generally known, is this: melt a little iſinglaſs glue, made with brandy, and pour it thinly over the Medal, ſo as to cover its whole ſurface; let it remain on for a day or two, till it is thoroughly dry and hardened, and then, taking it off, it will be fine, clear, and hard as a piece of Muſcovy glaſs, and will have a very elegant impreſſion of the coin. *Shaw's Lect.*

We have an eaſy method of procuring the true impreſſion or figure of Medals and coins, by Mr. Baker in the Philoſ. Tranſ. N°. 472.

Take a perfect and ſharp impreſſion, in the fineſt black ſealing-wax, of the coin or Medal you deſire; cut away the wax round the edges of the impreſſion; then with a preparation of gum-water, of the colour you would have the picture, ſpread the paint upon the wax impreſſion with a ſmall hair pencil, obſerving to work it into all the ſinking or hollow places, theſe being the riſing parts of the Medal; and the colouring muſt be carefully taken from the other parts with a wet finger. Then take a piece of very thin poſt paper, a little larger than the Medal, and moiſten it quite through. Place it on the wax impreſſion, and on the back of the paper lay three or four pieces of thick woollen cloth or flannel, of about the ſame ſize; the impreſſion, with its coverings, ſhould be placed between two ſmooth iron plates, about two inches ſquare, and one tenth of an inch thick. Theſe muſt be carefully put into a ſmall preſs, made of two plates of iron, about five inches and an half long, one inch and a half wide, and half an inch in thickneſs, having a couple of long male ſcrews, running through them, with a turning female ſcrew on each, to force the plates together. Theſe being brought evenly together, by means of the ſcrews, will take off a true and fair picture of the Medal; which, if any deficiencies ſhould appear, may eaſily be repaired with a hair pencil, or pen, dipped in the colour made uſe of.

If a relievo only be deſired, nothing is neceſſary, but to take a piece of card, or white paſte-board, well ſoaked in water; then placing it on the wax mould, without any colouring, and letting it remain in the preſs for a few minutes, a good figure will be obtained.

MELÆNA'CTOS, *the black eagle*, a ſpecies called alſo aquila Valeria by ſome authors. It is a ſmall eagle, of twice the bigneſs of a crow. Its jaws and eye-brows are deſtitute of feathers, and look reddiſh: its head, neck, and breaſt, are black, and in the middle of his back he has a large triangular ſpot, of a pale browniſh red; with ſomething of whiteneſs intermixed. His rump is a reddiſh brown, and his wings variegated with black, white, and grey; his beak is not large, black at the end, the ſkin covering the noſtrils red, and the iris of his eye hazel-coloured. His legs are feathered a little below the knee, and below that red, and the claws very ſharp. *Willughby's Ornithology.*

ME'LANCHOLY (*Dict.*)—The cauſes evidently productive of Melancholy are obſerved to be,

1. All things which fix, exhauſt, or diſturb the nervous fluid of the brain; ſuch as violent and ſudden frights, intenſe thinking upon any object, exceſſive love, watchings, ſolitude, fear, and hyſteric diſorders.

2. Such things as hinder and diſturb the generation, reparation, circulation, and various ſecretions and excretions of the blood, eſpecially in the ſpleen, ſtomach, omentum, pancreas, meſentery, inteſtines, liver, uterus, and hæmorrhoidal veſſels: ſo that, of conſequence, Melancholy may be produced by the hypochondriacal diſorder; by acute diſeaſes ill cured, and eſpecially a phrenitis and burning fever; by an exceſs of all the ſecretions and excretions; by ſuch aliments and drinks as are cold, tenacious, terreſtrial, tart, and aſtringent; by violent heat long protracted and parching the blood; as alſo by a ſtagnant, moiſt, and cloudy air.

3. A naturally black, hairy, dry, ſlender, and robuſt conſtitution of body, a middle age, a quick, penetrating, and diſcerning genus.

If this diſorder continues long, it produces ſtupidity, epilepſies, apoplexies, madneſs, convulſions, blindneſs, ſurpriſing fancies, laughter, weeping, ſinging, ſighs, eructations, flatulences, anxieties; an urine ſometimes copious and limpid like water, and at others highly thick; a retention, accumulation of the excrementitious blood in the veſſels of the abdominal viſcera, and often a ſudden excretion of it; obſtinate coſtiveneſs, frequent ſpitting of a thin matter, and an incredible ability of enduring watchings, hunger, and cold.

This diſorder has often been cured by a ſupervening unſeemly itch, ſometimes reſembling an elephantiaſis; by numerous and large varices; by a copious diſcharge from the turgid hæmorrhoidal veins; and an evacuation of the black bile by vomit and ſtool.

Patients labouring under this diſorder are generally injured by all medicines which impair the ſtrength, and evacuate too forcibly; as alſo by thoſe which throw the humours into too violent commotions, whether cordials, or medicines of whatever other denomination.

Hence the beſt method of curing this diſorder is, after a due obſervation of the firſt cauſes and the variety of patients conſtitutions, to accommodate various medicines to theſe cauſes, and various conſtitutions.

The ſeveral intentions of cure to be purſued, therefore, are,

1. To rouſe, augment, and regulate the fluids of the brain and nerves; which is done, firſt, by diverting the mind from its uſual object to others of an oppoſite nature: ſecondly, by inducing cautiouſly another diſpoſition, or affection of mind, oppoſite to Melancholy: thirdly, by humouring the perverſe and falſe turn of the imagination: or, fourthly, by frequently oppoſing it with great vigour.

2. To remove thoſe obſtructions which are either the cauſe, or the effect, of a perverted imagination, by ſoftening, inciding, and ſtimulating the obſtructing matter, by means of mineral waters, whey, viſceral, hepatic, and antihypochondriac decoctions, waters invigorated with lixivial or compound ſalts, laxative preparations of mercury, emetics, motion, exerciſe, riding, ſailing, uterine medicines, and ſuch as promote the lochia, remedies which procure hæmorrhoidal diſcharges, baths, liniments, and plaiſters.

3. They alleviate the ſymptoms by veneſection, immerſion in cold water, and the uſe of carminatives and opiates.

4. After due evacuations, to exhibit ſuch things as are from experience known to exhilarate the mind, and corroborate all the parts of the body.

From what has been ſaid, it is obvious that the perfect cure of this diſorder, as well as of great many others falſly accounted incurable, conſiſts in the correction of the bilis atra, or melancholic humour.

When Melancholy increaſes ſo far as to bring on an agitation of the fluids of the brain, capable of driving the patient into a raging fury, the diſorder is called madneſs.

This only differs in degree from a dejected Melancholy, is its offspring, ariſes from the ſame cauſes, and is generally to be cured by the ſame medicines.

In madneſs the muſcles are generally ſurpriſingly ſtrong, the patient is afflicted with watchings, incredibly capable of enduring hunger and cold, diſtracted by terrible imaginations, and ſubject to thoſe diſorders called lycanthropia and cynanthropia; which ſee.

It is obſervable, that, upon diſſecting thoſe who have died of madneſs, the brain has been found dry, hard, and friable, with its cortical ſubſtance of a yellow colour, and its veſſels turgid, varicoſe, and diſtended with black and viſcid blood.

It is alſo obſervable, that, during this diſorder, all the excretions have, in like manner, almoſt ceaſed.

Unexpected precipitation into the ſea, and a ſubmerſion in it, continued as long as poſſible, conſtitute the principal remedy for it.

Madneſſes, obſtinate againſt all remedies, have often been removed upon the approach of varices, hæmorrhoidal diſcharges, dyſenteries, dropſies, copious ſpontaneous hemorrhages, tertian and quartan fevers.

Such a ſort of madneſs ſometimes ariſes after the body is, by an autumnal, violent, and long-continued intermittent fever, weakened and exhauſted, both by the force of the diſeaſe, and repeated veneſections and purgings. The madneſs is alſo generally brought on again by theſe very means.

This ſpecies of the diſorder is only to be cured by the uſe of reſtoratives, cardiacs, and corroboratives, long perſiſted in: but, if it is treated with evacuation, it brings on an atrophy, a weakneſs, and an unſurmountable fooliſhneſs.

But a madneſs ariſing in robuſt vigorous perſons in the flower of their age, or of hot and plethoric habits, is to be cured by repeated veneſections, interpoſing a briſk purge between each; and, when the diſorder is alleviated, it is to be treated with opiates and cardiacs. *Boerhaave's Aphoriſms.*

ME'LON, *melo*, in botany, makes a diſtinct genus of plants, the characters of which are theſe:

The flowers conſiſt only of one leaf each, and are wide at the mouth, and divided into ſeveral ſegments, wholly reſembling the flowers of cucumbers. Of theſe alſo ſome are male or ſterile flowers, having no embryo fruit; others are fruitful or female flowers, having an embryo which ripens into a large fruit of an oval figure, ſometimes ſmooth, ſometimes rough, divided into three cells, and containing oblong ſeeds; each of theſe cells ſeems alſo divided into two. See *Plate* XXXII. *fig.* 4. where *a* is the flower, *b* the fruit.

The proper management and culture of Melons is this: the ſeeds ſhould be procured from good Melons, produced in ſome diſtant garden; for, if ſowed on the place where it was raiſed and ripened, it is very apt to degenerate. This ſeed ſhould be kept three years before it is ſowed, and it ſhould be ſowed at two ſeaſons. The firſt for the early crop, to be raiſed under frames, ſhould be ſown in January or the beginning of February; the ſecond, to be raiſed under bell or hand glaſſes, is to be ſowed in March, and this is the ſowing which produces the general crop of Melons, which ripen in July and Auguſt. About a week before the time of ſowing the ſeed, ſome dung ſhould be prepared in a heap with the litter, or ſome coal aſhes, and the ſame methods uſed in the early cucumbers, for the firſt crop; but for the ſecond, which is of more general uſe, the ſowing may be on the upper ſides of the hot-beds that were for the early Melons or cucumbers, or on a freſh moderate hot-bed. When the young plants are come up, they muſt be removed to another hot-bed, and covered with hand glaſſes, and watered and ſhaded till they have taken root; and, after this, they muſt have as much air and ſun as the ſeaſon will permit, and their ſtalks ſhould be earthed up as they grow, which will vaſtly ſtrengthen them.

In the beginning of April the plants will begin to ſhew their rough leaves; a parcel of dung is then to be prepared with litter and coal aſhes. The common quantity is a load to five holes; a trench muſt then be dug, which ſhould be ten inches deep, if the ſoil be dry, but only three, if it be wet. The dung muſt be evenly laid in this, and heaped up to three feet high: then the place intended for the holes muſt be marked out, at each of which muſt be laid a baſket full of light rich earth, thruſting a ſtick of two feet long into the middle. Then cover the dung all over with the earth, which was dug up out of the trench, laying it ſmooth, and about three inches thick; then the glaſſes are to be placed cloſe down over the place where each of the ſticks is, and in two days the earth will be warm enough to receive the ſeedling plants. The ſticks are now to be taken out, and the earth formed in the places into a hollow like a baſon, that it may retain the water which is given to the plants. The plants are then to be taken up, and two ſtrong and thriving ones put into each of theſe holes, which muſt be watered and ſhaded till they have taken root. The plants having taken root, and thruſt out a fourth leaf, the top of each of them ſhould be pulled off, in order to force out ſhoots from the bottom; and, as the weather becomes warmer, the glaſſes muſt be raiſed with ſtones on the ſouth ſide, to give them air, and about twice a week they ſhould have a little water.

About the middle of May the ſtalks of the plants will begin to preſs upon the glaſſes on every ſide, and the glaſſes are then to be raiſed up on bricks, to give them room to run out; and they ſhould be pegged down with forked ſticks, and turned into a proper direction for their running, ſo that they may be out of the way of tangling one with another: they ſhould now, if the weather be ſevere, be ſheltered with mats in the night, and watered gently at times. When the ſtalks of the plants are grown to the edges of the bed, the earth muſt be raiſed with old dung buried under it, till it be upon a level with the beds, for two feet wide on each ſide. The branches are here to be trained in a proper courſe, and the glaſſes are to be left over the roots of the plants; and, after this, what water is given them is to be ſprinkled all over the plants. When the fruit begins to appear, the waterings muſt be very gentle on the plants; but it will be proper to ſoak the earth well with large quantities of water about the beds, which will ſpread a moiſture even to the roots of the plants; from this time the plants ſhould be gently watered twice a week, and that always in the evening. When the Melons are grown of the ſize of a tennis ball, a piece of tile ſhould be laid under each to keep them from the ground. As they afterwards approach to ripeneſs, they ſhould be turned ſeveral times, that they may ripen equally every ſide; and if, the weather be not very favourable, they ſhould be covered with glaſſes.

If the Melon is deſigned to be eaten as ſoon as cut, it ſhould be ſuffered to remain on the plant till it changes pretty yellow, and the ſtalk begins to ſeparate from the fruit; but, if it is to be kept two or three days after cutting, it muſt be always cut proportionably earlier.

It is a practice with many to take off the leaves about the fruit, that it may have more ſun; but it is wrong, and the fruit is always the worſe taſted for it, and the ſkin is hard and tough. *Miller's Gard. Dict.*

When a Melon is perfectly fine, it is full, without any vacuity: this is known by knocking upon it, and, when cut the fleſh muſt be dry, no water running out, only a little dew, which is to be of a fine red colour. Large Melons are not to be coveted, but firm and well-flavoured ones. Our gardeners, who raiſe Melons for ſale, ſow the ſeeds of the large rather than the good kinds, and they increaſe the ſize of theſe by much watering the roots, but this ſpoils the taſte. Some of the French raiſe at this time particularly fine Melons, by a method kept as a ſecret, but which we find, on a ſtrict enquiry, is no other than the ingenious Mr. Quintiny's, of that nation, publiſhed near eighty years ago in our Philoſophical Tranſactions.

The Melons, particularly proper to be treated in this manner, are thoſe which have a thin and ſomewhat embroidered ſkin, not divided by ribs, and have a red pulp, dry and melting on the tongue, not mealy, and of a high flavour.

Petrified ME'LONS, a name given by the people who have written books of travels, &c. to certain ſtones found on mount Carmel, which reſembles Melons.

ME'LTING *Cone*, in aſſaying, is a ſmall veſſel made of copper or braſs, of a conic figure, and of a nicely poliſhed ſurface within. Its uſe is to receive melted metals, and ſerve for their precipitation, which is effected, when two bodies melted together, and yet not mixing perfectly with one another in the fuſion, ſeparate in the cooling into two ſtrata, on account of their different ſpecific gravity. This precipitation might be made in the ſame veſſel in which the fuſion is performed; but then the melting pot or crucible muſt be broken every time to get it out, whereas the conic ſhape, and poliſhed ſurface of this veſſel, makes it eaſily got out without violence. The ſhape of this veſſel is alſo of another uſe in the operation; for, by means of it, the heavy matter, ſubſiding to a point, is formed into a perfect and ſeparate regulus, even where the whole quantity, as is very frequently the caſe, has been but very ſmall.

When the quantity of the melted matter is great, it is common to uſe, inſtead of this cone, a large braſs or iron mortar, or any other conveniently ſhaped braſs or iron veſſel. It is neceſſary, when the cone is of braſs, to be cautious that it be not made too hot; for the brittleneſs of that metal, when hot, makes it eaſily break, on the ſtriking with any force on that occaſion, to make the melted maſs fall out.

Theſe, and all other moulds for receiving melted metals, muſt always be well heated before the maſs is poured into them, leſt they ſhould have contracted a moiſture from the air, or have been wetted by accident; in which caſe the melted metal will be thrown out of them with great violence and danger. They ought alſo to be ſmeared over with tallow on their inſide, that the regulus may be the more eaſily taken out of them, and the ſurface of the mould not corroded by the melted maſs poured in.

If a very large quantity of a metal is, however, to be received into them, and eſpecially if any thing ſulphureous have place among it, this caution of tallowing the moulds does not prove ſufficient; for the large quantity of the maſs makes it continue hot ſo long, that this becomes but a ſlight defence to the ſurface of the mould. In this caſe the aſſayer has recourſe to a lute, reduced to a thin pap with water, which, being applied in form of a very thin cruſt, all over the inſide of the cone or mould, ſoon dries up indeed, but always preſerves the ſides of the veſſel from the corroſion of the maſs. And this caution is found neceſſary, even when pure copper is melted alone, without any mixture of ſulphur. See *Plate* XXXI. *fig.* 1. *Cramer's Art of Aſſ.*

Weakneſs of the ME'MORY, in many caſes, is to be conſidered as a diſeaſe, and is looked on in that light by the medical writers, who have preſcribed various remedies for it. The principal cauſes of this debility, are a too frequent and conſtrained uſe, or rather abuſe of it, in the getting by rote numbers of words and ſyllables, particularly in the learning different languages; a paralytic affection in the head; violent external injuries in the ſame part; violent pains in the head, attended with deliriums, or attending a phrenitis. And to theſe are to be added drunkenneſs, and an abuſe of venery.

Prognoſtics. All debilities of Memory are cured, with great difficulty, by medicines alone; and indeed this complaint is ſeldom removed, unleſs the whole frame of mind and courſe of life be altered; all paſſions avoided, and exceſs of every kind left off. But, of all other kinds, that debility of Memory which proceeds from a paralytic diſorder of the head, particulary when that diſorder affects the tongue, is found to be the moſt obſtinate and difficult of cure. Much ſleep, or exceſſive waking, are equally hurtful to the Memory, and frequently bring on an almoſt total loſs of it.

Method of treatment. All ſuch medicines as are of an agreeable taſte or odour, are generally ſuppoſed to be of ſervice in ſtrengthening the Memory; and lignum aloes, ambergreaſe, and ſome other of the ſcented drugs, have been known to do great good. The aromatic, volatile, and ſpirituous medicines alſo all help in this caſe, if taken in ſmall doſes, and continued for a long time together. The analeptics and nervine medicines are alſo greatly recommended, but they are ſeldom found of uſe; for, among people afflicted with a debility of Memory, many are thoſe of robuſt conſtitutions and ſtrong appetites, who eat already more than nature requires, and have therefore very little uſe for analeptics or nutritive things. Bleedings in ſmall quantities frequently repeated, in caſes where there is no contrary indication, frequently prove of great ſervice in this caſe; but the primæ viæ are firſt to be cleanſed before ſuch a courſe is entered upon. Many greatly recommend bags of aromatics to the head, to be conſtantly worn in caps; but it is much to be feared theſe can have but very little effect. *Junck. Conſp. Med.*

ME'NSTRUUM (*Dict.*)—*Action of* MENSTRUUMS.— The changes, wrought upon bodies by the diſſolving power of Menſtruums, ſeem greatly to depend upon the minute particles of the Menſtruum now ſtrongly cohering with the particles of the ſolvend; and can ſcarcely be attributed to an eſſential alteration introduced by the Menſtruum into the diſſolved particles. Though pure metals, ſuch as gold, ſilver, and mercury, diſſolved, ſeem entirely changed; yet they may be eaſily ſeparated from the Menſtruums in the form of a calx, which being fuſed in the fire, the metal is recovered unchanged. Hence it appears, that the Menſtruums have no other effect, than barely adhering to the ſurfaces of the metallic particles, while divided: many more inſtances of this kind may be given.

But it may be objected, that ſolution produces new bodies; becauſe, if red lead be diſſolved in diſtilled vinegar, there ariſes ſugar of lead, when the acid of the vinegar is attracted into the particles of the lead; and, though this ſalt of vinegar be diſtilled in a retort with a ſtrong heat, the ſpirit of vinegar is not recovered, but a particular liquor obtained, which will burn in the fire. There are many more inſtances of the like kind; but we muſt conſider, that the adhering parts of the Menſtruum cannot always clearly extricate themſelves, but remain united. Hence, ſome imagine, that the nature of bodies is deſtroyed, while there only happens ſuch a ſimple conjunction of unchanged particles, under a new appearance.

Thus the blade of a lancet or knife, when naked, has the appearance of the power of cutting; but, when in the ſheath, it has not, then, the ſame appearance; though, in themſelves, the knife, or lancet, is ſtill the ſame. The eaſier they are to be unſheathed, the ſooner the appearance of their cutting power becomes manifeſt; but, if the ſheath was firmly connected with the blade, we ſhould not ſcruple to ſay, that the blade was changed. So, if a little cylinder of pure ſilver be gilt, and ſo put into aqua-fortis, the ſilver will be perfectly diſſolved, and leave the hollow covering of gold entire, floating like a black film in the Menſtruum; whence the acid parts of vinegar may be ſo united to certain parts of lead, as not to ſeparate upon diſtillation, but eaſily riſe together. It would, therefore, be wrong to aſſert, that the acid of the vinegar was thus converted into a new kind of inflammable liquor by the contact of lead: it is highly probable, that this difference much oftener happens from combination, than from any change of the ſubſtance; and the like holds, alſo, in ſeparation. For the ſubſtance diſſolved often conſiſts of very different parts, ſome of which are perfectly taken up by the Menſtruum, while others have been rejected, and left ſeparate: whence, after the Menſtruum is abſtracted from the ſolution, there remains a different ſubſtance from what was employed as the ſolvend. And hence, without caution, one might be ready to infer, that the ſubſtance thus procured was a new one, produced by the changing power of the ſolvent; whereas, in reality, it is only produced by a bare ſeparation.

Hence we may learn, that the action of all known Menſtruums depends upon motion: for, if a Menſtruum did not change the motion of the parts upon which it acts, thoſe parts would remain as they were; in which caſe the Menſtruum, contrary to ſuppoſition, could have no action at all. The origin of this motion we cannot fairly attribute to the common cauſes of motion, ſuch as impulſe, gravity, elaſticity, magnetiſm, and the like; but there is a particular cauſe, not common to all bodies, exerted between the ſolvent and ſolvend. An enquiry ſhould be carefully made into this ſubject, to which we are the more incited, as ſome great philoſophers have conceived, that all the actions of bodies muſt be accounted for mechanically.

When a ſolvent divides its ſolvend by a mere mechanical motion, this motion muſt be generated in the particles of the ſolvent by ſome cauſe, and this cauſe is generally fire. The particles of the Menſtruum, thus agitated, muſt ſtrike againſt the ſurfaces of the united particles of the ſolvend, communicate to them their motion, and looſen and ſeparate them from the ſolid, whether this action be exerted externally, on the ſurface of the ſolvend, or internally, by penetrating the ſolvend. Though this mechanical manner of acting may have ſome effect, it is, perhaps, leſs than is generally imagined: for fluids can produce little alteration in a ſolid, by means of their quantity, hardneſs, figure, and weight; and the force they receive from the fire is but ſmall, and always as capable of acting upon themſelves: the power of ſolution, therefore, muſt depend upon ſome other cauſe. Thus a wedge could never cleave wood by being barely applied to it, or kept floating about it; but muſt firſt be fixed into the ſubſtance, and then driven farther by an external force; an action not to be expected from the particles of a yielding fluid.

Thoſe Menſtruums alone appear to act mechanically, which, by a bare mechanical motion, ariſing from their magnitude, hardneſs, figure, weight, and impulſe, firſt attenuate bodies, then directly ſeparate from them again, according to their ſpecific gravities; by which kind of ſolution no great change can ariſe. By this mark we may diſtinguiſh Menſtruums which act mechanically from others.

Repulſion, alſo, may cauſe bodies to ſeparate, after having been mixed together by ſhaking; as in oil and water, or alcohol and oil of tartar per deliquium; where not only gravity, but, alſo, repulſion occaſions a ſeparation, and ſuffers ſimilar things to unite with ſimilar.

When, after ſolution, the diſſolved particles remain equally mixed with thoſe of the ſolvent, though, at firſt, they differed remarkably in their weight, ſuch a ſolution may partly be aſcribed to the general mechanical power, which here almoſt univerſally occurs; but principally to another action, ariſing from the peculiar properties of the ſolvent and ſolvend, with reſpect to each other: as, by this power, the particles of the one attract the particles of the other; thus both are ſeparated from their former concretions, and afterwards permix or unite with each other, ſo as to form numerous new ſpecies of bodies.

To illuſtrate this doctrine by an example: if a ball of ſoft clay be put into water, and ſet over the fire to boil, the parts of the water put in motion by the fire will divide the clay into ſmall particles, and permix them with the body of the water, while the boiling continues; but when the external force of the fire ceaſes, and the water comes to reſt, and grows cool, all the clay falls to the bottom: this I would call a mere mechanical ſolution.

But if a ball of ſal-gem be boiled in four times its quantity of water, all the ſalt immediately diſſolves ſo perfectly as to remain totally imbibed, ſuſpended, and uniformly diffuſed in the water, even after it grows cold, and is thoroughly at reſt; although the gravity of the ſalt is much greater than that of the water. Whence it appears, that the water has a power, by which it unites to itſelf the particles of the ſalt, ſo that they cannot be ſeparated from it by their own gravity, but remain ſuſpended. The cloſer or looſer degrees of adheſion of the particles of different Menſtruums with the particles of the body diſſolved are almoſt infinite; and hence ariſe numerous differences in the corpuſcles produced by Menſtruums.

Calcined ME'RCURY, *mercurius calcinatus*, a new and more expreſſive name for the preparation of Mercury, commonly called precipitate per ſe. It is made by ſetting purified quickſilver, for ſeveral months, in a ſand-heat, in a glaſs veſſel with a broad bottom, and opening it to the air by a ſmall hole, till it is reduced to a red powder.

The quickſilver muſt have a communication with the external air, as is neceſſary to the calcining of all the metals. This opening is beſt made, not as in the common bolt-heads, but at the lower end of a ſtem, going into the body of the glaſs; that, if the quickſilver riſe with the heat, it may not, by aſcending into the ſtem, be removed out of the heat that is to calcine it. *Pemberton's London Diſpenſatory.*

Coralline MERCURY, *mercurius corallinus*, the name given, in the London Diſpenſatory, to a preparation of Mercury, commonly known by the name of arcanum corallinum. It is prepared in this manner: pour upon the red corroſive Mercury, commonly called red precipitate, thrice its weight of rectified ſpirit of wine; digeſt them together in a gentle heat for two or three days, often ſhaking the phial; then ſet fire to the ſpirit, and continue ſtirring the powder till the ſpirit is burnt away. *Pemberton's Lond. Diſp.*

This operation proceeds upon the principle of ſpirit of wine's dulcifying acid ſpirits.

Oil of MERCURY, the name given by the chemiſts to a preparation of Mercury in a fluid form, by means of a ſtrong acid. The preparation is this: calcine Mercury with oil of vitriol to a dry ſnowy calx; ſuffer it to cool, then put it into a glaſs, and pour upon it an equal quantity of oil of vitriol; let this boil away almoſt to a dryneſs, carefully avoiding the poiſonous fumes; then increaſe the fire, and by degrees reduce it to a dryneſs again; which is, in this ſtate, a very difficult and tedious taſk. When the powder is dry, put the ſame quantity of oil of vitriol to it again, and proceed as before: at length it will ſcarce dry by means of ever ſo long or ſtrong a fire, but only ceaſe flowing freely, and become ſomewhat rigid, like a fixed oil. It is then highly ſharp, cauſtic, and not to be touched, like the ignis gehennæ of Paracelſus. By this means the Mercury is ſo fixed with the oil of vitriol, as not to be evaporated, or fly off, by the action of a very violent fire.

By this proceſs we ſee the method of impregnating, ſaturating, and incerating metals by acids to any degree, and alſo of fixing, in a great degree, volatile Mercury by them; but no metal is hence to be expected, for, in whatever manner Mercury is fixed with acids, it is always recoverable again in its priſtine ſtate, by grinding it with twice its weight of iron filings, and diſtilling it in a glaſs retort, with the greateſt degree of a ſand-heat. *Boerh. Chem.*

MERI'DIAN *Teleſcope*, a teleſcope, as *a b* (*Plate* XXXI. *fig.* 2.) fixed at right-angles to an axis *c d*, and turned about it in the plane of the Meridian.

The vulgar uſe of it is to correct the motion of a clock or watch, by obſerving, day after day, the exact time when the ſun or a ſtar comes to the Meridian. It ſerves alſo for other uſes to be mentioned hereafter.

The axis *c d* conſiſts of a ſtrong braſs plate, broader in the middle than towards the ends, having another long plate placed edgeways and ſoldered along the middle of the backſide of it from one end to the other. This plate is alſo broader in the middle than towards the ends, to prevent its ſpringing. To the ends of theſe plates two ſolid pieces of braſs are firmly jointed and ſoldered; and, the whole being placed in a turning lathe, the ſolid ends are turned truly cylindrical, to an equal thickneſs, and are alſo well ſmoothed and poliſhed with oil and proper powders. Flat upon the broader plate of the axis, there lies another braſs plate, in the ſhape of a croſs; one bar of it being parallel, and firmly ſkrewed to the axis. The ends of the other bar, being turned up at right-angles, have ſemicircular notches filed in them, to receive the cylindrical tube of the teleſcope, which is made of braſs, to prevent its warping; and is firmly fixed in theſe notches by two half-collars of braſs, which go over the tube, and are ſkrewed to the ends of the ſemicircular notches, as repreſented in the figure. The cylindrical ends of the tranſverſe axis *c d* are to be placed upon two angular notches *e f g* and *h i k*, filed in two thick braſs plates, and well planed and poliſhed, for the axis to turn very ſmoothly upon them. In order to bring the axis *c d* exactly perpendicular to the plane of the Meridian, each of the notched plates are contrived to be moveable by a ſkrew, one upwards or downwards, and the other ſideways, by ſliding them upon the ſurfaces of two other braſs plates immoveably fixed to two poſts or free-ſtone pillars.

In order to move the notched plate *e f g*, *fig.* 3, up or down, two long upright ſlits *h i* are cut through it; in each of which, at *k* and *l*, are two ſquare ſtuds of braſs firmly riveted to the fixed back-plate A B, being exactly as broad as the ſlits that ſlide by them. In the middle between them there is alſo a ſhorter parallel ſlit *m n*, through which a broad-headed ſkrew-pin is ſkrewed into the back-plate, having a round ſpringing plate under the head of it; thus the two plates are preſſed together or relaxed, according as the notched plate is to be fixed or moved. To perform this motion gradually, *p q* repreſents a ſmall piece of another braſs plate, laid upon the fore-plate and riveted to the middle of one of its upright ſides. In the end *p*, which projects over this ſide, there is a ſmall ſquare notch, which receives the circumference of a ſmall circular plate *r*, like a ſkrew-head, fixed perpendicular to a long ſkrew *r s t*, placed parallel to this upright ſide of the notched plate. This ſkrew works round in a concave ſkrew in the middle of a thick braſs ſtud at *s*, firmly riveted to the back-plate, and being turned by a hollow key *v*, put upon the ſquare end of it, it gradually raiſes or depreſſes the notched plate *e f g*; which is fixed more firmly, at its proper height, by turning the middle ſkrew at *o*, abovementioned.

The angular notch that ſupports the other end of the tranſverſe axis is moveable ſideways, by the ſame contrivance; as will appear

Engraved for the Supplement.

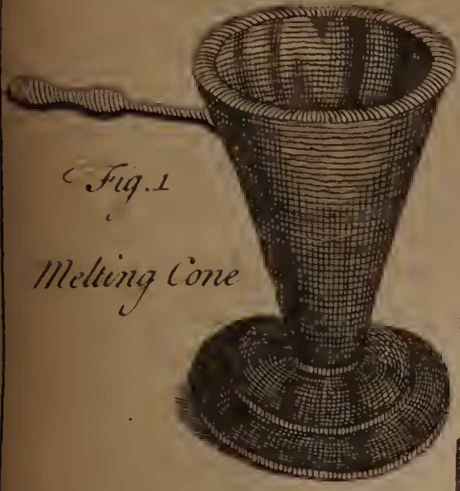


Fig.1 Melting Cone

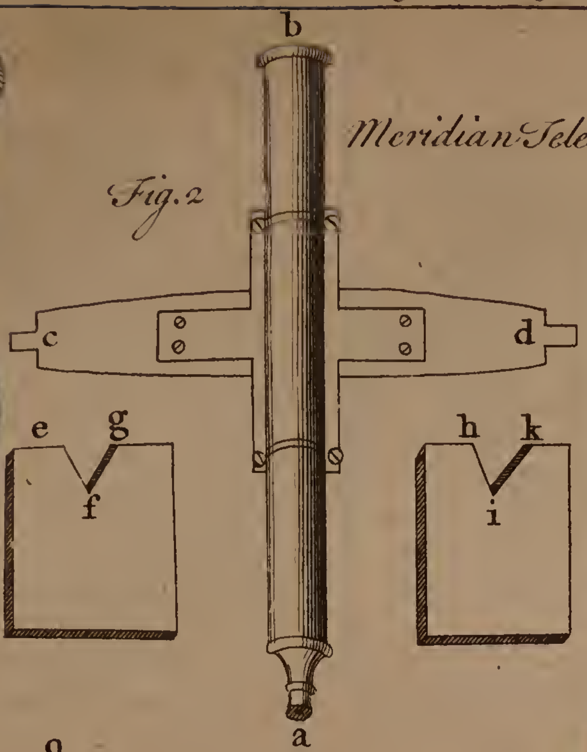


Fig.2 Meridian Telescope

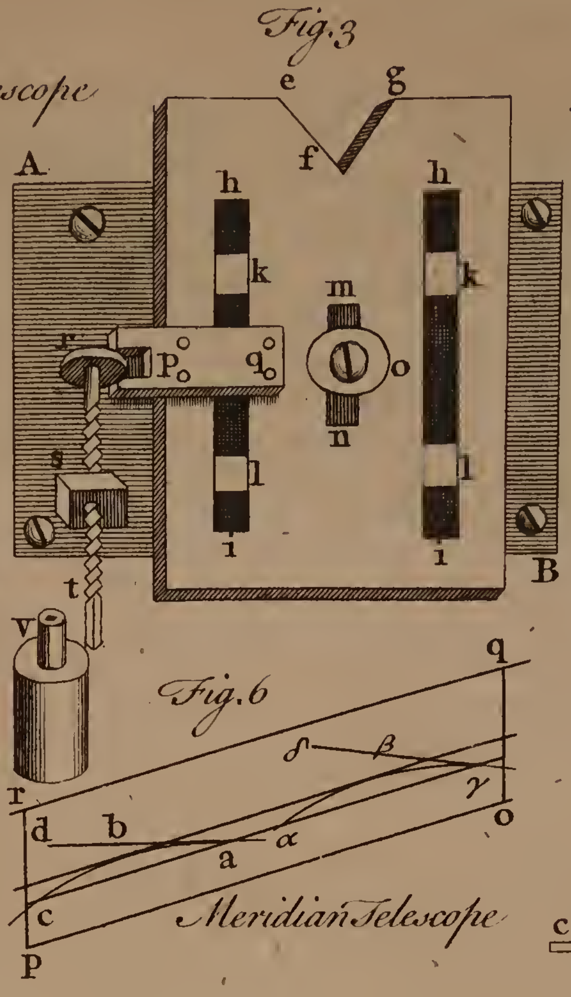
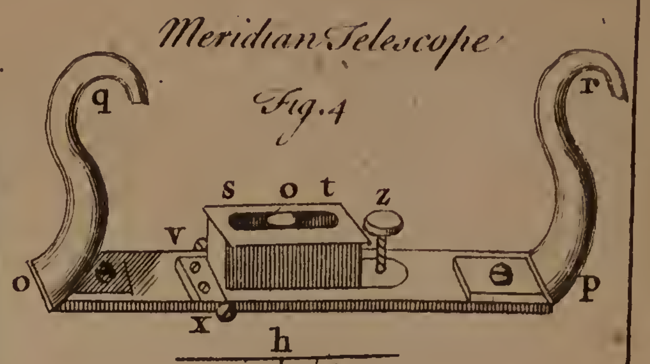


Fig.3
Fig.6 Meridian Telescope


Meridian Telescope Fig.4

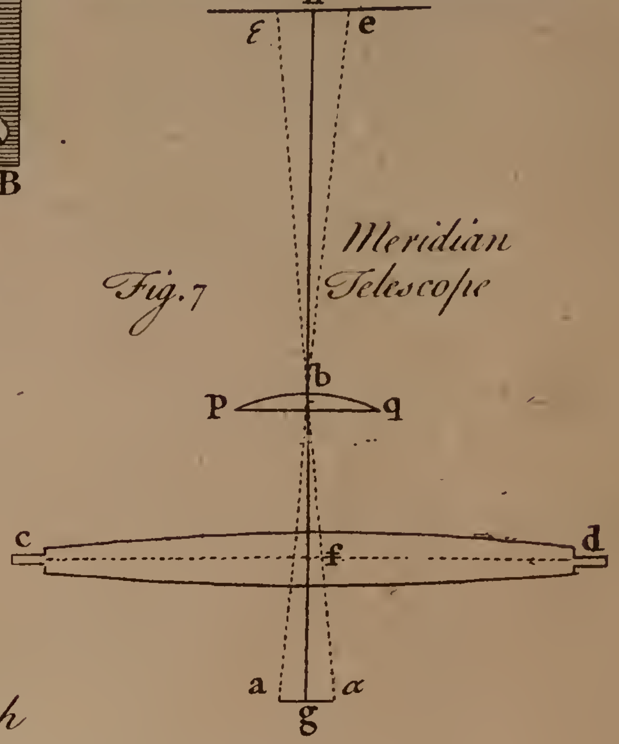


Fig.7 Meridian Telescope

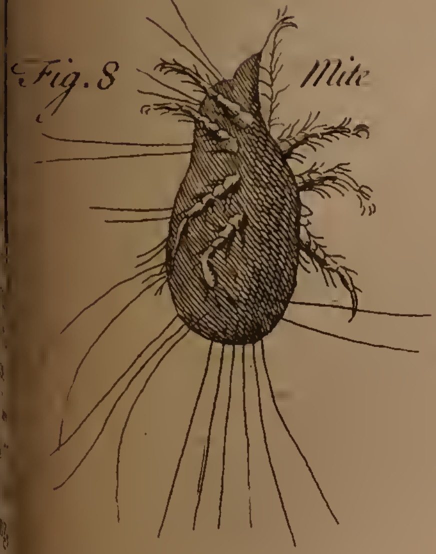


Fig.8 Mite

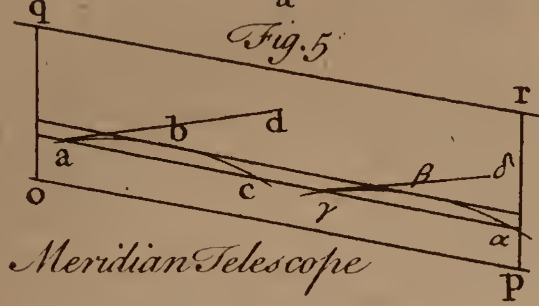
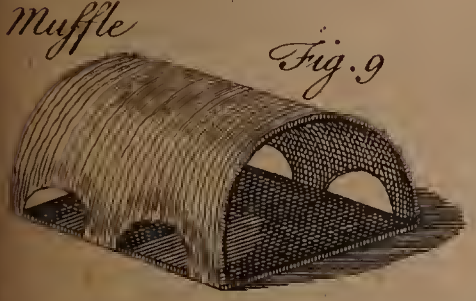
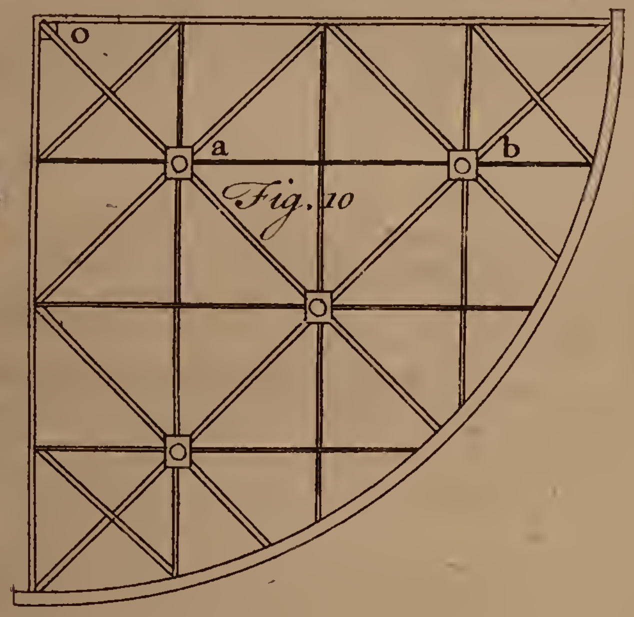
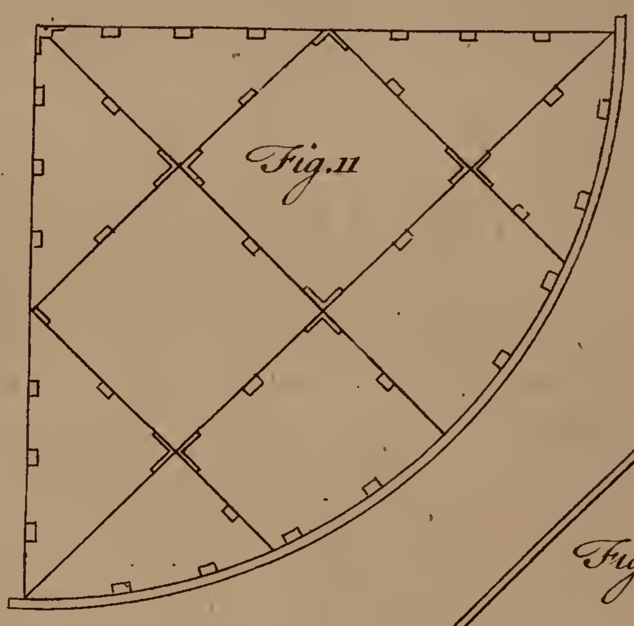


Fig.5 Meridian Telescope


Muffle Fig.9


Mural Arch Fig.10


Mural Arch Fig.11

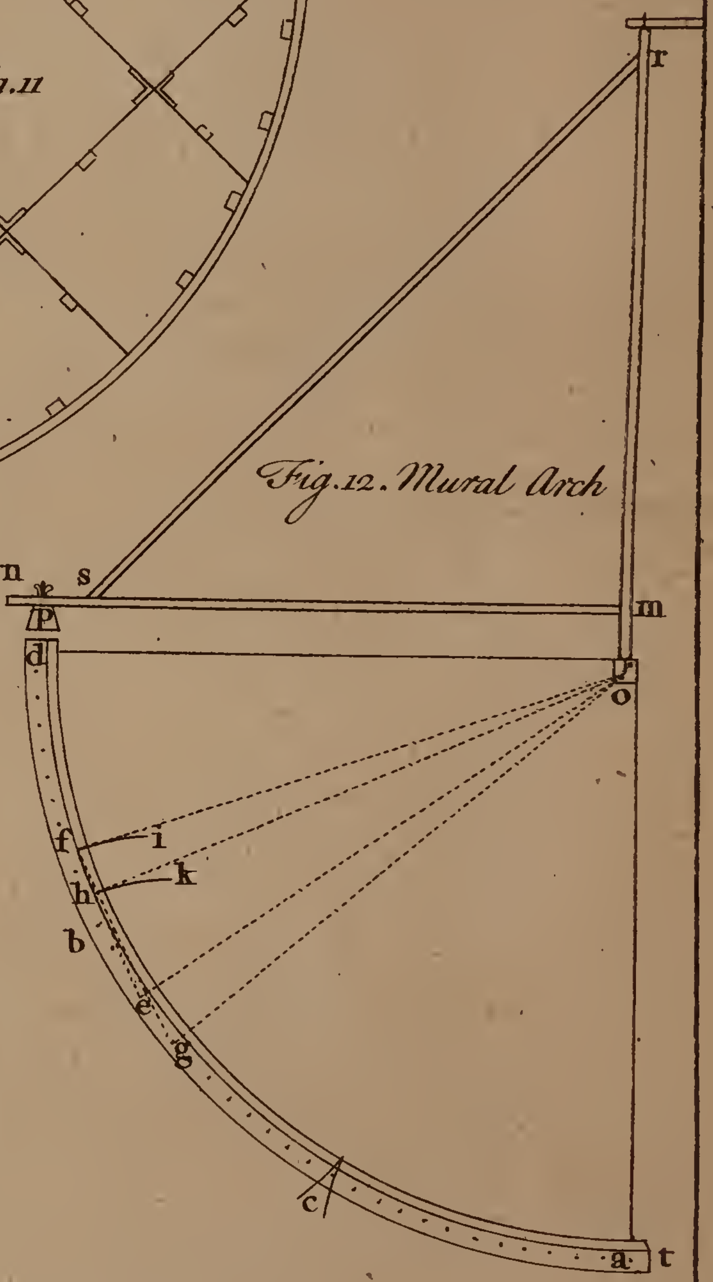


Fig.12. Mural Arch

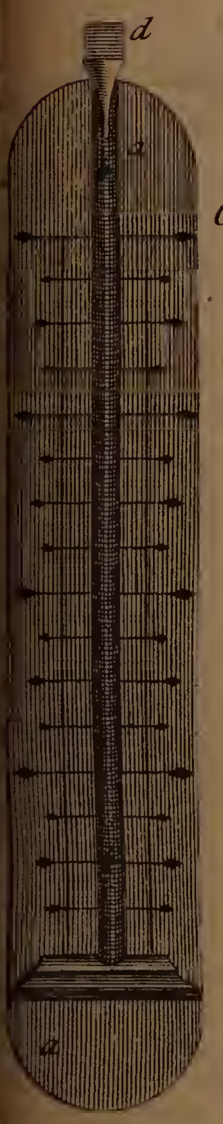
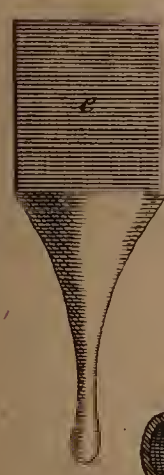
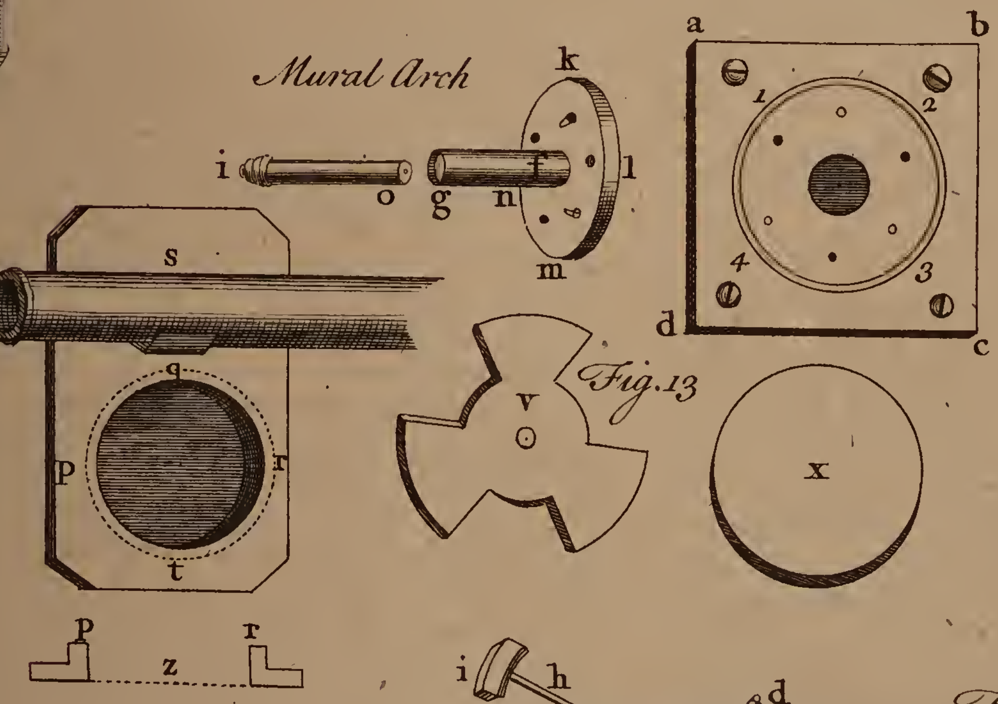


Fig.17 Ombrometer




Mural Arch Fig.13

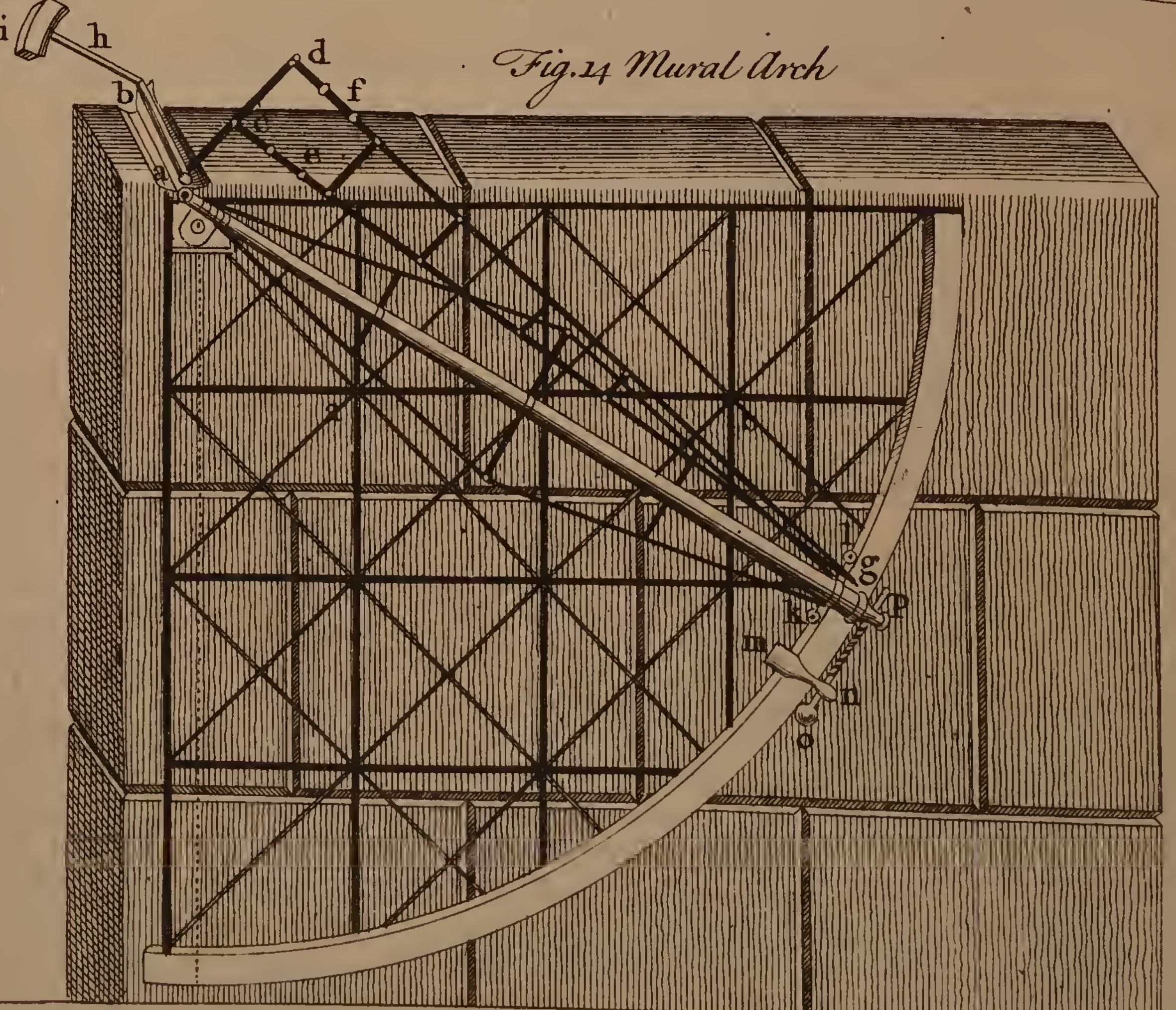


Fig.14 Mural Arch

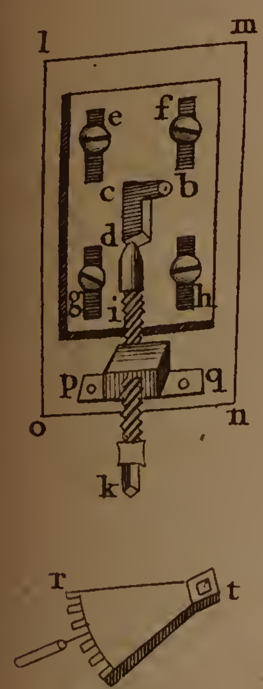


Fig.15 Mural Arch

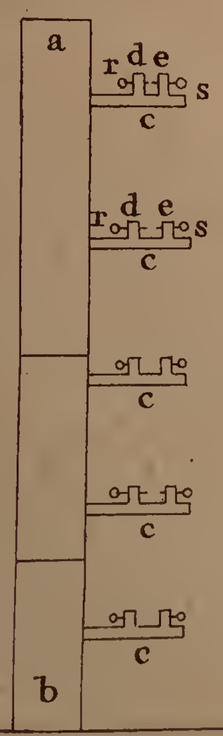


Fig.16 Mural Arch

Printed for T. Hinton in Newgate Street.

appear by ſuppoſing the notch efg to be cut in the ſide oppoſite to the ſkrew rst, and this ſide to be turned upwards.

The tranſverſe axis is to be placed horizontal upon the angular notches by a ſpirit level, conſiſting of a hollow glaſs tube st, *fig.* 4, five or ſix inches long; not quite ſtraight, but as little incurvated as poſſible; and filled with ſpirit of wine, or any liquor that will not freeze or grow foul, all but a bubble of air; which, by the laws of hydroſtatics, will always move to the higheſt place in the cavity of the tube. The tube, with its convexity upwards, is placed in a long ſlender braſs box, made fit to receive it, and is faſtened in it by very hard cement. This box is laid lengthways upon a long ruler op; and through the bottom plate of the box, a little produced, there paſſes a fine ſkrew-pin Z, to be turned by the fingers; whoſe end, by working againſt the ſurfaces of the ruler below, gradually raiſes or depreſſes this end of the box, while it turns upon a ſmall axis vx near the bottom of the other end of it.

Upon the ends of the ruler op two braſs plates oq, pr, are fixed, whoſe planes are perpendicular to the length of the ruler; theſe plates, being equal in length, have their upper parts formed into circular hooks q, r, to be hung upon the cylindrical ends of the tranſverſe axis of the teleſcope; the interval between the hooks being of a proper length to interpoſe them between the ſhoulders of the cylinders at the end of the axis and the braſs notches they reſt upon.

The frame $poqr$, being thus ſuſpended upon the tranſverſe axis, raiſe or depreſs the tube of the level by twiſting the knob of the ſkrew Z, till you bring either end of the air-bubble to reſt at any point o, towards the middle of the tube, and obſerve any mark upon the ſide of the tube that is oppoſite to it. Then take off the frame $poqr$, and, turning the ends of it contrary ways, hang it again upon the cylinders. And, if the air-bubble reſts exactly at the ſame mark as before, the tranſverſe axis is truly horizontal: if not, depreſs that end of the axis which lies on the ſame ſide of the mark as the bubble does, or raiſe the oppoſite end, till the bubble returns about half-way towards the mark. Then, having made a new mark where it reſts, tranſpoſe the frame again, and repeat the ſame practice till the bubble reſts exactly at the ſame point in both poſitions of the frame. Inſtead of making marks, over-againſt one end of the bubble, it is better to have a fine pointer, ſliding upon a wire, along the top of the tube.

Let a plane paſſing through the axis qr, *fig.* 5, 6, and the mark a where the bubble reſteth, cut the tube of the level in the curve abc; and let a line ac, drawn parallel to the axis qr, cut off the arch abc, and after the frame of the level has been tranſpoſed, the chord ac of the arch abc will ſtill be ſituated ſomewhere in the ſame parallel to qr as before, ſuppoſe at $\alpha\gamma$. Now, ſince the ends of the chords ac, $\alpha\gamma$, are turned contrary ways in the ſame line, it is plain that the mark a, which was the higheſt point in the arch acb, being now tranſpoſed to α, is become the low point of the ſame arch in the ſituation $\alpha\beta\gamma$. Therefore the bubble cannot now remain at the mark α, but will aſcend to the higheſt point of the arch $\alpha\beta\gamma$; which will be γ, if the arch be circular. For then the tangents ad, $\gamma\delta$ to the points a and γ will be parallel to each other; and, ad being horizontal, $\gamma\delta$ will be ſo too; and conſequently γ will be the higheſt point. Let $b\beta$, drawn parallel to the axis or to $a\gamma$, touch the arch $\alpha\beta\gamma$ in β; and, it is evident, the point β will be lower than γ. Therefore by depreſſing that end of the axis qr, which lies on the ſame ſide of the mark α as the bubble does at γ, the point γ will alſo be depreſſed; and ſo the bubble will recede from γ towards the mark α till it comes to β, when β becomes the higheſt point; that is, when the tangent $b\beta$ and the axis qr are parallel to the horizon: and then, if the frame $qopr$ be tranſpoſed back again, the bubble will reſt at the ſame point β as before.

Now, if the arches abc, $\alpha\beta\gamma$ be circular, b and β are exactly the middle points of the arches. But, if the arches be not circular, the points b and β will not be in the middle, yet, being at the greateſt diſtance from the chords ac, $\alpha\gamma$, they will be the points where the bubble will reſt, when the axis is horizontal.

It muſt be obſerved of theſe levels ſo ſuſpended, that, if you gently turn the frame about the axis of ſuſpenſion, the air-bubble will frequently change its place, though the ſupporters of the axis keep fixed; either becauſe the plane of the curvity of the tube is not parallel to the axis, or becauſe the cavity of it is not cylindrical, or upon both accounts. It is therefore neceſſary to reduce the plane of the frame as near to the ſame vertical poſition as poſſible, which may be done either by a plumbet hanging down by the ſide of a perpendicular ruler fixed to the horizontal one op, in *fig.* 4, or by another tube of a ſpirit level, fixed upon the ruler op at right-angles to it. But, if the frame $poqr$ vibrates freely upon the axis, this additional apparatus will be needleſs.

If the far end of the teleſcope be juſt made to preponderate the elevation of it, for obſerving the appulſes of ſtars to the croſs hairs, it may be gradually altered by a ſtring, tied to its near end, and wound about a peg fixed below the teleſcope. The peg may be made to turn with a proper degree of ſtiffneſs between two ſemicircular notches preſſed gently together by a ſkrew-pin paſſing through both the pieces. Or the ſame deſign may be executed ſeveral other ways.

If, after the teleſcope is turned upſide down, and the contrary ends of the tranſverſe axis are placed upon the ſame notches, you perceive that the ſame point of the object is covered by the interſection of the hairs in the focus of the teleſcope; it is certain that the line of ſight is perpendicular to the tranſverſe axis. But, if the interſection covers a different point of the object, the hairs muſt be moved by the key above-mentioned, till they appear to biſect the line that joined thoſe two points of the object as near as you can judge; then, by reverting the teleſcope to its former poſition, you will find whether the hairs be exactly adjuſted.

For let the line cd, *fig.* 7. be the tranſverſe axis which the teleſcope turns about a, the interſection of the croſs hairs; b the center of refractions in the object-glaſs, and ab the line of ſight. Let ab, produced, meet a remote object in e; and the point e will appear in the teleſcope to be covered by the interſection a, becauſe the image of it falls upon a. Imagine a line gh drawn through the center b to cut the axis cd at right-angles in f, the hair $a\alpha$ in g, and the object $e\varepsilon$ in h; and when the ends of the axis cd are tranſpoſed by reverting the teleſcope, the perpendicular bg will keep its poſition, or be parallel to it; but ba will be tranſpoſed into the poſition $b\alpha$, equally inclined to the contrary ſide of the perpendicular bfg. Produce αb till it meets the remote object in ε, and the croſs hairs at α will now appear to cover the point ε. But the perpendicular gbh biſects the interval $e\varepsilon$ in h. Therefore by moving the interſection of the croſs hairs from α towards g, till you perceive the middle point h is covered by it, it is manifeſt that the line of ſight is now perpendicular to the tranſverſe axis cd; and conſequently upon reverting the teleſcope, the ſame point h will be covered as before. Hitherto I have ſuppoſed the teleſcope to be turned about an axis cd, lying in the ſame plane with the line of ſight; but, if it turns about any other line parallel to cd, it is eaſy to underſtand that the motion of the line gbh will ſtill deſcribe a plane perpendicular to this tranſverſe axis. It is ſcarce neceſſary to be obſerved that the perpendicularity of the line of ſight to the tranſverſe axis has no dependence upon its paſſing through the middle of the aperture of the object-glaſs, nor of being parallel to the ſides of the tube; nor is it required to coincide with the axis of the object-glaſs. *Smith's Optics.*

MERI'DIONAL *parts* (*Dict.*)— To find the Meridional parts to any ſpheroid, with the ſame exactneſs as in a ſphere.

Let the ſemi-diameter of the equator be to the diſtance of the focus of the generating ellipſe from the center, as m to 1. Let A repreſent the latitude for which the Meridional parts are required, s the ſine of this latitude, the radius being unit; find the ark B, whoſe ſine is $\frac{s}{m}$; take the logarithmic tangent of half the complement of B from the common tables; ſubtract this logarithmic tangent from 10.0000000, or the logarithmic tangent 45°; multiply the remainder by $\frac{7915 \cdot 7044678978}{m}$, &c. and the product ſubtracted from the Meridional parts in the ſphere, computed in the uſual manner from the latitude A, will give the Meridional parts expreſſed in minutes for the ſame latitude in the ſpheroid, provided it be oblate.

Example: if $mm : 1 :: 1000 : 22$, then the greateſt difference of the Meridional parts in the ſphere and ſpheroid is 76.0929 minutes: in other caſes, it is found by multiplying the remainder abovementioned by 1174.078.

When the ſpheroid is oblong, the difference of the Meridional parts in the ſphere and ſpheroid, for the ſame latitude, is then determined by a circular ark. *Phil. Tranſ.* N°. 461.

MESE'NTERY (*Dict.*)— The diſorders incident to the Meſentery deſerve our moſt attentive conſideration, ſince the ſuperfluous humours of the veins are eaſily conveyed to it, and lay a foundation for very terrible diſorders, ſuch as a cholera, melancholy, fluxes, gripes, cachexies, atrophies, languors, ſlow and erratic fevers, together with other diſeaſes, whoſe natures are not to be diſcovered without great difficulty. When the Meſentery is affected with a tumor without inflammation, the tumor is generally, at firſt, lax and ſoft, but, ſome time after, becomes intirely dry and indurated. This tumor, and the part in which it reſides, are inſenſible of pain; for which reaſon the internal ſwelling, which lies pretty deep, is only to be diſcovered by a rough touch.

In this caſe, the part affected is diſtended, which leſſens the diameters of the inteſtines, and, by that means, occaſions coſtiveneſs; which effect is by no means produced by a tumor of the abdominal muſcles, or prominent fat; for neither of theſe affect the inteſtines. The fat, alſo, when laid hold of by the hand, may be diſtinguiſhed from the abdominal muſcles. But, when the tumor is lodged in the abdominal muſcles, it is always diſcoverable by the firſt touch, and is ever painful when preſſed, and ſometimes painful without any compreſſion. Beſides, a tumor of the abdominal muſcles is prominent, when not preſſed; perceptible upon the mildeſt touch, and of an oblong figure, like that of the muſculus rectus. *Lommii Medic. Obſervat.*

Obſtructions of the Meſentery proceed from the ſame cauſes with thoſe of the liver and ſpleen, but happen more frequently and eaſily, by reaſon of the narrowneſs of the meſeraic; and, eſpecially, of the lacteal veſſels, which convey the chyle to the organs allotted for the ſecond digeſtion. And when the chyle, which is ſo often mixed with crude and groſs humours, ſtagnates, and produce obſtructions, in the lacteal veins, the meſaraic veins are, alſo, obſtructed by groſs humours conveyed from the liver, ſpleen, and other parts, and lodged there for a conſiderable time. During the ſtay of theſe humours, they become gradually thicker, ſo, as at laſt, ſometimes, to produce a ſcirrhous tumor. With theſe humours are, alſo, ſometimes, mixed groſs flatulences, which generally prove the cauſes of violent ſymptoms. To the obſtruction, alſo, or rather the contraction, of theſe veſſels, we refer the compreſſion of the glands diſperſed through the whole ſubſtance of the Meſentery; for theſe, increaſing beyond meaſure, as happens in ſtrumous perſons, compreſs the meſaraic veins, and hinder not only the due diſtribution of the chyle, but, alſo, the circulation of the blood.

The diagnoſtic ſigns of obſtructions of the Meſentery are divided into three claſſes, which either indicate the ſpecies of the diſeaſe, the part affected, or the productive cauſes.

The ſigns which indicate the ſpecies of the diſorder, that is, obſtructions of the hypochondria, and their cauſes, are the ſame with thoſe producing obſtructions of the liver and ſpleen. But the ſigns which in a peculiar manner indicate, that the Meſentery is affected, are tenſion and reſiſtance in the middle of the abdomen, under the ſtomach, and in the umbilical region, where there is, alſo, a ſenſe of weight, ſometimes an obtuſe pain, and ſometimes one of an highly acute kind, when flatulences are contained in theſe parts: a pain is, alſo, ſometimes, perceived in the back, to which the Meſentery is affixed; rumblings and noiſes happen in the belly, eructations are excited, and vapours are raiſed to the head, by which means various ſymptoms are produced: in a word, all the ſymptoms which generally attend melancholy, indicate obſtructions of the Meſentery, becauſe that diſorder is produced and cheriſhed by obſtructions of the ſame kind.

As for the prognoſtics: this diſorder is not of itſelf very dangerous, becauſe the Meſentery is capable of bearing great diſturbances, without any immediate danger to life. Beſides, generous remedies may be uſed for the cure of this diſorder, which, when duly exhibited, generally produce the deſired effect, unleſs the diſorder cauſes hypochondriac melancholy, which, on account of the obſtinate nature of the melancholic humour, is generally called the reproach of phyſicians. But, as the Meſentery is not furniſhed with an exquiſite ſenſation, and as the obſtructions of it are generally not very troubleſome to the patient, they are often neglected, and lay a foundation for other highly dangerous diſorders.

The cure of this diſorder is to be performed in the ſame manner with that uſed for removing obſtructions of the liver. *Riverius, Prax. Med.*

MI'LIUM, *millet*, the ſeed of a plant, which by conſent of authors, both ancient and modern, is refrigerating and drying; it is of bad juice, difficult of digeſtion, binds the belly, and generates flatulences; it is, however, well known to be a very grateful food to many nations at preſent. In former times it ſerved to make bread, under a dearth of better corn, as we are aſſured by Dioſcorides, Pliny, Galen, and others of the ancients. Among the Italians, ſays C. Bauhine, loaves made of millet, which are yellow, are eaten hot by many, not out of neceſſity, but for their ſweetneſs; but, when this bread is grown hard, it is quite black. Of the flour of millet and milk the Italians make fine cakes, which muſt be eaten as ſoon as dreſſed, or elſe they become glutinous, and ungrateful to the taſte. In former times they made a ſort of white puddings of millet, as Pliny tells us. And among the Coſſacks and Tartars, their principal food is millet, the crude meal of which they mix with the milk of mares, or with blood drawn from the crural vein of their horſes. A pudding, prepared of millet, boiled in milk, with an addition of butter, and ſugar ſprinkled over it, is much in requeſt among the Germans at preſent; and theſe puddings have been long ago introduced into England, and are ſtill in faſhion.

The flower of millet was formerly uſed in fomentations for the gripes, and for pains of the head and nerves; it was applied externally in bags, becauſe the uſe of it in cataplaſms was difficult, on account of its friability. If the membrane of the brain happens to be wounded, it is excellently conglutinated ſays Archigenes, by infuſing thereon the juice of calaminth, and ſprinkling it with the dry flour of millet. A decoction of millet, with figs and raiſins, is called by Heurnius a noble ſudorific and diuretic. Or, take of a decoction of millet, boiled till it burſts, four ounces; white wine, two ounces. Let the patient take it hot. *Cheſneau. Raii Hiſt. Plant.*

Millet is diuretic and aſtringent; the ſeeds are of extraordinary ſervice in diſeaſes of the lungs, and exulcerations of the kidneys; made into a cataplaſm, they are anodyne and reſolvent. *Hiſt. Plant. adſcript. Boerh.*

Indian MI'LLET.—It delights in a fat and humid ſoil; for which reaſon ſome ſow it in their fields to correct their luxuriance; it was brought from India into Spain, Italy, and other warm countries: they ſow it in ſummer, and reap it in autumn.

The ſeed is like panic both in taſte and temperament. The pooreſt ſort of people in Italy, and the peaſants in the Paduan, grind the ſeed, and make it into loaves, which are friable, and afford but little nutriment, being black, difficult of digeſtion, and binding. It is more uſual to make puddings, or white pots, of the flour and milk. In Tuſcany they ſow it more for the ſake of feeding their poultry, than to ſerve as aliment for men. They, alſo, give it to their cows, horſes, and ſwine. Of the pith of the ſtalks is prepared an excellent remedy for the ſtrumæ; the preparation of which ſee in the Bauhines and Matthiolus; which laſt author commends, alſo, the flowers, for uterine fluxes and the dyſentery. *Raii Hiſt. Plant.*

MILLEFO'LIUM, *yarrow*, in botany, a genus of plants, whoſe characters are:

The leaves are very finely cut; the calyx is ſquamoſe, and almoſt cylindrical; and the flowers are very cloſely collected into umbella's.

Yarrow has a white creeping root, which ſpreads much on the ſurface of the ground. The leaves are long and narrow, having on each ſide ſeveral very finely divided pennæ. The ſtalk is firm and erect, a foot or two high, ſomewhat hairy, and beſet alternately with ſmaller, and rather finer leaves. The flowers grow on the top of the branches in flat umbels, each flower being made of five little, white, roundiſh leaves, ſet about a thrum of the ſame colour, growing in a ſcaly calyx, in which is contained flattiſh white ſeed. It grows every-where in the fields, and flowers in June and July. The leaves are uſed.

Yarrow is cooling, drying, and binding; very ſerviceable in in all kinds of hæmorrhages, whether ſpitting or vomiting blood, bleeding at the noſe, dyſentery, or the too great flux of the menſes, or violent flooding, cooling, and tempering its immoderate heat and ſharpneſs. It, alſo, helps a gonorrhœa, ſtrangury, heat of urine; and, applied outwardly, is of ſervice againſt ruptures, and to ſtaunch the bleeding in freſh wounds. *Miller's Bott. Off.*

This plant is a little acrid, bitter, aromatic, and gives a conſiderable tincture of red to blue paper. It ſeems to me, that the acid part of the natural ſalt of the earth, diſengaging itſelf of the other principles through the texture of this plant, forms, with the terreſtrial parts, an aluminous ſalt, united with a little eſſential aromatic oil.

By the chemical analyſis are extracted from the yarrow ſeveral acid liquors, a great deal of earth, no volatile concrete ſalt, and a little urinous ſpirit.

Thus this plant is vulnerary, reſolvent, and aſtringent. It is uſed in ptiſans, and infuſions, after the manner of tea. Some boil its leaves in broths, to ſtop all ſorts of hæmorrhages, and eſpecially the irregular flux of the piles and fluor albus. Its juice is preſcribed from eight ounces to ſix; the powder, from a drachm to half an ounce: it is mixed, alſo, with paſte, to make aſtringent biſcuits. Tabernæmontanus ſays, the water of yarrow is good for the epilepſy; and that the wine of mead, made with this plant, ſtops all ſorts of irregular fluxes. *Martyn's Tournefort.*

MINE (*Dict.*)—*Tracing of* MINES, a term uſed by our miners, to expreſs the tracing up the mineral appearances on the ſurface of the earth to their head, or original place, and there diſcovering a Mine of the metal they contain.

This practice depends on the change wrought on the face of the earth by the deluge, of the effects of which theſe remains are a very great proof. The ſuperficial, or upper part of veins, is always the poor, the richer ores lying deeper, the poor ones only ſerving to lead the way. Theſe poor ores, or ſtones impregnated with the metallic matter of the Mine, and called by our workmen ſhoad-ſtones, were probably, at the creation of the earth, brought regularly up to the ſurface, and ſhewed the places of the metals below. But, at the time of the covering the earth by the waters of the deluge, they were, with the reſt of the ſurface, waſhed off, and carried, with the deſcent of the water, down into the plains, or into the beds of rivers, and there carried many miles down the ſtream. This being an allowed truth, the art of training a Mine is eaſy; for, though this carrying the ſhoad-ſtones and poor ore was done ſo many ages ago, yet, all the way that ſome pieces were carried on, others would be depoſited by the way, and, the heavieſt and richeſt falling firſt, the lighteſt would always be carried fartheſt, and there would be always left a ſtream of this matter all the way from the place where it was firſt produced, that is, where the Mine now is; for the breaking of the ſurface of the earth, at this great cataſtrophe, was not ſo deep as to reach that; and this ſtream or train of matter will be found richer and richer as it approaches the Mine, and finally will ſtop at the place where it is.

Where there is ſuppoſed to be a Mine of any metal, the hills and countries all about are diligently ſearched; the ſituations, and deſcent of the lands, and the earth, ſtones, and other foſſil bodies, are examined, particularly the colour and nature of the various ſorts of earth and ſtones which are found on the hills where the Mine is ſuſpected to lie, that they may be readily known again, if any of them are found in the neighbouring valleys. The ſtones which denote the loads, and are called ſhoad-ſtones, are found two, three, four, or even five miles from the hills, where they originally lay; but, if the ſame ſort of ſtones are remembered on the hills, the train is to be made out.

After any great land-flood, in which it is ſuppoſed there are uſually ſome new frets made in the banks of the rivers, theſe are carefully examined, to ſee whether any metalline ſtones may be found in their ſides and bottoms, all being then ſo clean, that the ſmalleſt ſhoad-ſtone may uſually be ſeen. If no ſtones of this kind are found, it ſometimes is of uſe, in order to farther reſearches, to examine whether any pieces of earth, of a different colour and nature from that of the reſt of the bank, be found; for, this being, if any ſuch is found, waſhed alſo from the neighbouring hills, it proves a great direction which ſide of the hill to ſearch into.

If no ſhoad-ſtone or grewt of a different nature from the reſt be found in theſe frets or newly worn banks, the miners leave the place for the preſent. For though the bed of the river afford many metalline ſtones, they never regard them, the continual change of place they receives from the current of the water, rendering them only tokens that there is metal ſomewhere in the country; but they confound and perplex rather than inſtruct in the ſearch after the places where it is.

If there be found indeed ſtones of the ſhoad-kind, full of protuberances, or having ſharp angles, as if newly broken, it may be worth while to ſee whether they are not waſhed out of ſome part of the neighbouring banks by the late floods; as this ſort of appearance is a token of their having been newly taken into the bed of the river. But, if they are rounded and ſmooth, it may be concluded that they have been long ſubject to the action of the water, and brought, perhaps, many miles from the places where they were originally lodged in the earth, where only they could have been of any uſe to the tracer of the Mine.

When the frets in the ſides of rivers have been traced in vain, the ſearcher after a Mine goes up to the ſides of the hills moſt ſuſpected to have Mines in them, and there ſeeks for a convenience of bringing a little ſtream of water to run down. When this is found, he cuts a trench about two feet over, and as deep as the ſhelf. The water is turned into this cut, and after two or three days running in it, all the filth will be waſhed away, and the looſer part of the earth cleared off; and if any ſhoad-ſtones are lodged within the whole courſe of this cut, they will be found. If any ſuch are found, it is an unqueſtionable proof that there is ore in the higher parts of the hill; this encourages the work, and there is always found a Mine, or at leaſt a ſquat, which will, without much danger, repay the expence and trouble. The ſquats are flat parcels of the ore, lying in different and diſtinct places of the hills, and not communicating with one another.

Sometimes a great deal of this labour is ſaved, and the ſhoad-ſtones are found on the ſurface of the ground, either turned up by the plough, or thrown up in ſmall quantities in molehills, or raiſed by ſome other accident; for they are ſeldom found naturally lying on the very ſurface of the earth; for the putrid remains of vegetable and animal ſubſtances, and other adventitious matter, have raiſed the ſurface of the earth in all places, ſince the time of the flood, and made indeed a ſort of new ſurface. Theſe ſtones were certainly laid bare on the ſurface of the ground, at the time of their being carried down from the Mines; but this adventitious matter has buried them in this long tract of time, and they are generally found under about a foot of a ſort of vegetable mould. If, by any of theſe ſearches, a ſhoad is found, the miners have nothing to do but to follow it to its head, and there make the opening; but if no ſuch direction can be had, nor any ſhoad found, and there is yet ſuſpicion that there is a Mine in the hill, the method is to make an eſſay-hatch, as it is called; this is ſunk near the foot or bottom of the hill, and is an opening of about ſix feet long, and four feet broad, made in the ſearch of a vein as deep as the ſhelf; this is a caution that muſt be always carefully obſerved, for if they are made leſs deep than this, they may miſs of the vein, though there is one. And the ſinking thus deep is always attended with certainty, for if no ſhoad is found on this, it may be concluded there is none there; except that ſometimes it is found that the ſhoad has been waſhed clean away, within two or three feet from the land: and then the load or vein is two feet farther, or thereabouts, up in the hill. If any ſhoad is found in the eſſay-hatch, there is a certainty of a vein of ore; neither doth it add a little toward the making a conjecture how high up the hill, or how far off the vein ſtring, or bonny, is, carefully to mark how deep from the ſurface of the earth the ſhoad lies, for this is held an infallible rule, that the nearer the ſhoad lies to the ſhelf or faſt ground, the nearer the vein itſelf is, and vice verſa.

When there is no ſhoad or appearance of a Mine found in the firſt eſſay-hatch, if the conjecture of a Mine being in the hill has any tolerable foundation, the tracing it does not end here; but they go ten or twelve fathoms up the hill, and there open a ſecond eſſay-hatch, and if no ore or ſhoad-ſtone is found in this, they go as many fathoms on each hand at the ſame height with the ſecond hatch; and there open a third and a fourth hatch, of the ſame depth and dimenſions with the firſt; if in neither of theſe there is found any ſhoad-ſtone, they aſcend proportionably with three more hatches, if the ſpace of ground requires, at every ten or twelve fathoms, and in this manner open them three abreaſt, at twelve fathoms diſtance up to the top of the hill. If no ſhoad is found in any of theſe, it is concluded then that there is no tracing a Mine there, and the hill is left.

If any ſhoad is found in any of theſe hatches or openings, the aſcending hatches from this are kept on in a direct line, and, the deeper the ſhoad lies, the nearer the vein is. The ſhoad grows gradually deeper from the ſurface, but nigher the ſhelf as they approach the Mine: as, ſuppoſe it be but half a foot from the ſhelf and ſeven feet deep from the ſurface, the vein is then concluded to be within a fathom or two; and on this the firſt proportion of twelve fathoms between every hatch is leſſened, to ſix, four, two, one, or even leſs than that, as the vein is conjectured to be more and more near.

It often happens, for want of a good gueſs in this matter, that the diggers over-ſhoot the load; that is, they open their next hatch too high up the hill, or above the load or vein: this is a miſtake eaſily diſcovered and eaſily rectified. If a ſhoad is found lying near the ſhelf in one hatch, and in the hatch above there is no ſhoad at all, it is a proof that the hatch is too high, and the remedy is only to ſink a hatch at a middle diſtance between the laſt two, which will probably fall upon the very point of the load, and finiſh the work of tracing.

Sometimes it happens that, in continuing the tracing of the firſt ſhoad, a ſecond or new one is found; it is not uncommon for two ſhoads to be thus found in one hatch, and this is eaſily diſcovered without any danger of miſtake; for ſuppoſe in the laſt hatch the ſhoad which they trace lay at eight feet deep, and in this it lies at ten feet, and, beſides this, there is a ſhoad found at two feet depth; it is very certain, that the ſhoad at ten feet deep is the ſame they were before tracing, and this is a new one pointing to another vein or load, which is now firſt diſcovered ſo near the ſurface of the earth. This has generally gravel or earth mixed with it, and is to be carefully examined; when the higher hatches are opened, this is continually found, as well as the old load; and when the firſt is traced to the point of the vein, this ſecond is to be continued in the ſame manner, by other hatches opened at the ſame diſtances above: it often happens that in tracing this ſecond ſhoad, the hatches dug for it diſcover another new one or a third ſhoad; all theſe are to be traced one over the other by the ſame hatches, and will all be found worth the ſeeking after. The old writers on minerology agree with us in this obſervation, and tell us, it is not uncommon in ſome places to find as far as ſeven loads lying parallel to one another in the ſame hill. In theſe caſes, however, there is uſually one maſter-load, or grand vein; the other ſix, that is, three on each ſide, being the leſſer or concomitant veins. Five in the ſame manner ſometimes lie in this order, the grand load in the middle and two on each ſide; but the more common method is three, a large one, and two ſmaller.

Every load has a peculiar coloured earth or grewt about it, which is found alſo with the ſhoad, and this always in a greater quantity, the nearer the ſhoad lies to the load, and becomes leſſened by degrees to the diſtance of about a quarter of a mile, further than which that peculiar grewt is never found in any quantity with the ſhoad; ſo that this is a proof that the load or vein is near, when it is found in quantity.

A valley may chance to lie at the foot of three ſeveral hills, in ſuch a manner, as to contain three ſeveral grewts, or that earth which was moved with the ſhoad in the concuſſion of the ſtrata at the deluge, with as many different ſhoads or trains of ſhoad-ſtones in the midſt of each: in this caſe it will be very neceſſary to know the caſt of the country, and of each hill in reſpect to its grewt, for the ſurer training of them one after another as they lie in order: according to the foregoing rules of eſſay-hatching, the uppermoſt in this caſe always directs which hill to begin with firſt.

It ſometimes happens that, after having trained the ſhoad found in a valley up to the upper parts of a hill, there is only a ſquat, or bonny, found inſtead of a right vein of ore, for theſe detached parcels of ore have their ſhoads as well as the right veins. Theſe are uſually about two or three fathoms long, and a fathom broad; few of them are larger, moſt leſs, and they never communicate with any other load or vein, nor ever ſend forth any of their own. The extremities of theſe beds of ore terminate without ſending out any ſtrings, not lying within walls as the loads; but though they are in the ſhelf or faſt ground, not moved by the flood, their ſurface is equal every-where with that of the imaginary ſhelfy one, and they go down five or ſix fathoms deep and there terminate at once. The ore contained in theſe are rich, and they are always wrought out to the conſiderable advantage of the owners.

Theſe are the general rules of tracing Mines, and though ſomewhat tedious and expenſive, they are certain, and never liable to the error and diſappointment the other ſhorter ways, as they are called, are liable to. Theſe ſhort ways are by the virgula divinatoria or the hazel-wand, whoſe bending in certain places, without any external viſible force, is to point out the place where the vein of ore lies: the waters thought to iſſue from the particular loads are alſo uſed by ſome as a ſhort means of finding the veins; other of theſe ways are alſo by mineral ſteams and effluvia, by the barrenneſs of the ſoil, and the pitching of nocturnal lights on the ſuppoſed orifices of mines. But theſe methods are too extravagant or too uncertain to be uſed in caſes of ſo much conſequence. When the mine is found by more certain rules of tracing, the digging it is a matter of leſs difficulty.

Engliſh MI'NERALS.—Dr. Woodward has obſerved, that the Engliſh Minerals are much more valuable and numerous, than has been generally ſuppoſed. Fuller's earth, a thing ſo cheap as to be diſregarded by many, he obſerves, is of almoſt as much value to our commerce, as any article of foreign production. The property this earth has of imbibing oil and greaſe, is not confined to the trifling ſervice of taking out accidental ſtains in cloaths, but it is of ſo much uſe in cleanſing the wool and the cloth made of it, that we could never have flouriſhed in the cloth trade in the manner we have done, had we not this foſſil among us ſo plentiful and cheap, and at the ſame time ſo excellently good. This earth is one inſtance of the pre-eminence of our ſoil above others. Another inſtance we have in our black lead or wadd, a mineral of great uſe and value in ſeveral branches of trade and arts; and which is found no where fine and good, except in England, and in our colonies; and that of the laſt place, though better than the black lead of other nations, is greatly inferior to our own.

The amber and jet of England are found in conſiderable quantities, and are equal to thoſe of any other part of the world. Our canal coal comes very near the beauty of jet, and even our common coal for firing is greatly ſuperior, in goodneſs, to that of any other part of the world, and is no where found in ſuch vaſt plenty as with us. The Engliſh earths and gravel are well known to be ſuperior to thoſe of other countries, in none of which, ſuch graſs plats or ſuch gravel walks are to be ſeen, as in the Engliſh gardens. We have ſtones, ſlates, flags, and the other neceſſary foſſils for building, in ſufficient plenty.

Vitriol and alum are found in greater plenty in England, than in any other country; and are ſo eaſily worked or procured from their ores, that we can ſell them cheaper than any other people. *Woodw. Cat. Foſſ.*

Tin is another article, in which England has always had a great pre-eminence; the county of Cornwall alone produces more tin than all the world beſides, and the tin of England is well known to excel that of other nations, as well in value as in quantity.

Lead ore is alſo richer in England than in any other country, and is found in greater quantities here than any where elſe; beſides this, it runs more kindly in the fire, and requires leſs trouble and expence in the working, than any other lead; and is, when wrought, much finer and more ductile, than any other lead.

This does not ariſe from any peculiarity in the metal, for lead is the ſame in all countries, when equally purified; but the ſpar which lies about, and is mixed with our lead ore, is of ſuch a nature and diſpoſition, that it is eaſily wrought upon and readily parts from it, leaving the metal more pure than it can be procured by the common large operations in other countries; ſo that they are forced to ſend it away much leſs pure than ours is.

Copper and iron are alſo found in very great plenty, and ſeveral ores of theſe metals have of late been brought into uſe, which were not known before the modern improvements in chemiſtry.

MINERO'LOGY (*Dict.*) — The neceſſity of cleaving and opening rocks has always been accounted one of the moſt troubleſome articles in the buſineſs of mining; they being often compoſed of ſuch ſtone as tools can work but very ſlowly upon in the common ways. Fire and gun-powder have been the two things principally had recourſe to on theſe occaſions; and both ſucceſsfully, but in different ways. The fire calcines ſtones, and they then eaſily become ſhattered to pieces, and give way to tools that would not touch them before; but in this caſe, beſides the expence of wood, the hinderance of the labourers is an article to be conſidered, for the rocks are made ſo hot all about the place where the fire has been, that the people cannot get to work again for a day or two, and then the effect of fire reaches but a little way in the rock.

Gun-powder makes its way much farther, and at the ſame time is much cheaper and does not delay the work, but the labourers may go on immediately afterwards. There have been many ways contrived of uſing this, but one of the ſimpleſt and beſt ſeems to be that delivered by Mr. Beaumont, in the Philoſophical Tranſactions. For this there are only three ſimple inſtruments required, a borier, a gun, and the quinet or wedge. Theſe are the names the miners on Mendip-hills give the inſtruments. The borier is an iron inſtrument, ſteeled at the end; it is two feet two inches long, and is ſomewhat thicker at the ſteeled end than in any other part: the uſe of this is to make the hole in the rock deep enough to receive the powder. The gun is about ſix inches long, and an inch and quarter in diameter; and has a hole drilled through it, to receive the priming. The quinet is a wedge of iron of about ſix inches long, and ſo ſhaped, that its flat part on one ſide joins with a flat part in the gun made to receive it, and by that means the gun is faſtened very firmly in its place. *Philoſ. Tranſ.* Nº. 167.

The manner of uſing theſe inſtruments is this: one man holds the borier on the rock, turning it round, while another forces its point in by blows of a large hammer on the other end. When the hole is made ſomewhat deeper than the length of the gun, they dry it with a rag, and then put into it two or three ounces of powder; over this they lay a paper, and then they put the gun into the hole, and faſten it in by driving in the quinet or wedge againſt its flat part. When the powder and gun are thus fixed, they paſs down a wire through the hole drilled in the gun, and with this they pierce a hole through the paper that covers the powder; they then prime the gun, and lay a train with a lighted match; but all go out of the mine before the gun-powder takes fire, and, as ſoon as it has gone off, they go down to work again, finding the rock ſplit, and the inſtruments unhurt. The paper in this caſe is put over the powder only, that the tools may be ſafely employed in driving down the gun and the quinet, becauſe, were not the powder covered, it might do miſchief to the workmen by going off by ſome ſpark cauſed by ſtriking either againſt thoſe inſtruments, or againſt the rock itſelf.

MI'SSEL-*bird*, in zoology, the common Engliſh name of the larger ſpecies of thruſh, called alſo the ſhrite, and by authors the turdus viſcivorus major. It is much larger than any other of the thruſh kind. Its legs and feet are yellow; its head of a browniſh lead colour; and its back, tail, and rump, of the ſame colour, with an admixture of yellow; but, in the ſummer months, it a little changes its colour, and becomes more grey, or of the colour of unripe pickled olives; its throat, breaſt, and belly, are all variegated with black ſpots; the middle of its belly whitiſh, and the upper part of its breaſt, and part of its ſides, and the under feathers of its tail yellowiſh. *Ray's Ornithology.*

MIST.—The bluiſh Miſt, which we ſometimes ſee on our fields and paſtures in a morning though often innocent, yet has been in ſome places found to be the actual cauſe of murrain, and other fatal diſeaſes among the horned cattle.

Dr. Winklar gives, in the Philoſophical Tranſactions, an account of a murrain affecting the cattle in Italy and other places, which was evidently ſeen to ſpread itſelf over the countries in the form of a blue Miſt. Wherever this was perceived, the cattle were ſure to come home ſick; they appeared dull and heavy, and refuſed their food; and many of them would die in four and twenty hours. Upon diſſection there were found large and corrupted ſpleens, ſphacelous and corroded tongues; and in ſome places thoſe people who were not careful of themſelves, in their management of the cattle, were infected and died as faſt as themſelves. The principal cauſe of this diſeaſe ſeemed to be the exhalation of ſome unwholeſome ſteams from the earth; and it was obſervable, that there had been three earthquakes in Italy the year before it happened. The method of cure which ſucceeded beſt, was this: as ſoon as any beaſt appeared to be ſick, they examined the tongue, and, if aphthæ, or little bliſters, were found on it, they ſcraped it with a ſilver inſtrument made with ſharp teeth at the ſides, till it bled in all thoſe parts where the apthæ were; the blood was then wiped away with a cloth, and the whole tongue waſhed ſeveral times with vinegar and ſalt. After this the following medicine was given internally: take of ſoot, brimſtone, gun-powder, and ſalt, of each equal parts; mix theſe in as much water as will make them thin enough to be ſwallowed, and let a ſpoonful be given for a doſe three or four times a day. The cattle which were in health had this medicine given them, as well as the ſick; and the conſequence was, that very few died in Switzerland, while almoſt all died in other places.

It was very remarkable that the contagion, on this occaſion, ſeemed to travel ſlowly and regularly on: it came at the rate of about two German miles in twenty-four hours: this it kept regularly to, during the whole time of its raging, and never appeared in very diſtant places at the ſame time.

The whole ſurface of the earth emitting theſe effluvia, no cattle eſcaped them in the courſe of their way, but thoſe which were kept within doors at rack and manger fell ill at the ſame time, and in the ſame manner with theſe in open fields. Dr. Slare was of opinion, that it was owing to certain inſects which could not fly faſter than at the rate of two German miles a day; and that they travelled regularly, and ſpread the miſchief where they paſſed; but there wanted ſome judicious perſons, verſed in theſe obſervations, to have examined both the ſtate of the air, and the beaſts, on this occaſion. *Philoſ. Tranſ.* Nº. 145.

MITE, in natural hiſtory, the name of a ſmall animal, very well known and found in old cheeſe, and many other bodies both recent and periſhing.

To the naked eye the Mites in cheeſe appear like moving particles of duſt, but the microſcope diſcovers them to be perfect animals, having as regular a figure, and performing all the functions of life as perfectly as creatures that exceed them many times in bulk. See *Plate* XXXI. *fig.* 8.

They are cruſtaceous animals, and are uſually tranſparent; the principal parts of them are the head, the neck, and the body. The head is ſmall in proportion to the body, and has a ſharp ſnout, and a mouth that opens and ſhuts like a mole's. They have two ſmall eyes, and are extremely quick-ſighted; and, when you have once touched them with a pin, you will eaſily perceive how they avoid a ſecond touch.

They are of different ſorts; for ſome of them have ſix legs, and others have eight. Each leg has ſix joints ſurrounded with hairs, and two little claws at the extremity, with which it very nicely takes hold of any thing. The hinder part of the body is plump and bulky, and in an oval form, from which there iſſue out a few exceeding long hairs. Other parts of the body and head are alſo beſet with thin and long hairs.

The males and females are eaſily diſtinguiſhed in theſe little animals. The females are oviparous as the louſe and ſpider, and from their eggs the young ones are hatched in their proper form, without having any change to undergo afterwards. They are, however, when firſt hatched, extremely minute, and, in their growing to their full ſize, they caſt their ſkins ſeveral times.

Theſe little creatures may be kept alive for many months between two concave glaſſes, and applied to the microſcope at pleaſure. They are thus often ſeen in winter, conjoined tail to tail; and this is performed by an incredible ſwift motion. Their eggs, in warm weather, hatch in twelve or fourteen days; but, in winter, they are much longer. Theſe eggs are ſo ſmall, that a regular computation ſhews, that ninety millions of them are not ſo large as a common pigeon's egg. *Baker's Microſcope.*

MNE'ME-*cephalicum balſamum*, the name of a famous compound balſam, ſaid to have been purchaſed from a certain Engliſh phyſician by Charles Duke of Burgundy, at the price of ten thouſand florins. Some who have been very laviſh in its praiſes have affirmed, that it has a power of preſerving in the mind the remembrance of all things that are paſt; but this ſeems ſtretching the praiſe of it a little too far. It is prepared in the following manner: take of the juices of the leaves of baum and baſil, of the flowers of tamariſk lilies, primroſes, roſemary, lavender, borrage, and broom, of each two ounces; of lilies of the valley, roſes, and violets, each one ounce; of cubebs, cardamoms, grains of paradiſe, and yellow ſaunders, carpobalſamam, Florentina iris, ſaffron, ſavory, piony flowers, and thyme, of each half an ounce; of liquid ſtorax, ſtorax calamita, opoponax, bdellium, galbanum, gum ivy, and labdanum, of each ſix drachms; roots of long birthwort and piony, and oil of turpentine, ſpikenard, coſtus, juniper, bays, maſtich, ben, and ſpike, of each, five drachms. The dry ingredients are to be beaten to powder, then mixed with the reſt, and, a ſufficient quantity of water being added, the whole is to be diſtilled by an alembic, and the oil carefully ſeparated from the water. The method of uſing it is this: the firſt two months the paſſages of the ears and noſtrils are to be anointed with the bigneſs of a pea of it every day; then, for two months longer, the ſame is to be repeated every third day; after this, it is to be uſed once a week; then, once a fortnight, till a year is expired; and, after this, it is to be uſed once in two months for the ſucceeding years. This is the account of Sennertus. *Sennert. Pract.*

MNI'UM, in natural hiſtory, the name of a genus of moſſes, the characters of which are theſe: it has heads of two different kinds, the one ſort naked and duſty, having no calyptra or other covering; the others are regular capſules, like thoſe of the hypnum and bryum, containing a fine powder, and covered with a calyptra or hood. This diverſity in the fructification diſtinguiſhes the Mnia from all the other moſſes; but theſe diverſely conſtructed heads are in ſome ſpecies found on the ſame plants; in others, on different ones of the ſame ſpecies, as the male and female flowers are in hemp, mercury, and many others of the larger plants. The ſtalks which ſupport the membranaceous heads are long and naked; thoſe which ſupport the naked heads, are in ſome naked, in others covered with leaves; but they are in all ſhorter than the others. *Dillen. Hiſt. Moſc.*

MI'XTURE, *mixtura ſimplex*, *ſimple mixture*, in pharmacy, the name of a form of medicine uſed in the preſcriptions of ſome modern phyſicians. It is made by mixing ten ounces of the ſpiritus theriacalis camphoratus of Bates, ſix ounces of ſpirit of tartar, and two ounces of ſpirit of vitriol; theſe are to be ſet in a glaſs hermetically ſealed for three weeks, that they may be perfectly mixed; the doſe is a drachm or thereabouts. Its virtues are, that it reſiſts putrefaction, promotes ſweat, and is of great ſervice in malignant fevers.

MO'AR-*loore*, in huſbandry, a term uſed to expreſs a peculiar diſtemperature of corn, generally comprehended under the common term of a blight. In this caſe the earth ſinks away from the roots of the corn, and leaves the plant ſtanding in great part above ground with naked roots; theſe being too weak to ſupport the ſtalks, the plants fall, and the ears become light. This a diſtemperature peculiar to corn, growing on light and looſe lands. *Tull's Horſehoing Huſbandry.*

The remedy is this: turn a ſhallow furrow againſt the rows, when they are ſtrong enough to bear it, and the mold is fine and dry; the motion of the ſtalks with the wind will draw in this looſe powder, and it will ſpread itſelf equally among all the plants in the row, though it be triple or quadruple. It is eaſy to ſee that this remedy is only practicable in the method of the horſehoeing-huſbandry; for, in the common way of ſowing, there is no means of relief in this caſe. And, in general, the horſehoeing-huſbandry prevents the falling of the wheat, the ſtalks never drooping ſo abſolutely in the drilled wheat, as they do in that ſown the common way.

MOCK-*Bird*, the name of an American bird of the merula kind, and very much approaching the blanvogel or cæruleus. It is of the ſize of the common lark: its beak is ſhort and ſtraight, its tail very long, and its whole body of a very fine deep blue. *Ray's Ornith.*

MOCK-*Lead*, in minerology, a name given by the Engliſh writers to a ſort of foſſil, called alſo blende and galena. It has very much the appearance of an ore of lead, being bright and gloſſy, of a bluiſh black colour, and plated; but, on trial, it is found to yield very little or none of that metal.

MODE (*Dict.*) — Some Modes cannot exiſt without the ſubject, as being only circumſtances thereof; as roundneſs, length, &c. but there are others which are likewiſe ſubſtances, as apparel, hair, nails, &c. which may ſubſiſt without the ſubject.

MODI'LIONS.—*Plate* IV. *fig.* 5, in the Dictionary, repreſents a Modilion of Vignola, and *fig.* 8. a Modilion of Scamozzi.

MO'FFAT-*Waters*, mineral waters of conſiderable efficacy at Moffat, in the county of Annandale. They ariſe from two ſprings on the declivity of a hill, which yield about 1360 gallons of water daily. Theſe waters have a ſulphureous taſte and ſmell, like the waſhings of a gun-barrel; their colour is milky or bluiſh. The ſeaſon for uſing them is between the middle of April and the end of September; but they may be drank all winter, and, if the rains be moderate, the ſtrength of the water is not found to be impaired. The water of the upper ſpring, being too foul for drinking, is made uſe of for bathing, and is, for this purpoſe, made ſomewhat warmer than tepid. The quantities of water, uſually drank, are pretty large, exceeding ſometimes a gallon. It is uſual to join purgatives, and that in great doſes, frequently repeated with the uſe of the waters; but this is thought unjuſtifiable by ſome. The water is alterant and diuretic. Its purging is owing to the large quantities drank, or to ſome ſingularity in the conſtitution, as a weak ſtate of the ſtomach and inteſtines. Few medicines are ſaid to be ſuperior to theſe waters in diſorders of the ſtomach and bowels. It has alſo proved uſeful in nephritic, nervous, and hyſteric cholics, melancholy, barrenneſs, female weakneſſes and diſorders, as alſo in old gleets, either natural, or cauſed by venereal diſorders. In rheumatic and ſcorbutic complaints it is advantageous, and in cutaneous eruptions. It is ſaid ſeldom to fail in ſcrophulous diſorders. This water gives but ſmall marks of a chalybeate nature with galls, nor any of acidity with tincture of roſes, or ſyrup of violets; neither does it produce any effervеſcence with oil of tartar per deliquium, or ſpirit of ſal ammoniac. It ſeems to contain a ſubtile volatile ſulphur, but in a ſmall quantity, ſince it ſoon loſes its remarkable ſmell and taſte, when expoſed to the air, and that acid liquors can neither ſeparate nor precipitate it. Upon evaporation, there is found a dirty ſalt mixed with earth. This ſalt ſeems not to be nitre, nor ſal ammoniac, but common ſalt, and, by a ſlow evaporation of a ſolution of ſea ſalt, cryſtals, not unlike thoſe of the ſalt of Moffat-water, have been obtained. A particular account of theſe waters may be ſeen in the firſt volume of the Edinburgh Eſſays phyſical and literary.

MOIRE, in conchyliology, the mohair ſhell, a name given by the French virtuoſi to a peculiar ſpecies of voluta, which ſeems of a cloſely and finely reticulated texture, and reſembles on the ſurface a piece of mohair, or a very cloſe ſilk-worm's web. See the article VOLUTA.

MO'LA, in zoology, a name of a fiſh commonly called in Engliſh the ſun fiſh. It is of a very ſingular figure. Its body is broad and ſhort, and its hinder extremity is terminated by a circular fin, which ſerves it for a tail; ſo that it looks like the head of a large fiſh ſevered from its body; it is frequently of two feet in length, and ſometimes very much exceeds that ſize, growing even to two hundred weight. It has no ſcales, but is covered with a hard, harſh, and rough ſkin. Its back is black, and its belly white; the ſides are of a middle colour between both. Its back and belly both terminate in a narrow edge. Its mouth is very ſmall for the ſize of the fiſh, and, when open, is round. Its jaws are hard, and edged like a knife within; externally they are rough, as if beſet with ſeveral rows of ſmall teeth. The head does not at all project from the reſt of the body. The eyes are very ſmall. It has only one pair of fins, which are ſituated near the gills, which are only two elliptic holes covered with their proper membranes. Its fleſh is very ſoft, and its bones are all griſly and tender. The ſkin ſticks very firmly to the fleſh, and is not eaſily taken off. It is caught in the Mediterranean, and ſometimes in the Britiſh ſeas. *Willughby's Hiſt. Piſc.*

MOLE-*hills*.—Theſe little hillocks of earth are a very great prejudice to the paſture lands, not only waſting ſo much of the land as they cover, but hindering the ſcythe in mowing. In the weſt of England, they uſe a peculiar inſtrument for the breaking up of theſe; it is a flat board, very thick, and of about eight inches in diameter, into which there is faſtened a perpendicular handle of three or four feet long. It has four broad and ſharp iron teeth at the front, which readily cut through the hill, and ſpread the earth it conſiſts of; and, behind, there is a very large knob, proper for breaking the clods with, if there are any. Some uſe a ſpade, or other common inſtrument, in the place of this, but not ſo well. There is, however, a much better inſtrument even than this, for deſtroying theſe hills, where they are in very great numbers. This is a kind of horſe machine; it has a ſharp iron about three feet over, and with a ſtrong back. It is about four or five inches broad, and has two long handles for a horſe to be harneſſed to, and a croſs bar of iron to ſtrengthen it at the bottom of the handles, reaching from one handle to the other. The middle of this croſs bar is furniſhed with one, two, or more, ſharp pieces of iron, like ſmall plough-ſhares, to cut the Mole-hills into two, three, or more parts. The iron behind is of a ſemi-circular figure. A ſingle horſe is harneſſed to this machine, and a boy muſt be employed to drive it, and a man to hold and guide it; the ſharp irons or ſhares are the firſt thing that meets the hills; they run through it, break its texture, and cut it into ſeveral parts, and the circular iron, following immediately behind them, cuts up the whole by the roots, and leaves the land level. This inſtrument will deſtroy as many Mole-hills in one day as a common labourer can in eight, and would be of very great advantage to the kingdom, if brought into general uſe. *Mortimer's Huſbandry.*

MOLO'SSES, the droſs of ſugar, or what remains after the ſugar is extracted from the juice of the cane.

Artificial MOLOSSES. There has been found a method of making Moloſſes from apples, without the addition of ſugar. The apple that ſucceeds beſt in this operation, is a ſummer ſweeting of a middle ſize, pleaſant to the taſte, and ſo full of juice, that ſeven buſhels will yield a barrel of cyder.

The manner of making it is this: the apples are to be ground and preſſed, then the juice is to be boiled in a large copper, till three quarters of it be evaporated: this will be done with a moderate fire in about ſix hours, with the quantity of juice abovementioned; by this time it will be of the conſiſtence and taſte as well as of the colour of Moloſſes.

This new Moloſſes ſerves to all the purpoſes of the common kind, and is of great uſe in preſerving cyder. Two quarts of it, put into a barrel of racked cyder, will preſerve it, and give it an agreeable colour.

The invention of this kind of Moloſſes was owing to Mr. Chandler of Woodſtock, in New England, who, living at a diſtance from the ſea, and where the common Moloſſes was very dear and ſcarce, provided this for the ſupply of his own family, and ſoon made the practice general among the people of the neighbourhood. It is to be obſerved, that this ſort of apple, the ſweeting, is of great uſe in making cyder, one of the very beſt kind we know being made of it. The people in New England alſo feed their hogs with the fallings of their orchards of theſe apples: and the conſequence of this is, that their pork is the fineſt in the world. *Philoſ.Tranſ.* N°. 374.

MOLOSSES *ſpirits*, a very clean and pure ſpirit, much uſed in England, and made from Moloſſes or common treacle diſſolved in water, and fermented in the ſame manner, as malt for the common malt ſpirit. If ſome particular art is not uſed in the making of this, it will not prove ſo vinous as the malt ſpirit, but more flat and leſs pungent and acid, though otherwiſe much cleaner taſted, as its eſſential oil is of a leſs nauſeous flavour. Whence, if good freſh wine-lees, abounding in tartar, be duly fermented in the ſolution made thin for that purpoſe, the ſpirit will by that means become much more vinous and briſk, and approach more to the nature of the foreign ſpirits. After the firſt diſtilling of Moloſſes ſpirits from the waſh into low wines, it is to be rectified, and in the ſucceeding rectifications proper additions are to be made. Alkaline ſalts, ſo common in the rectifying malt ſpirits, muſt be avoided in this caſe, as not at all ſuiting this ſpirit; and the neutral ones only muſt be uſed, ſuch as ſandiver, common decrepitated ſalt, ſal enixum Paracelſi, and the like; but, upon the whole, nothing ſo conſiderable is to be expected from theſe ſalts, as from a careful rectification in balneo mariæ, without any other admixture; by this alone repeated two or three times with freſh water each time, the ſpirit will at once be made fit for the niceſt uſes.

Where the Moloſſes ſpirit is brought to the common proof ſtrength, if it be found not to have enough of the vinoſity, it will be very proper to add to it ſome good ſpiritus nitri dulcis; and, if the ſpirit be clean worked, it may by this addition alone be made to paſs on ordinary judgments for French brandy.

When newly diſtilled, this ſpirit like all others is colourleſs, and limpid as water; but our diſtillers always give it the ſame ſort of yellow tinge, which the foreign ſpirits are found to obtain from the caſks they are ſent over in. They have many ways of giving this colour extempore; but the two moſt in uſe are, either by an extract of oak-wood, or by burnt ſugar. Moloſſes ſpirit coming dearer than that of malt, it is frequently met with, baſely adulterated with a mixture of that ſpirit, and indeed ſeldom is to be bought without ſome daſh of it. Many have a way of mixing malt in the fermenting liquor; by this the yield of the whole is greatly increaſed, and the maker may aſſure the buyer that the ſpirit is pure as it ran from the worm. England is the principal place where this ſpirit is made at this time; it was at one time prepared in great quantities in France, eſpecially in the river Loire; but it is now forbid there, under a ſevere penalty. In Holland alſo they have it not, on account of the high duty laid upon treacle in favour of their own ſugar-bakers.

We meet with very little of Moloſſes ſpirit reduced to the ſtrength of alcohol or ſpirit of wine, though, when rectified to this ſtate in a proper manner, it is very little inferior to the real alcohol of wine, the name of which is ſo well known among us, though the thing itſelf is perhaps never ſeen here; all that we call ſpirit of wine being no other than malt ſpirit reduced to an imperfect alcohol, or a ſpirit almoſt totally inflammable. Great quantities of Moloſſes ſpirit are uſed in the adulterating of brandy, rum, and arrac; and great quantities are uſed alone in the making cherry brandy, and other drachms, by infuſion, in all which many prefer it even to the foreign ſpirits. In moſt of the nice caſes in our compound diſtillery, the Moloſſes ſpirit ſupplies the place of a pure and clean malt ſpirit, which we have not yet the way of producing in the large way to advantage. Our cinnamon, citron, and other fine cordial waters, are made with it; for the malt ſpirit would give theſe a very diſagreeable flavour.

There is alſo another uſe to which this ſpirit ſerves extremely well, and which even a foreign ſpirit which has any remarkable flower will not do ſo well in; this is the making the extemporaneous wine, which ſome people are ſo fond of. See the article *Extemporaneous* WINE.

It gives a yellow ſtain to the hands, or other ſubſtance dipped into it; and may therefore be of uſe in dying. It is poſſible alſo, that the vinegar-makers may find uſe for it in their way; but the moſt advantageous of all its uſes is to the diſtiller himſelf; a quantity of it added to new treacleintended for fermentation will be of great uſe in the proceſs, and increaſe very conſiderably the quantity of ſpirit; but the proportion in regard to the new matter muſt not be too great. *Shaw's Eſſay on Diſtillery.*

MOLU'CCA *Balm*, or *baum*, in botany, a genus of plants, whoſe characters are:

The calyx is expanded, large, bell-ſhaped, as it were membranaceous, and open. The galea is hollow, the beard tripartite, and the middle ſegment commonly bifid. The flower is very ſmall, and concealed in the center of the calyx. The ſeeds are angulous, and hardly covered.

This plant takes its name from the Molucca iſlands, where it was diſcovered. It is a vulnerary, and very good in a phthiſis, being uſed as tea. If the diſeaſe be attended with ſpitting of blood, the expreſſed juice is of ſervice, on account of its aſtringent quality, which is adapted to an hæmoptoe. No plant is a better lithontriptic, the leaves being infuſed in wine, or ſpirit of wine. It has the virtues of baum, but ſmells ſomewhat ſtronger. Here it may be proper to obſerve, that the perfectly cerulean colour of all plants proceeds from the fatneſs of the ſoil in which they grow; this is univerſally true of them all, and particularly in the inſtance before us. *Hiſt. Plant. adſcript. Boerhaave.*

MOLUCCA *beans*, a name given by Sir Robert Sibbald, in his Prodromus, and by Mr. Wallace, in his Deſcription of the Orkney-iſlands, to a ſort of fruit frequently caſt on ſhore in the North-weſt iſlands of Scotland, eſpecially, on the coaſts moſt expoſed to the waves of the occidental ocean.

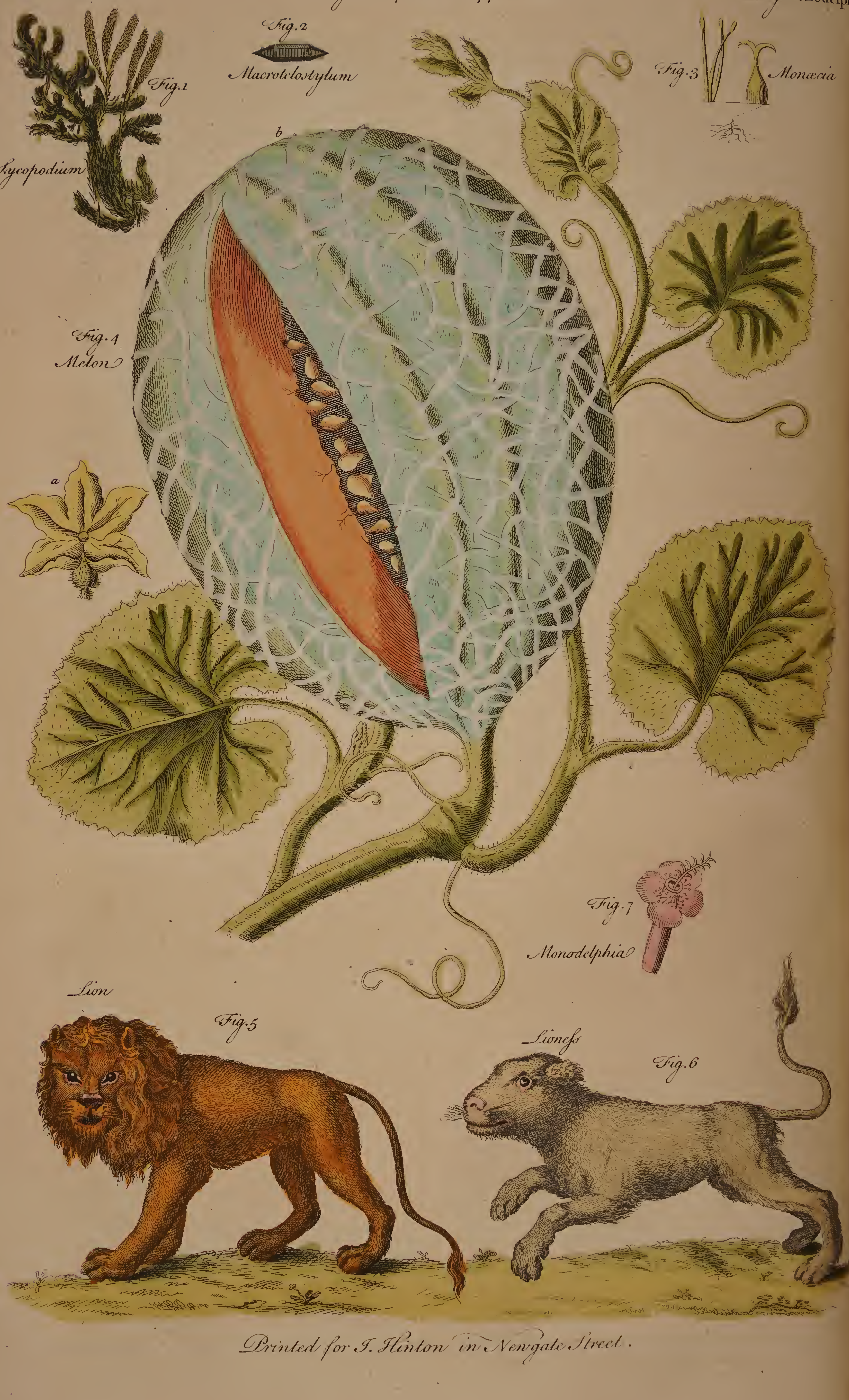
Some call them Orkney-beans; though they are not the produce of that iſland, or indeed of any part of Europe, but of America.

How the product of Jamaica, or other parts of America, ſhould be brought to the ſhores of Scotland and Ireland, ſeems not eaſy to determine on any certain foundation. It is eaſy to conceive that, when they grow by the ſides of rivers, they may fall off from the trees into them, and be thence conveyed into the ſea. It is likewiſe eaſy to ſee, that, when they are thus floating on the ſurface of the ſea, they may be carried about by the winds and currents, and be carried a great way; but their journey this way muſt naturally be ſtopped by the main continent of America, and they muſt be forced through the gulf of Florida, or the canal of Bahama, going thence conſtantly eaſt, and into the North American ſea. This is eaſily conceived by a ſimilar fact which happens every day: which is, that a kind of ſea lentil, called ſargoſſa, which grows very plentifully on the rocks about Jamaica, is waſhed off from thence, and carried by the winds and currents, which, for the moſt part go impetuouſly the ſame way, towards the coaſt of Florida, and thence into the North American ocean; and are there found floating on the ſurface. Thus far it is eaſy to trace our fruits from their native ſoil; but how, after this, they ſhould make the reſt of their voyage is a great myſtery, and not to be accounted for by us, unleſs we ſuppoſe, that as ſhips, when they go ſouth, expect a trade eaſterly wind, and, when they come north, expect, and generally find a weſterly wind, for at leaſt two parts in three of the year; ſo we are to ſuppoſe theſe fruits, being brought north by the current from the gulf of Florida, are put into theſe weſterly winds way, and by them conveyed to the coaſts of Scotland and Ireland. *Philoſophical Tranſactions*, N°. 222.

PLATE XXXII

Engraved for the Supplement

Facing Monodelphia



Printed for J. Hinton in Newgate Street.

MO'LYNEUX'S *parallactic teleſcope*, a curious teleſcope for finding the parallaxes of the heavenly bodies, invented by that ingenious gentleman.

The curious and uſeful teleſcope was ſuſpended in a vertical poſition, by two poliſhed cylinders, fixed near the top of the tube, ſo that their common axis, if produced through the tube, would paſs at right-angles to its axis, through a point near the center of the object glaſs. When the teleſcope was turned upon theſe cylinders, its axis of viſion moved like a pendulum in the plane of the meridian, and at the ſame time, a fine long wire, whoſe loop was put over one of the cylinders, hung down by the ſide of the tube, being gently ſtretched by a plumbet immerſed in a veſſel of water, deſigned to retard its vibrations. The lower end of this wire played gently againſt the ſmooth ſide of a ſlender braſs plate, fixed tranſverſely to the ſide of the tube, ſo as to point northwards and ſouthwards; and in the middle of this plate was punched a very fine round hole rather broader than the thickneſs of the wire. The teleſcope was gradually moved upon its axis of ſuſpenſion by the preſſure of a long ſkrew, in a parallel direction; the ſkrew worked in a hole of a plate, fixed to the wall of the houſe; and the tube was made to bear againſt the end of the ſkrew by a weight, fixed to the end of a ſtring, paſſing over a pulley, and having its other end tied to a hook, fixed in the ſide of the tube. The oppoſite end of the long ſkrew was fixed, like an axis, in the center of a braſs wheel, whoſe circumference was divided into a convenient number of equal parts, while an index, fixed to the board, pointed to the diviſions of the wheel.

Things being thus prepared, while the wheel was gently turned, the part of the wire, which played againſt the tranſverſe plate, was viewed through a double microſcope, until the little hole in this plate appeared to be biſected by the wire. The teleſcope being thus rectified immediately before the beginning of every obſervation of the tranſit of γ draconis (which paſſes very near the zenith of Kew) and the diviſion of the wheel over-againſt the index being then noted, the wheel was turned again, till the interſection of the wires in the focus was brought to touch the ſtar at the inſtant of its tranſit. Then, by the number of the revolutions of the wheel, and the parts of a revolution that had paſſed by the fixed index, the angular motion of the axis of the teleſcope was eaſily collected, from a proper table of minutes and ſeconds, anſwering to thoſe revolutions. Now, the differences of theſe angles, found at different obſervations, are the differences of the ſtar's declination. And, the inſtrument being rectified every time as above, it is eaſy to underſtand that theſe angular differences could not be altered by any warping, ſhrinking, or ſwelling of the materials of the inſtrument. *Smith's Optics.*

MO'NBIN, *the hog plum-tree*, in botany, a genus of trees, whoſe characters are:

It hath a roſe-ſhaped flower, conſiſting of ſeveral leaves, which are ranged in a circular order; from whoſe cups ariſes the pointal, which afterwards becomes an oval, fleſhy, ſoft fruit, incloſing an hard ſtone, in which are contained four kernels or ſeeds.

This tree is a native of the warmeſt parts of America, where it grows in the ſavanna's, and low marſhy places, in great plenty. It riſes to be forty or fifty feet high, and divides into a great many crooked branches, which are beſet with winged leaves, ſomewhat like thoſe of the aſh-tree. The flowers, which appear in the ſpring, are produced in large pyramidal bunches at the extremity of the branches, which are of a white colour, and are very ſweet. Theſe are ſucceeded by ſeveral yellow oval-ſhaped plums, growing in cluſters. The wood of this tree, being ſoft, is uſed, inſtead of cork to ſtop bottles in America. *Miller's Gard. Dict.*

MONOE'CIA †, in botany, a claſs of plants which have not the male and female parts, that is, the ſtamina and piſtillum in the ſame, but in different flowers; and thoſe on the ſame individual, or on the different ſtalks, growing from the ſame root; thoſe which contain the ſtamina are called the male flowers, thoſe which contain the piſtillum the female ones.

> † The word is derived from the Greek μόνος, the ſame, and οἶχος, habitation.

The plants of this claſs are the alder, mulberry, amaranth, &c. See *Plate* XXXII. *fig.* 3.

MONODE'LPHIA †, in botany, a claſs of plants, whoſe ſtamina or male parts, by reaſon of their filaments running in among one another, are all formed into one body.

> † The word is formed of the Greek μόνοο, ſingle, and ἀδελφὰ, brotherhood or community; theſe coalitions of the ſtamina in flowers being underſtood in botany by that term.

Of this claſs are the crane's-bill, mallow, &c.

The general characters of this claſs of plants are theſe: there is always a perianthium to the flowers, no ſpecies of the whole claſs being without it. This is always permanent, and ſurrounds the baſe of the ſeed-veſſel, after the flower is fallen. The flower always conſiſts of five petals, which are cordated at the top. The ſtamina are a great number of filaments, which grow together in one body at the baſe, and are looſe at the top. The external ones are ſhorter than the others, and the antheræ are always incumbent. In the piſtils there is found a receptacle of the fructification, which is placed in the center of the flower. The germina are erect, and ſurround in a rotary manner the apex of the receptacle. The ſtyles are all found growing together, at the bottom, into one body, with the receptacle, and in their upper part they are divided into as many filaments as there are germina. The ſtigmata are ſlender and expanded. The fruit is a capſule, divided into as many cells as there were piſtils in the flower. This is of very various figures in the various genera and ſpecies; but the ſeeds in all are uniform, or ſhaped like kidneys. See *Plate* XXXII. *fig.* 7.

MONOPE'TALOUS, in botany, a name applied to the flowers repreſented in *Plate* XXXVI. *fig.* 1.

MONTRO'SE *waters.* Steel ſpaws are very numerous in the country about Montroſe in Scotland: the principal of theſe are at Aberbrothoc, Kincardin, and Peterhead. That of Aberbrothic is in greateſt eſteem.

The water of this Montroſe well is univerſally diuretic; being drank from two to three pints, purges; and half the quantity ſucceeds with ſome. It has been found very uſeful in ſtranguries and ſtoppage of urine, ſcorbutic diſorders, flatulences, ſpaſmodic cholic, and ſpitting of blood. In rheums and ſtrains it has been of good uſe by way of cold pump, where perſons could not bear ſuch uſe of ordinary cold water. *Med. Eſſ.*

MOON (*Dict.*)— We have obſervations and tables concerning the Moon's motion, by Mr. Richard Dunthorn, in the Philoſophical Tranſactions, N°. 482, where he gives an hundred obſerved longitudes of the Moon compared with the tables, viz. 25 eclipſes of the Moon, taken, except the firſt, from Flamſteed's Hiſtoria Cœleſtis, the Philoſophical Tranſactions, and the Memoirs of the Royal Academy of Sciences; the two great eclipſes of the ſun in 1706 and 1715; 25 ſelect places of the Moon, from Flamſteed's Hiſtoria Cœleſtis; and 48 of thoſe longitudes of the Moon, computed from Flamſteed's Obſervations by Dr. Halley, and printed in the firſt edition of of the Hiſtoria Cœleſtis.

In the Philoſophical Tranſactions, N°. 473, we have a new method of computing the appulſes of the Moon to the fixed ſtars and planets; as alſo of the eclipſes of the earth, commonly called eclipſes of the ſun, by Mr. Gerſten, profeſſor of the mathematics at Gieſſen.

The full Moon appears to the naked eye broader than a circular object, ſubtending an equal angle, ſeen by perfect viſion. In a Moon of three or four days old the illuminated part appears too broad, in proportion to the obſcure part, and likewiſe ſeems to extend more outwards, or to have a greater diameter than the obſcure part. Alſo, in an eclipſe of the ſun or Moon, the bright part appears too broad in proportion to the dark part, and the eclipſe appears leſs than it really is.

This obſervation was made by Horrox, and is accounted for by Dr. Jurin, in his Eſſay upon Diſtinct and Indiſtinct Viſion.

MOOR-*cock*, an Engliſh name for the red game, or our lagopus, more commonly called the gor-cock. It is a very delicate bird, larger than a partridge, and common on the hills in Derbyſhire and Yorkſhire. *Ray's Ornithol.* See the article GOR-*cock.*

MOOR-*hen*, *gallinula*, in zoology, the name of a genus of water birds, the characters of which are theſe: the head is ſmall, the body compreſſed, the beak ſhort and moderately crooked, the wings ſmall, and hollowed like thoſe of the common cock and hen kind; the tail very ſhort, the legs long, and the toes remarkably ſo.

The common Moor-hen, called gallinula chloropus by authors, is a very well known bird, ſomewhat like the coot in ſhape, but ſmaller, and very much flatted in the body. Its feet are greeniſh, and its breaſt a lead-coloured blue; its belly greyiſh. It is common about our rivers, and is a very well taſted bird. *Ray's Ornithol.*

MOOR-*land*, or MOORY *land*, in agriculture, is a black, light, and ſoft earth, very looſe, and without any admixture of ſtones, and with very little clay or ſand.

The uppermoſt ſtratum of the fen lands is uſually of this earth, and it uſually conſtitutes a moderately thick or deep bed. Intermixed with water, it cannot eaſily be worked up into a paſte; and, when with labour worked into ſomewhat of a firm maſs, its ſurface appears ſpongy and porous; and, as ſoon as dry, it eaſily moulders away to powder.

It is uſually ſoft to the touch, unleſs it be worked very cloſely between the fingers; then it ſhews a mixture of a ſmall quantity of ſand, both to the touch and to the eye.

It ſeems indeed to conſiſt almoſt intirely of pure vegetable matter, and this, lying in ſuch plenty on the ſurface of the fen-lands, is the cauſe of their being ſo very fertile.

The great diſadvantage of the places which have this ſoil, is their being liable to be glutted with wet; and, to remedy the inconveniencies ariſing from thence, the farmers who rent theſe lands have a cuſtom of burning the ſoil at proper ſeaſons. It burns very freely and eaſily, the ſurface readily catching flame; and a ſubſtance ſomewhat bituminous, uſually contained among the ſoil, helps the burning. *Moreton's Northampt.*

MOOR-*ſtone*, the name of a very remarkable ſtone found in

Cornwall, and ſome other parts of England, and uſed in the coarſer works of the preſent builders.

This is truly a white granate, and is a very valuable ſtone. It is a very coarſe and rude, but beautiful congeries of variouſly conſtructed and differently figured particles, not diffuſed among, or running into one another, but each pure and diſtinct, though firmly cohering with whatever it comes in contact with. Its colours are principally black and white; the white are of a ſort of marble texture, and opake, formed into large congeries, and emulating a ſort of tabulated ſtructure; among theſe, there are many of a pure cryſtalline ſplendor and tranſparence, and among theſe are lodged in different directions many ſmall flaky maſſes of pure talcs of ſeveral colours; ſome are wholly pellucid, others of an opake white, others of the colour of brown cryſtal, and a vaſt number perfectly black. *Hill's Hiſt. of Foſſ.*

The people of Cornwall who have this ſtone in great plenty, uſe it in the tin works, and particularly in their tin kiln, on the good effect of which a great deal depends. This kiln is four-ſquare, and at its top is placed a large block of Moor-ſtone; the uſual ſize of this block is ſix feet in length and four in breadth; in the middle of this block there is made a hole of about ſix inches in diameter. This ſtone ſerves as a head to cover another like ſtone placed beneath it; but this under one is not ſo long as the upper by ſix inches. The reaſon of this is, that it muſt not reach the innermoſt or back part of the wall, which is the open place through which the flame aſcends from another place below that, where a very ſtrong fire of furz is conſtantly kept up; and there is another little hole alſo on the outſide. The forepart is like a common oven, and has ſuch a ſort of chimney.

The tin ore is roaſted in this kiln, to burn away the mundic, in this manner: the ore is brought in powder, and poured out in heaps on the ſurface of the top ſtone; a man ſtands there, and thruſts it down through the hole in this ſtone into the kiln, that is, to the ſurface of the under ſtone; a perſon who ſtands below, ſpreads this as it falls with an iron rake, and gives notice to the perſon above, when there is enough down, that is, when the ſurface of the lower ſtone is covered three or four inches thick. When this is done, the hole at the top is covered with green turfs, that the flame may reverberate the ſtronger, and the heat that the Moor-ſtone acquires helps to roaſt the ore; while the flame that comes up from the ore is blue, there yet remains mundic among it; but when this is burnt off, the flame is yellow. *Phil. Tranſ.* N°. 69.

The miners in ſome parts of Cornwall uſe the name Moor-ſtone for a ſort of coarſe free-ſtone, which lies very often over the tin ore; this is of a greyiſh colour, and is ſomewhat ſofter than that uſually employed in building.

MOOSE *Deer*, a very large and beautiful ſpecies of deer, common in North America.

The ſtag or male of this kind has a palmed horn, not like that of our common or fallow deer, but the palm is much longer and more like to that of the German elk; but it differs from that in having a branched brow-antler between the burr and the palm, which the German elk hath not.

The large horns found foſſile in Ireland. have, from their vaſt dimenſions, been ſuppoſed to have originally belonged to the black Mooſe deer; but they, as likewiſe moſt other of the large horns found in this part of the world, appear to be the horns of the German elk, having no brow-antlers.

Mr. Ray mentions, in his Synopſis of animals, a pair of extremely large foſſile horns, which he ſaw in a muſæum in Suſſex; but he mentions no brow-antlers in theſe, and therefore probably they, as well as moſt others preſerved in muſæums, were the horns of the German elk.

It is not agreed by authors what number of young the Mooſe brings forth at a time; Mr. Dudley ſays but two; but Joſſelyn, and from him Neal, ſay three; and theſe authors add, that they do not go ſo long with young as our does, by two months.

There is, beſide the Mooſe, another animal of the deer-kind, very common in Virginia, and other of the Northern provinces of America. This creature has round horns, not ſpreading out as in the ſtag or red-deer, but meeting nearer together at the tips, and bending forwards over the creature's head; and the brow-antlers are not crooked and ſtanding forward, but ſtraight and upright. The ſkin of this deer is of a ſandy colour, with ſome black hairs, and is ſpotted all over while young with white ſpots, as ſome of our fallow deer are, and it is about the bigneſs of our fallow deer when full grown.

The Dama Virginiana of Mr. Ray was different from this, if the deſcription be exact, and the horns of the palmated kind. This Dama of Mr. Ray ſeems to be what Joſſelyn, in his Voyages, calls the Maurouſe; but his deſcription is too ſhort to form any regular judgment from, he only ſays that the maurouſe is like the Mooſe, but that its horns are ſmall, and the creature about the bigneſs of a ſtag. *Phil. Tranſ.* N°. 444.

Joſſelyn mentions alſo the buck, the ſtag, and the rain-deer; but it is very much to be doubted whether they are the ſame with the Mooſe deer.

MO'RTAR (*Dict.*)—*Plate* XXXV. *fig.* 15, in the Dictionary, is a large Mortar; and *fig.* 22. repreſents the curve deſcribed by a bomb, ſhot from a Mortar.

Mortar, among bricklayers, a kind of cement, compoſed of lime, ſand, hair, &c. in which they lay the bricks, &c. in building.

The glaſs-makers in France are ſaid to uſe a ſort of Mortar, for plaiſtering over the inſide of their furnaces, which is made of a ſort of fuller's earth, which is procured at Beliere, near Forges, which is the only earth in France that has the property of not melting in this exceſſive heat; and alſo the pots which hold the melted metal, are made of this ſort of earth, and will laſt a long time.

Mortar for ſun-dials on walls, may be made of lime or ſand tempered with linſeed-oil, and, for want of linſeed-oil, may be made of ſcummed milk; but oil is better: this ſpread upon the wall will harden to the hardneſs of a ſtone, and not decay in many years, and will endure the weather ſix times as long as the ordinary plaiſter, made of lime and hair with water.

MO'RUS, *the mulberry.*— The fruit of this tree, while unripe, is very aſtringent, but, when thoroughly ripe, it is of a contrary quality, rather purgative, cooling, very pleaſant, and quenching thirſt. Its ſyrup, which is very pleaſant, is the only uſe made of it in the ſhops.

The more general cultivating mulberry-trees in England might be of greater uſe than is at preſent ſuppoſed in many reſpects. In Devonſhire they have a way of mixing mulberry-juice with their cyder in the making, and thus make the very beſt of all Engliſh vinous liquors. And as to the great article of breeding ſilk-worms, though a recommendation from the crown could not bring about the planting theſe trees in ſufficient number for it in James the Firſt's time, yet the trees have been found to flouriſh every where with us, when properly planted, and the worms feed very kindly and work very well with us. When this manufacture was firſt attempted, the people of many parts of England, nay, and in ſome parts of the dampeſt places in Ireland, tried it, and always with ſucceſs. The only thing that ſtopped the progreſs of ſo valuable a thing, at that time, was the want of a ſufficient quantity of mulberry-trees, and the ſcheme has been neglected ever ſince. *Phil. Tranſ.* N°. 133.

The tree was always eſteemed by the ancients for its delicious fruit, before the uſe of its leaves was ever found out. The Romans, in the height of their luxury, preferred it before all the foreign fruits; and Columella and the other ancients are very expreſs in the method of propagating it.

The common mulberry-tree is to be propagated either by ſowing the ſeeds, or by laying down the tender branches, which in two years will be well rooted, and may be cut off from the tree, and tranſplanted into the places where they are to remain. But thoſe plants which are propagated from ſeeds, are uſually the moſt vigorous, and grow the moſt regularly, and with the ſtraighter ſtems; but then there is a great diſadvantage attending this propagation, which is, that the trees are frequently altogether male, producing only catkins, and no fruit; ſo that it is better to do it by layers from a tree, which is known to produce plenty of good fruit; the ſtraighteſt ſhoots ſhould be always choſen for layers; and, when they are tranſplanted, they ſhould be tied up to ſtakes to keep them ſtraight. This tree ſhould not be often pruned, but only ſuch branches are to be cut off, as croſs and bruiſe one another.

The mulberry-tree thrives beſt in a light ſoil, which ſhould not be too wet, nor over dry; and it ſhould always have an open expoſure; for, if planted too near trees or buildings, ſo as to be ſhaded thereby, the fruit ſeldom ripens well; though it will be to great advantage to have them defended from the weſt and ſouth-weſt winds, by trees or buildings at a diſtance.

The ſoil under the mulberry-tree ſhould always be well dug up every year, and manured, which proves of very great ſervice to the fruit.

The white mulberry is cultivated in France and Italy for the ſake of its leaves, as there is an opinion, that the ſilk-worms ſhould be fed only with theſe; but it is affirmed by perſons who ſeem to know beſt, that the Perſians feed their worms only with the leaves of the black kind.

The trees, intended for feeding ſilk-worms, ſhould not be ſuffered to grow tall, but kept in a ſort of hedge; and inſtead of pulling off the leaves ſingly, they ſhould be cut off with ſheers, together with the young branches; this is not only much ſooner and more eaſily done, but it is leſs injurious to the trees. The white ſort is propagated either by ſeeds or layers, as the black, and is equally hardy. *Miller's Gard. Dict.*

MOSS.— Theſe ſmall plants, though neglected for many ages, have, by the induſtry and application of later botaniſts, been found a very numerous and very beautiful claſs of plants; and not without their uſe in medicine and mechanics, and to various purpoſes of human life. Dr. Dillenius, who has ſtudied them with an uncommon care, and given a very valuable hiſtory of them, has deſcribed more than ſix hundred ſpecies; the greater part of which are found in our own country, though ſome peculiar to others; and, doubtleſs, there yet remain vaſt numbers unheeded and unknown in many countries. See *Plate* XXXVI. *fig.* 2.

Uſes of Mosses.— Were there no other uſe in theſe minute and beautiful objects than the admiring the wonderful works of the

Creator, this were enough to make the ſtudy of them worthy of attention; the almoſt endleſs variety of the figure and ſtructure of their leaves, the ſlenderneſs of the ſtalks that ſupport them, and regularity and nice order in which they are arranged; the minuteneſs of their roots, and the ſlenderneſs of the pedicles which bear the heads, each of which is often ſmaller than the fineſt hair; and the extreme exility of the veſſels through which juices are conveyed along theſe for the nouriſhment of the plant and ſeeds, can never enough be admired; and the various ſtructure of the heads or ſeed-veſſels with their coverings, by means of which the tender ſeeds and farinæ are defended, afford to the microſcopic obſerver an endleſs fund of admiration.

But theſe are not all the uſes they were intended for, many may yet remain unknown; but we at preſent well know that ſeveral of the uſnea's are great and valuable medicines, uſed as deſiccatives and aſtringents; that the common cup Moſs is one of the greateſt remedies in the convulſive coughs of children, called the chin-cough, is known to every one; and Dr. Mead has ennobled the grey ground lichen, by publiſhing its virtues in one of the moſt terrible of all diſeaſes, the bite of a mad dog. The common green liverworts are known medicines in diſorders of the breaſt, as are alſo all the ſpecies of polytricha. The ſeeds of our lycopodium are given with ſucceſs in nephritic caſes; and the Indians give one of their ſpecies in many diſtempers, and, as they ſay, with great benefit. The common white ground coralloides ſerves the rain deer of Lapland for food, when all other herbage is loſt; and the conſervæ ſerve for food to many of the fiſhes both of the ſea and rivers, and to ſeveral water-fowl. And theſe, as well as the land Moſſes, afford ſhelter and habitation to many inſects, and their young. Many of the ſpecies of coralloides and lichenoides are found of great uſe in that profitable branch of commerce, the art of dying; and, doubtleſs, many others have alſo the ſame qualities, though not yet diſcovered; and we may be guided, in ſearches of this kind, by obſerving that many of them tinge the papers, between which they are dried, to very beautiful and laſting colours. The Moſſes which cover the trunks of trees, as they always are freſheſt and moſt vigorous on the ſide which points to the north, if not only produced on that, ſerve to preſerve the trunk of the tree from the ſeverity of the north winds, and direct the traveller in his way, by always plainly pointing out that part of the compaſs.

The ſoft marſh and bog Moſſes ſerve the poor in many places for ſtuffing their beds, and in the buſineſs of tranſporting plants from other countries, nothing is of ſo great uſe as the ſtalks and leaves of theſe little vegetables: the ſucculent plants coming over in great beauty and vigour, when rolled up in dry Moſs; and trees and ſhrubs, by having their roots covered with ſuch as is ſomewhat moiſt.

The great quality of the Moſſes, which makes them ſo ſerviceable in this caſe, is, that they do not heat and ferment on being moiſtened, as hay and ſtraw would.

Moss *on trees*, in gardening. The growth of large quantities of Moſs on any kind of tree is a diſtemper of very bad conſequence to its increaſe, and much damages the fruit of the trees of our orchards.

The preſent remedy is the ſcraping it off from the body and large branches, by means of a kind of wooden knife, that will not hurt the bark; or with a piece of rough hair-cloth, which does very well after a ſoaking rain. But the moſt effectual cure is, the taking away the cauſe. This is to be done by draining off all the ſuperfluous moiſture from about the roots of the trees, and may be greatly guarded againſt in the firſt planting of the trees, by not ſetting them too deep.

If trees ſtand too thick in a cold ground, they will always be covered with Moſs; and the beſt way to remedy the fault, is to thin them. When the young branches of trees are covered with a long and ſhaggy Moſs, it will utterly ruin them; and there is no way to prevent it, but to cut off the branches near the trunk, and even to take off the head of the tree, if neceſſary, for it will ſprout again; and if the cauſe be in the mean time removed by thinning the plantation, or draining the land, the young ſhoots will continue clear after this.

If the trees are covered with Moſs, in conſequence of the ground's being too dry, as this will happen from either extreme in the ſoil, then the proper remedy is, the laying mud from the bottom of a pond or river, pretty thick about the root, opening the ground to ſome diſtance and depth to let it in; this will not only cool it, and prevent its giving growth to any great quantity of Moſs, but it will alſo prevent the other great miſchief which fruit-trees are liable to in dry grounds, which is, the falling off of the fruit too early. *Mortimer's Husbandry.*

Silk Moss, in botany, a name given by Count Marſigli to a ſpecies of ſea Moſs, of a very remarkable fineneſs and ſoftneſs, much more reſembling ſilk than any other vegetable productions. It is wholly compoſed of a ſort of tuft or fine hairs or filaments, and is of a bluiſh green colour, and almoſt tranſparent. It grows on rocks, ſtones, ſhells, or any thing elſe that lies in its way, and is found, uſually, at ſmall depths; it is not ſo tough and flexible as many others of the ſea plants, but is eaſily rubbed to powder between the fingers. When examined by the microſcope, the ſingle filaments do not appear of the ſame equable ſurface and uniform texture; but they are ſeen to be jointed and made up as it were of a great number of pieces faſtened end by end to one another, in the manner of the beads of a lady's necklace. It is of a fine bluiſh green, and perfectly tranſparent before the microſcope, and reſembles a ſtring of gems, ſuch as the aqua marina, or ſome other like ſtone. *Marſigli, Hiſt. de la Mer.*

Moss is alſo a name given by ſome to the boggy ground in many parts of England, more uſually a fen and bog.

MO'THER-*wort*, *cardiaca*, in medicine, is only uſed in the ſhops as an ingredient in ſome of the compound waters, intended againſt hyſteric complaints; and the country people frequently make an infuſion of it in the manner of tea, for the ſame purpoſe. It is alſo ſaid to be good in flatulences and cholics, to give great relief in epileptic caſes, and to deſtroy worms. It promotes urine and the menſes, but its power this way is greatly inferior to that of penny-royal.

MOU'NTAIN (*Dict.*)— The difficulty of breathing at the tops of high mountains is a thing ſo plainly felt, that none who has ever been in the way of making the experiment, but is well convinced of the certainty of the fact. Acoſta deſcribes what he felt on the tops of the high Mountains of Pariacaca very judiciouſly.

The Mountains of Armenia, and particularly that on which Noah's ark is ſuppoſed to have reſted, have been alſo made famous by the like accounts; though the ſnows that lie on the tops of their Mountains make it impracticable to aſcend their tops, the people who climb as they can, always find that they breathe with more difficulty, and are compelled to fetch their breath oftener, than when on the plains; and, on travellers complaining of this, their guides always tell them, that it is a known thing, and is what every body ſuffers there.

The Mountains in Languedoc and the Pyreneans have the ſame effect. People of curioſity have ſometimes remained hours on the ſummit of theſe Mountains, and always found the ſame ſort of difficulty in breathing; but it is poſſible that this may be owing to the exhalations of certain ſteams from the earth in theſe places, leſs loaded with a weight of air than below; and this appears the more probable, as in going up the Mountain Teneriffe, if many people are in company, and aſcend different ways, ſome uſually bear it better than others; and the very complexions of ſome are turned yellow by the exhalations which are very plainly perceived by their ſmell and ſharpneſs, while others who aſcend to the ſame height by different tracts, eſcape.

The moſt remarkable Mountain in the world, in ſhape, is that called the needle Mountain, or the inacceſſible Mountain, in Dauphiny.

This is a vaſt hill, placed as it were bottom upwards, or ſet on its ſummit on the earth with its broad baſe elevated in the air; it is but about a thouſand paces in circumference at the bottom, and is above two thouſand at the top. On the center of the plain at the top there ſtands another ſmall and very narrow, but very high hill.

It obtained the name of the needle, as it got the other, by its being ſuppoſed impracticable to the aſcent of any one, by reaſon of its projecting ſo greatly outwards. Some hardy perſons, however, once ventured to climb it, and found at the top a number of the chamoiſe, animals by no means qualified for climbing, and which doubtleſs had never either aſcended or deſcended the Mountain, and which muſt be ſuppoſed to have bred there for many ages, though it be very difficult to account for their firſt getting to the place. *Hiſt. Acad. Par.*

MU'FFLE, in metallurgy, is an arched cover, reſiſting the ſtrongeſt fire, and made to be placed over coppels and teſts in the operations of aſſaying, to preſerve them from the falling of coals or aſhes into them; though at the ſame time of ſuch a form, as not to hinder the action of the air and fire on the metal, nor prevent the inſpection of the aſſayer.

The Muffles may be made of any form, ſo they have theſe conditions; but thoſe uſed with coppels are commonly made ſemi-cylindrical, or, when greater veſſels are employed, in form of a hollow hemiſphere.

The Muffle muſt have apertures, that the aſſayer may look in; and the fore-part of it muſt be always quite open, that the air may act better in conjunction with the fire, and be inceſſantly renewed; for, without this, ſcarce any fumes are to be produced; and, without theſe, the vitrification of lead is ſcarce practicable; for, when the air is once filled with a certain quantity of vapours, it ſcarce admits any more afterwards; and for this reaſon a conſtant ſucceſſion of freſh air is neceſſary. The apertures in the Muffle ſerve alſo for the regimen of the fire; for the cold air ruſhing into the larger opening before, cools the bodies in the veſſel; but if ſome coals are put in it, and its aperture before be then ſhut with a door fitted to it, the fire will be increaſed to the higheſt degree, much more quickly than it can be by the breathing-holes of the furnace. Another uſe of theſe apertures is alſo, that the arſenical vapours of lead and antimony, paſſing through the holes in the back part of the Muffle, may not be offenſive to the aſſayer, who ſtands before it.

As to the height, length, and depth of the Muffles, theſe muſt be proportioned to the ſize and number of the veſſels they are intended to cover; and care muſt be taken in this, that all parts of the inner ſurface of thoſe veſſels muſt be in the reach of the aſſayer's eye. The moſt frequent ſize of the Muffle, however, is four inches high, ſix or eight inches long, and four or ſix inches broad. The ſegments cut off at the baſes, for the leſſer holes, muſt be of ſuch a proportioned height, that the leaſt veſſels, put under it, may not be in the way of coals or aſhes falling into them; for that always hinders the vitrification of lead, and the deſtruction of the other metals and ſemi-metals, and will ſometimes intirely reduce them again, when already deſtroyed; and the ſcoriæ, ſoftened by aſhes, ſoften and retard the operation.

Wooden moulds, of a proper ſhape, are moſt convenient for the making theſe Muffles in, and the matter for making them is the ſame with that of the German clay teſts; that is, either a pure native clay, of a condition to bear the fire, which will be known upon the trial; or ſuch clay, hardened by a mixture of the powder of ſtones: and, in order to the forming of theſe, the maſs muſt be made tolerably ſoft and pliant. Knead a ſufficient quantity of this maſs with your hands upon a flat ſtone; ſpread it out evenly into a thin cake or plate, ſomewhat longer and broader than you intend the Muffle to be made; and ſo thick, that two or more thin plates or laminæ, of about two lines thick each, may be cut off from it. This is eaſily done by rolling the maſs on the ſtone with a rolling-pin, ſtrewed over lightly with aſhes, or powder of chalk.

When the cake is thus rolled out, with a thin, fine, and perfectly ſtraight braſs wire, cut off, from the cake, one thin plate; this muſt be done with great caution, leſt it ſhould break; take this up, and, rubbing it over with oil or fat, lay it over the mould; then cut out a ſemicircular piece from the maſs, of the ſame thickneſs with the former, and with this cover the back plane, or farther end of the mould, joining the edges of this plate to thoſe of the former, cloſely and perfectly, by wetting them well with water.

Next, cut off from the cake another thin plate, to be the bottom of the Muffle; this may be either left looſe for the Muffle to be placed on it occaſionally, or the bottom edges of the already formed Muffle may be joined to it all round, by means of water, as the back was before joined to the arched part of the Muffle. But, whether it be intended that the bottom ſhall be thus fixed on, or left looſe, it muſt be half an inch broader every way than the bottom of the Muffle, that this may ſtand the more firm and ſure upon its baſis.

When the Muffle is thus made, wet your hands, and rub it carefully all over, that the ſmall and perhaps inviſible cracks, and the chinks in the plates, may be cloſely joined, and the whole matter of it applied perfectly cloſe to the ſurface of the mould.

When the Muffle has been ſome time expoſed to the air, and is ſomewhat dried and hardened on the mould, cut out two or three hemiſpherical pieces on each ſide, to make the holes before deſcribed, at the baſis and back; and then draw away the mould from within it; for if the Muffle is ſuffered to dry perfectly on the mould, it always cracks. When the whole is perfectly dry, let it be baked in a potter's kiln, or in the aſſayer's oven; but, without great care in the latter method, and lighting the fire at top firſt, it is apt to crack, ſo that the potter's kiln, where at hand, is much the better way of baking it. *Plate* XXXI. *fig.* 9.

If there be adapted to the formerly deſcribed convex mould another concave one nearly fitting it, only leaving room for the thickneſs of the Muffle between, and the clay be placed between them, and formed by this means into its exact ſhape, by a ſtrong and every way equal preſſure, this will make Muffles not only with much leſs trouble, but they will be much ſtronger, leſs apt to crack, and more capable of reſiſting the fire, than thoſe made by the hand in the other way.

The only caution, neceſſary for the making them, is, that the clay be a little drier than when it is to be worked by the hand; that the ſides, both of the inner or convex mould, and of the outer concave one, be thoroughly oiled or greaſed, and the preſſure on the ſurface of the outer or concave mould be as ſtrong and as equal as may be. There is no clay better for the making theſe Muffles than the Windſor loam, an earth well known among the chemiſts and glaſs-men, and always to be ſold in London; and the rubbing the inſides of the mould with black, in fine powder, very well ſupplies the place of greaſing them, to prevent the matter from ſticking to them.

Theſe are the Muffles ordinarily uſed in aſſaying; but, when very large teſts are to be covered, they uſe large ſpheroidal Muffles, made of caſt iron, or ſometimes of the ſame clay, and wrought in the ſame manner, only made upon proportionably larger moulds. The clay is uſually, for theſe large ones only, laid in a lump on the top of the mould, and with wet hands ſpread all over it to the bottom, and by this means a Muffle is made with little trouble. *Cramer's Art of Aſſay.*

MU'MMY, among the gardeners, is the term uſed for a ſort of waxy compoſition uſed in grafting. It is made of one pound of common black pitch, and a quarter of a pound of turpentine, put into an earthen pot with a cover fitted to it; this is to be ſet in the open air, and the cover being taken off, the matter is to be ſet on fire, and when it has burned a little while, it is to be quenched, by putting on the cover. This is to be repeated till the mixture is of a proper conſiſtence, which is known by pouring a little of it on a pewter plate, on which, when it is enough, it will coagulate immediately. When it is of this conſiſtence, it is to be poured into another pot, and a little yellow wax is to be added to it, and then, melting the whole together, is to be kept for uſe. *Miller's Gard. Dict.*

MU'RAL *Arch* (*Dict.*)—The following is a deſcription of the Mural arch in the Royal Obſervatory at Greenwich.

Since the meaſure of time by pendulum-clocks, and conſequently of the apparent diurnal motion of the heavens, has of late been brought to the utmoſt perfection, aſtronomers are agreed that a large quadrant, with a teleſcopic ſight, fixed in the plane of the meridian to a free-ſtone wall, and thence called a Mural arch, is by far the moſt accurate, expeditious, and commodious inſtrument of all others for the chief purpoſes in aſtronomy. For, by obſerving the times by the clock of the appulſes of any objects in the heavens to the plane of the meridian, we have their right aſcenſions; and, by their meridian altitudes obſerved at the ſame times, the latitude of the place being once determined, we have alſo their declinations, and, by conſequence, their places in the heavens. Thus, by a good inſtrument of this kind, a catalogue of the places of the fixed ſtars may be made in leſs than a tenth part of the time, and with much greater certainty and exactneſs than by the beſt moveable quadrant or ſextant, as might eaſily be ſhewn; not to mention the ſaving an immenſe labour in trigonometrical calculations. I think the noble Tycho Brahe was the firſt aſtronomer that uſed a Mural arch, for taking meridian altitudes; but he could not determine right aſcenſions ſo accurately as now, for want of the late improvements in pendulum-clocks. After him, Hevelius, Flamſteed, and others, made uſe of the like inſtruments, whoſe deſcriptions may be ſeen in their printed works; but I paſs them all over, as being far inferior to this at Greenwich: the expence of which was defrayed by the bounty of his late Majeſty King George the Firſt; and the particular accuracy, whereby it excels all others, is owing to the extraordinary ſkill and contrivance of the late Mr. George Graham; who, beſides the direction of the whole deſign, and inſpection of the inferior workmen, was pleaſed to perform the diviſions of the arch, and all the nicer parts of the work, with his own hands; and to him I am highly obliged for informing me in the methods he took to perform it. How far the tables of the moon's motion are corrected by an incredible number of obſervations made with this noble inſtrument by our royal aſtronomer Dr. Halley, and how near they are brought to ſufficient exactneſs for finding the longitude at ſea, are related under their proper articles in the Dictionary and Supplement At preſent I proceed to a deſcription of the inſtrument.

Excepting the circular limb, the quadrant is chiefly compoſed of ſtraight iron bars, joined together, as repreſented in *Plate* XXXI. *fig.* 10, 11. The breadth of every bar is two inches and nine-tenths, and its thickneſs, one-tenth and three-fourths, nearly. In ſpeaking of the diſpoſition of theſe bars, thoſe, whoſe planes compoſe the plane of the quadrant, I ſhall call flat bars; and thoſe, whoſe planes are perpendicular to the former, I ſhall call perpendicular bars. The lines in *fig.* 10, repreſent the diſpoſition of all the flat bars, and thoſe in *fig.* 11. repreſent the diſpoſition of all the perpendicular bars, placed behind the flat ones; and are only to be ſeen on the back-ſide of the quadrant. The chief deſign, in this diſpoſition of both ſorts of bars, is to ſecure the figure and plane of the quadrant from any alterations that may be cauſed, either by the weight of the materials, or by their ſwelling or ſhrinking by the weather, or by the motion of the teleſcope about the center of the quadrant, or by any accident whatever: the whole fabric is farther ſtrengthened by a great number of ſhort iron plates or pieces of the like bars bent to a right-angle, and placed behind the quadrant in the angles made by the flat and perpendicular bars, and riveted to them both. Their number and places where they are riveted are repreſented in *fig.* 11. by the ſmall parallelograms adjoining to the lines: and, to make more room for the rivets, the edge of each perpendicular bar does not divide the breadth of the flat bar in the middle, but in the ratio of 2 to 1; and the little plates are riveted on the broader ſide. The black thickenings of the lines at their interſections in the eleventh figure repreſent little plates of iron bent in right-angles, and riveted in the angles made by the interſections of the perpendicular bars. At the circumference of the quadrant there is alſo a perpendicular bar, bent circular, and faſtened all along the middle of the breadth of the limb or flat arch of the quadrant, by a ſufficient number of the little plates we have been ſpeaking of.

The limb of the quadrant is compoſed of two quadrantal arches, of the ſame length, breadth, and thickneſs; one of iron, the other of braſs laid over it. The breadth of each is three inches and four-tenths, and the common part of their breadths, where they lie doubled one over the other, and are riveted together, is two inches and two-tenths, the braſs limb being remoter from the center than the iron one by an inch and two-tenths. The limb was reduced to a true plane, as follows: *a b d o*, *fig.* 12, repreſents the quadrant, placed very firm upon a level plane, with its braſs limb lying upwards; and *l m* repreſents an axis made of iron, placed perpendicular

PLATE XXXIII. *Engraved for the Supplement.* *Facing* Mural *Arch.*

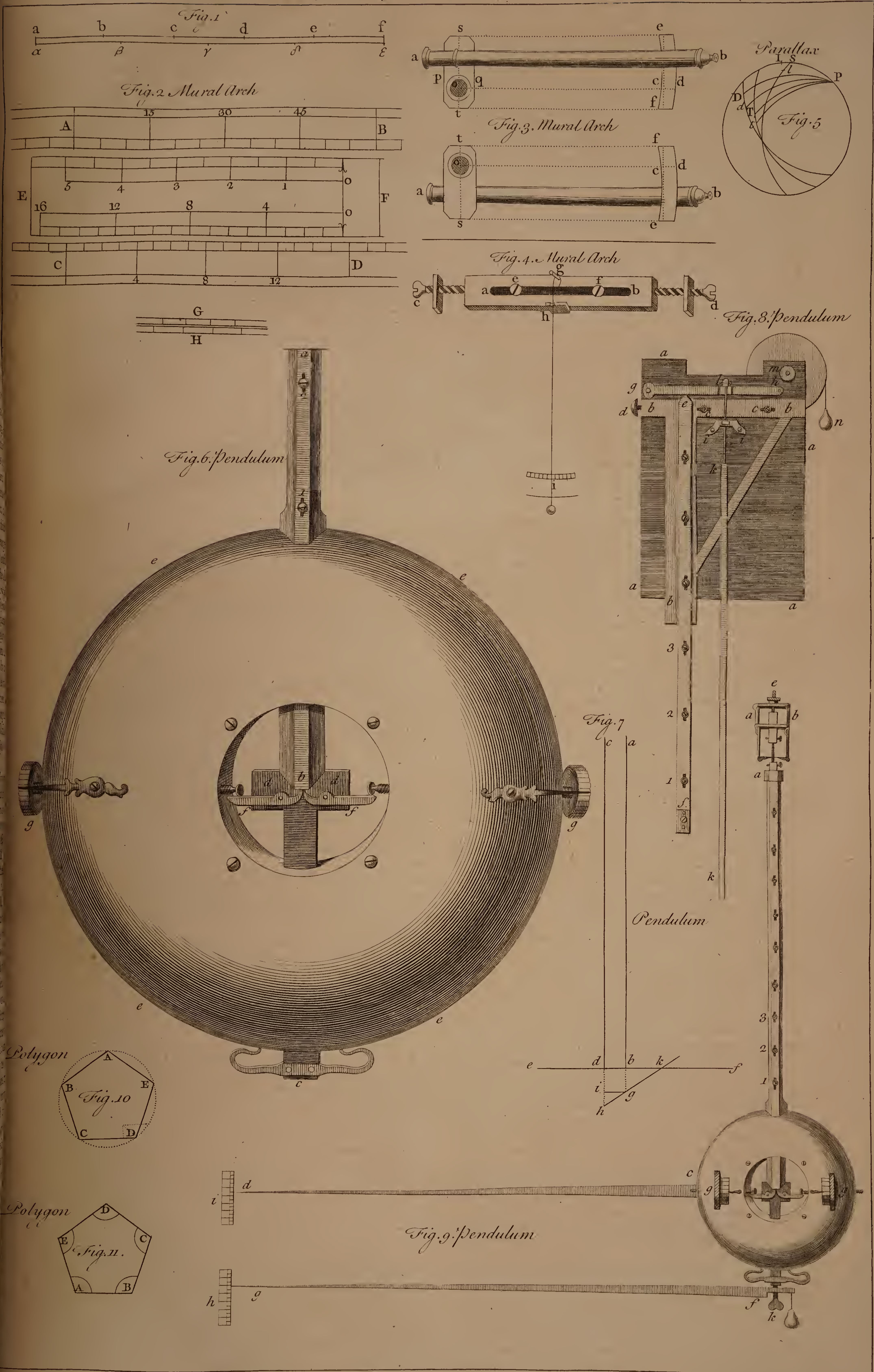


Fig.1

Fig.2 Mural Arch

Fig.3. Mural Arch

Fig.4. Mural Arch

Parallax *Fig.5*

Fig.6. Pendulum

Fig.7 *Pendulum*

Fig.8. Pendulum

Fig.9. Pendulum

Polygon *Fig.10.*

Polygon *Fig.11.*

Printed for J. Hinton in Newgate Street.

to the plane of the quadrant, and pointing to its center *o*; *m n* is an arm of iron, equal in length to the radius of the quadrant, and fixed at right angles to the bottom of the axis *l m*; to the end of this arm an iron ſcraper *n p* was fixed directly over the braſs limb; and, being firmly ſupported by the arm and its braces, was turned about the axis *l m*, till, by ſcraping the braſs, it reduced its ſurface to a perfect plane; care being taken that the edge of the ſcraper was exactly perpendicular to the axis of its motion.

There are two arches ſtruck upon the braſs limb; one with a radius of 8 feet, or more exactly of 96, 85 inches; and the other, with a radius of 95, 8 inches. This inner arch is divided into degrees, and 12th parts of a degree; and the outward arch into 96 equal parts, which are ſeverally ſubdivided into 16 equal parts. The beam of the compaſs which ſtruck theſe arches, was ſecured from bending by ſeveral braces faſtened to it; and, when an arch was ſtruck, 60 degrees of it were determined by placing one point of the compaſs at *a*, and by making a ſtroke at the other at *b*. This arch *a b* was biſected in *c* by drawing two ſmall arches upon the centers *a* and *b*, with ſuch a radius as to croſs the arch *a c b*, in two points as near together as poſſible without touching each other; then the ſmall interval between them was biſected at *c*, by eſtimation of the eye, aſſiſted by a magnifying glaſs. After this, the interval between the points *a* and *c*, or *c* and *b*, was taken with the beam compaſs, and was transferred from *b* to *d*, which determined the length of the quadrantal arch *a c b d*. Every one of the three arches being biſected in the ſame manner, the quadrant became divided into 6 equal parts, containing 15 degrees a-piece; and every one of theſe was divided into three equal parts as follows. To avoid making any falſe or ſuperfluous points in the quadrantal arch, with its radius unaltered, but upon any other center, there was ſtruck another faint arch, upon which the chord of 15 degrees, already found, was transferred from the quadrantal arch; and the third part of 15 degrees, being determined by trials upon the faint arch, was transferred back again upon the quadrantal arch; which then was divided into 18 equal parts, containing 5 degrees a-piece; and the 5th part of theſe was found by trials, as before, in dividing a ſeparate arch, drawn upon a new center for this purpoſe only. The ſubdiviſions of the degrees into 12 equal parts were made by biſections and triſections as before. Thus was the whole quadrant divided without any falſe or ſuperfluous points.

The outward quadrantal arch was divided into 96 equal parts, by no other method than that of biſection, till 60 degrees or two thirds of the quadrant became divided into 64, and the remaining third into 32, equal parts; which make 96 in the whole. And every one of theſe were alſo divided into 16 equal parts, by continual biſections. Theſe two ſorts of diviſions are a check upon each other, being in effect two different quadrants; and, the diviſions in one being reduced into the diviſions of the other, by a table made for that purpoſe, they are never found to differ above five or ſix ſeconds in any place of the limb: and, when they do, the preference ought to be given to the biſected diviſions, as being determined by a ſimple operation.

The diviſions hitherto mentioned being only very fine points in a fine arch *a b d*, ſcarce diſcernible by the naked eye; it was neceſſary, as uſual, to ſtrike lines perpendicular to the arch, through every one of them. But, ſince it is very difficult, and tedious too, to draw lines exactly through every point by the edge of a ruler, the following method was judged more accurate and expeditious. It was propoſed then to divide any other concentric arch, *f b t* (*fig.* 12.) by croſs ſtrokes, into a ſimilar parts to thoſe in the given arch *a c g e d b*. Take a ſmall beam compaſs, and, having once fixed its points at any convenient interval, upon the centers *e*, *g*, &c. being the given points of the divided arch, ſtrike the ſmall arches *f i*, *h k*, &c. cutting the undivided arch in *f*, *h*, &c. then will the intercepted arches, as *f h*, &c. be ſimilar to the arches *e g*, &c. that is, they will ſubtend the ſame angles at their common center *o*. For joining *e f*, *g h*, and alſo *o f*, *o h*, *o e*, *o g*, the triangles *e o f*, *g o h*, will be ſimilar and equal to each other; every ſide in one being reſpectively equal to every ſide in the other. Therefore by taking away the common angle *e o h*, from the equal angles, *e o f*, *g o h*, the angles *e o g*, *f o h*, that remain, will alſo be equal.

If the triangles *e f o*, *g h o*, &c. be right-angled at *f* and *h*; the dividing ſtroke *f i*, *h k*, &c. will cut the quadrantal arch *f b t*, at right angles alſo, at *f* and *h*, &c.

In the thirteenth figure *a b c d* repreſents a ſquare piece of braſs (with ſeveral ſteady pins in it) ſkrewed to the flat bars, at the center of the quadrant, the ſkrew-holes being ſo large as not to touch the ſkrews; and *k l m n* repreſents a thick circular plate of braſs, with a hollow pipe *f g* fixed perpendicular to the middle of it; this plate was turned exactly circular in a lathe, upon a braſs arbor *o i*, turned tapering and a little hollow in the middle, ſo as to fit the cavity of the pipe *f g*, and to bear againſt it chiefly at both ends. When the hollow pipe *f g* is put through the hole (exactly fit for it) in the middle of the ſquare *a b c d*, the braſs circle *k l m n* is fixed to the plane of the ſquare *a b c d*, with ſkrews and ſteady pins. The point *o*, in the pole of the arbor *o i*, is not only the center of the circular neck *k l m n*, about which the teleſcope muſt turn, but alſo the very center upon which the divided arches were ſtruck upon the limb of the quadrant. The end of the teleſcope that holds the object glaſs, lies croſs one end of an oblong plate of braſs *s t*, at right angles to its ſides, and is held to the plate, by a brace that may be widened and ſtreightened by a ſkrew. Towards the other end of the plate *s t*, there is a round hole, lined with a ſteel collar *p q r*, to be put over the braſs neck *k l m n*; and to turn round upon it. The ſection of this collar, made perpendicular to the plane of it, is repreſented at *z*; the broader of the two rings being under the plate *s t*, and contiguous to the ſquare plate *a b c d*. Over this neck and collar there is fixed a braſs ſpring repreſented at *v*, and ſkrewed to the neck *k l m n*, to keep the collar from ſlipping from it; and over all theſe is ſkrewed a cap repreſented at *x*, to cover the center work, and to keep off the duſt; which is alſo prevented from coming between the plates *a b c d* and *s t*, to the neck and collar, by means of a braſs hoop ſurrounding the broad rim or baſe of the collar *p r*, and ſkrewed to the back-ſide of the plate *s t*; which hoop is received into a circular grove 1, 2, 3, 4, made in the ſquare plate *a b c d*, without touching any part of it.

The chief excellency of the preſent center work conſiſts in preſerving the place of the central point of the quadrantal arch in the pole of the arbor *o i*. For, whenever the neck plate *k l m n* ſhall be worn ſo much as to cauſe an unſteady motion of the teleſcope about the center of the quadrant, a new neck plate and pipe may be caſt, well hammered and turned upon the poles of the ſame arbor *o i*, to fit the hole and collar; and then it will carry the teleſcope about the center of the limb, as exactly as when all was new.

The fourteenth figure gives a view of the quadrant fixed to the eaſtern ſide of a free-ſtone wall, built for that purpoſe in the plane of the meridian. The whole weight of the quadrant is ſupported by two ſtrong iron pins fixed to the wall (as hereafter deſcribed) and projecting through two holes made in two ſquare plates of iron riveted to the quadrant at *a* and *b*, in the tenth figure. The pin at *a*, which bears the greateſt part of the weight, is immoveably fixed in the wall; but the pin at *b* is moveable up or down by a ſtrong ſkrew, in order to bring one ſide of the quadrant to an horizontal, and the other to a vertical poſition.

The contrivance for the motion of the pin *b* is this: in the fifteenth figure *l m n o* repreſents an oblong plate of iron, let into the free-ſtone wall, and faſtened to it by bolts of iron, which paſs through the wall and through another plate let into the oppoſite ſide of it; the bottom of each plate being bent ſquare and bedded in the ſtone. And *e*, *f*, *g*, *h*, are the heads of 4 iron ſkrews, whoſe ſhanks going through 4 long ſlits, made in another iron plate, repreſented by the ſmaller parallellogram, are ſkrewed into the fixed plate *l m n o*. The moveable pin *b c* is fixed to this leſſer plate, which is raiſed, or depreſſed, by means of a long ſkrew *k i*, working againſt the bottom of the pin *b c* at *d*; being turned round in a ſtrong concave ſkrew, fixed to the bottom of the larger plate at *p q*. The key for turning the long ſkrew *k i* is a ſector of a circular plate repreſented at *r s t*; the ſquare hole in its center *t* being put upon the ſhank *k*. The radius of the key is juſt ſo big as to move in the ſpace between the wall and the bars of the quadrant; and a chiſſel *s* is inſerted into the teeth upon the arch of the key, to give power to the hand that moves it. The weight of the quadrant being thus ſupported by the pins *a*, *b*, (*fig.* 14.) the plane of it is fixed to the wall and adjuſted in any poſition, by much the ſame number of hold-faſts as there are little ſquares round about the quadrant in the ſeventh figure. Each hold-faſt conſiſts of two ſeparate parts; one of them is fixed to the wall, and the other to the quadrant.

In *fig.* 15. *a b* repreſents the wall ſeen end-ways, and *c*, *c*, ſeveral hold-faſts fixed into it. Between the chaps of each hold-faſt, repreſented at *d*, *e*, there paſſes one end of a ſmall plate of braſs, whoſe plane is parallel to the plane of the quadrant, the other end being bent to a right angle and riveted to the perpendicular bars of the quadrant; and each plate is pinched by two oppoſite ſkrews *r*, *s*, that work through the chaps *d*, *e*, which are made pretty wide for adjuſting the poſition of the plane of the quadrant. The intent of the ſkrews in the chaps of the hold-faſt was alſo that, if the wall or quadrant ſhould ſwell or ſhrink, ſo as to alter their proportions, the braſs plates might ſlide without diſtending the inſtrument. The hold-faſts are not faſtened in the wall with lead, which is apt to yield, but with a compoſition made of ſtone-duſt, pitch, and brimſtone, or roſin; ſuch as ſtone-cutters uſe for cementing broken ſtones.

The continuance of the exactneſs of the quadrant depends, in a great meaſure, upon a free and eaſy motion of the teleſcope round the center of it; which will be obtained by counterpoiſing the weight of the teleſcope, and by eaſing the center of the quadrant of as much of thoſe weights as poſſible. For this purpoſe in *fig.* 14. *a b* repreſents an iron axis laid croſs the top of the wall; having two braſs plates fixed perpendicular to the ends of it, with notches or holes cut in them for this axis to turn in, which points to the center of the quadrant at right angles to its plane. To that end of this axis next the quadrant, an iron arm *c d* is fixed, having two braſs plates *c e*, *d f*, almoſt perpendicular to it; to them are riveted two ſlender ſlips of fir, whoſe other ends meet at *g*, near the eye glaſs; being held together in a braſs cap or ſocket. Through a ſmall plate fixed to one ſide of a collar, embracing this lower end of the teleſcope, there paſſes a ſcrew pin at *g* parallel to the teleſcope; which pin, being ſkrewed into the cap at the end of the ſlips, holds up the teleſcope tight againſt the center work. The ſlips are ſtrengthened by 5 or 6 croſs braces of the ſame wood, as repreſented in the figure. To the other end of the axis *a b* another arm *h i* is fixed parallel to the teleſcope, and in a contrary direction, carrying a weight *i* to counterpoiſe the weight of the teleſcope, and make it reſt in any poſition. And, for the greater eaſe and freedom of its motion, two ſmall braſs rollers are fixed to each ſide of it, at *k* and *l*, which are held tight to the plane of the limb by a plate ſpringing againſt its backſide, which plate has alſo a roller at each end of it.

When the teleſcope is pretty nearly directed to an object whoſe altitude is to be taken, a plate *m n*, which is carried by the teleſcope along the limb, and lies croſs it, may be fixed to it by a ſcrew, not here repreſented. Then by twiſting the head *o* of a long ſkrew *o p*, which is parallel to the limb, and which works through a female ſkrew, annexed to the plate *m n*, and whoſe neck at *p* turns round in a collar annexed to the teleſcope; a very gradual motion is given to the teleſcope for bringing the croſs hairs exactly to cover the object.

To avoid the trouble of ſubdividing the quadrantal arch into ſmaller parts, the teleſcope carries a ſmall braſs plate, which ſlides upon the limb, and is called a nonius, from the name of its inventor. To underſtand the reaſon and uſe of this plate, it is convenient to premiſe the following theorem: If a line *a f*, (*plate* XXXIII. *fig.* 1.) be divided into any number of equal parts, *a b*, *b c*, *c d*, *d e*; and an equal line $\alpha\,\varepsilon$ be divided into other equal parts, $\alpha\beta$, $\beta\gamma$, $\gamma\delta$, $\delta\varepsilon$, whoſe number is one leſs than the number of parts in *a f*; I ſay that $\alpha\beta$, $\alpha\gamma$, $\alpha\delta$, $\alpha\varepsilon$, will exceed *a b*, *a c*, *a d*, *a e*, reſpectively, by one, two, three, or four parts of *a b*; whoſe denominator is the number of parts in *a e*, or in $\alpha\varepsilon$. For let the lines *a f*, $\alpha\varepsilon$, be coincident at both ends, and, ſince any equimultiples of two quantities *a b*, $\alpha\beta$, are in the ſame ratio as the quantities themſelves, it will be as $ab : \alpha\beta :: ac : \alpha\gamma :: ad : \alpha\delta :: ae : \alpha\varepsilon$ or *a f*, and disjointly as $ab : b\beta :: ac : c\gamma :: ad : d\delta ; : ae : e\varepsilon$ or *e f*. The conſequents, $b\beta$, $c\gamma$, $d\delta$, $e\varepsilon$, are therefore in the ſame arithmetical progreſſion as the antecedents *a b*, *a c*, *a d*, *a e*; and the firſt of the conſequents $b\beta$ is the ſame part of its antecedent *a b*, as the laſt conſequent *e f* is of its antecedent *a e*, or as $\alpha\beta$ is of $\alpha\varepsilon$, the number of parts in *a e* and $\alpha\varepsilon$ being equal by the firſt ſuppoſition: and it is manifeſt that any two equal and coincident arches of a circle have the ſame property.

The upper arch A B (*fig.* 2.) repreſents a degree divided into 12 equal parts, containing 5 minutes in each; and the end arch C D a 96th part of the quadrant, divided into 16 equal parts; and E F the nonius, or ſubdividing plate fixed to the teleſcope, and ſliding with it in the ſpace between the arches A B, C D. The degrees and minutes, and alſo thoſe 96 parts of the quadrant, are numbered from the left hand to the right, beginning from the interſections of the vertical radius, in order to meaſure the diſtances of objects from the zenith; but the parts upon the nonius are numbered the contrary way, beginning from the line *o o*, called the index; which is drawn perpendicular to the ſides of the nonius, at the end next the right-hand; and the line of ſight through the teleſcope is ſo adjuſted by the croſs hairs in its focus, as to be parallel to the index *o o* produced through the center of the quadrant. In the ſcheme the nonius E F is ſo ſituated, that the upper end of the index *o o* is not oppoſite to any one ſtroke upon the adjoining arch, but to ſome unknown point of a 12th part of a degree, intercepted between 50 and 55 minutes. To find the overplus above 50, I obſerve by looking back from the index, that a ſtroke of the nonius, which lies between the numbers 3 and 4, is directly oppoſite to a ſtroke upon the adjoining arch, which ſhews that 3 minutes and a half are to be added to the 50 minutes aforeſaid.

For ſince a degree is divided into 12 equal parts, containing 5 minutes in each, and ſince the length of the nonius is made equal to 11 of thoſe parts, and is divided into 10 equal parts; it appears by the theorem, in counting back again from the coincident ſtrokes to the index, that the firſt part of the nonius exceeds the firſt upon the limb by $\frac{1}{10}$ of this latter part, that is, by $\frac{1}{10}$ of 5 minutes, which is half a minute; and by conſequence that 7 parts of the nonius, from the coincident ſtrokes to the index, exceed the 7 correſponding parts of the arch, by 7 half minutes, or 3′ 30″.

When it happens that no one ſtroke upon the limb is directly oppoſite to a ſtroke upon the nonius, then look for that ſingle part of the limb, which is ſo oppoſed to a ſingle part upon the nonius, as to be exceeded by it at both ends, as repreſented in the parts G and H. Then, if by eſtimation of the eye, this part of the nonius exceeds the part of the limb equally at each end, allow 15″ more than if they had coincided at their ends next the index; and, as according as the exceſs next the index is judged to be one third, one half, double or treble of the other exceſs, allow $7\frac{1}{2}''$, 10″, 20″, $22\frac{1}{2}''$, reſpectively. For ſince the ſum of the two exceſſes is always the ſame, and anſwers to 30″, (as is plain, when one of them is deminiſhed to nothing;) the number of ſeconds to be added will always be to 30″, as the exceſs next the index is to the ſum of the two exceſſes.

The lower arch of the nonius is divided into 16 equal parts, and is equal in length to 17 equal parts upon the oppoſite arch, and conſequently will determine 16 parts of any one of them, by the theorem and method abovementioned. In the preſent ſcheme the oppoſite ſtrokes of the nonius and the lower arch are ſuppoſed to coincide at the end off the 9th part upon the nonius, which ſhews that the index cuts off 9 ſixteenths of the oppoſite part of the arch. And ſo the length of the arch, from the beginning of a 96th part of the quadrant, is thus denoted, 15, 9, the lower pointer being paſt the 15th ſtroke.

This way of ſubdividing by a nonius is preferable to the common method of drawing diagonals; both becauſe the trouble of drawing ſo many diagonals is intirely avoided, and alſo becauſe they cannot be drawn ſo exactly by the edge of a ruler, as the lines upon the nonius; and laſtly becauſe the interſection of theſe diagonals with the index or fiducial edge (as they call it) by reaſon of their great obliquity to each other, cannot be determined ſo exactly by the eye, as the coincidence of two ſtrokes in the nonius and the arch, which ſtand directly oppoſite to one another.

The object glaſs being firmly and immutably fixed in the teleſcope, the nonius plate *c d* (*fig.* 3.) and the collar plate *s t*, were both ſkrewed faſt to the teleſcope, when taken off from the quadrant; and the line of ſight was brought to be parallel to the line *c o*, drawn through *o*, the center of the collar *p q*, to *c* the beginning of the diviſions on the nonius, in this manner: the lines *s o t* and *e c f* being drawn upon theſe plates both perpendicular to *o c*, any diſtances *o t* and *c f* were taken equal to each other on one ſide of *o c*; and any other diſtances *o s* and *c e* (long enough to go beyond the teleſcope) were alſo taken equal to each other on the oppoſite ſide of *o c*. Through the four points *e*, *s*, *t*, *f*, the ends of the two plates were filled exactly parallel to *o c*. Then placing the points *t*, *f*, upon two points *m*, *n*, of an horizontal line drawn upon a firm plane, a point of a remote object covered by the croſs hairs was marked. And the teleſcope being turned half round its axis *a b*, and the oppoſite points *e*, *s*, of the plates being placed upon the ſame points *m*, *n*, another point of a remote object now covered by the croſs hairs was alſo marked; and, the teleſcope remaining fixed, the croſs hairs were moved in its focus, till, after ſeveral repetitions of this practice, the ſame point of the object was covered by them in both poſitions of the teleſcope; and then the line of ſight was exactly parallel to the line *o c*, ſuppoſing the object was very remote. But, becauſe ſmaller marks upon a nearer object are better diſcerned, the hairs were ſo adjuſted till in each poſition of the teleſcope they covered a ſeparate mark, the interval of the marks being taken equal to the difference of the heights of the axis of the teleſcope, above the fixed line *m n*, as near as could be meaſured.

The object glaſs being well centered (ſee the article CENTERING) the line of ſight was firſt of all made parallel to the plane of the quadrant, as near as it need be, by the meaſures of the braſs work annexed to the teleſcope; and then the plane deſcribed by the line of ſight, turned about the center of the quadrant, was brought into the plane of the meridian, by obſerving whether the fixed ſtars paſſed over the croſs hairs at the ſame inſtant of time, as they paſſed over a meridian teleſcope, placed ſo near the quadrant, that the two obſervers could hear each other calling out at the times of the tranſits. And, by the coincidence of theſe obſervations upon ſtars at various altitudes, it appeared that the plane of the quadrant was wrought very true. For it is certain that the meridian plane deſcribed by the meridian teleſcope, as turning upon a tranſverſe axis, muſt be truer than that deſcribed by the quadrantal teleſcope, as guided by the rollers upon the limb.

When the quadrant was thus reduced into the plane of the meridian by the hold-faſt above deſcribed, that radius of it, which terminates 90 degrees, was placed exactly vertical (by the movement abovementioned) with a plumb line of very fine ſilver wire; playing exactly over the middle of the central point *o* (*plate* XXXI. *fig.* 13, 14.) (in the pole of the arbor *o i*) and alſo over the ſtroke at 90 degrees upon the limb below. This poſition of the quadrant being once found, another plumb line was ſuſpended by the ſide of the quadrant, quite clear of the center work, ſo as to play exactly over the middle of a fine point made in the limb below, in order to examine afterwards whether the quadrant has kept its place. For this purpoſe, an oblong piece of braſs *a b*, (*plate* XXXIII. *fig.* 4.) laid flat upon the ſquare plate at the center of the quadrant, was gradually moved to the right or left, by two ſkrews *c*, *d*, working againſt the ends of it: a ſlit *a b* being cut lengthways through the plate to ſlide along two other ſkrew-pins *e*, *f*, fixed in the back plate. The wire of the plumbet was hung by a loop upon a pin *g*, and lay in a very fine angular nick, filed in the edges of a little plate *h*, which projected a little farther than the loop, for the wire to bear upon it. This plate *b*, and the pin *g*, were both fixed to the oblong plate *a b*; by whoſe gradual motions above deſcribed, the wire *h i* was brought to play exactly over the middle of the hole *i* in the limb; and then the plate *a b* was preſſed to the quadrant by the ſkrews *e*, *f*. *Smith's Optics.*

MU'REX, in natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe:

It is an univalve ſhell, bent with ſharp ſpines and tubercles, with a rough clavicle exerted near the ſummit in moſt ſpecies, but in ſome depreſſed. The mouth is always expanded, and ſometimes as liquor, ſometimes not; the lip is ſometimes digitated, ſometimes elated or folded, or jagged; and the columella is ſometimes rough, ſometimes ſmooth. See *Plate* XXXVI. *fig.* 3.

The antients were furniſhed with their fineſt purple dye, from a fiſh of the Murex kind, and therefore expreſſed the purple colour by the word Murex. We find, in Virgil,

——Tyrio ardebat murice lana.

Plumier tells us, that, in America, the Murex is called piſſeur, from its readily ejecting the liquor, which gives the purple colour, when it is taken from the rocks. And Fabius Columna diſtinguiſhes the Murex from the purpura and buccinum, but in a very injudicious manner. He ſays the purpura affords the fine purple colour: the Murex is covered with ſpines and turbercles, and the buccinum is known by its ſmooth and long wreath. But he ſhould have known that the affording the purple dye is common to the Murex and purpura, and even to ſome of the buccinum kind; and that there are Murexes with very few ſpines or tubercles, and buccina which are not ſmooth. The knowledge of the inſufficiency of theſe characters would have engaged him in ſeeking others more eſſential; and a perſon of his great abilities would then perhaps have prevented half the confuſion that has happened ſince in the world, on occaſion of errors of this kind propagated from his writings, and thoſe of two or three others of his time. See the article PURPLE.

MU'SA, *the plantain-tree*, in botany, a genus of plants, whoſe characters are:

The root ſends forth ſhoots, while the ſtalk, after producing its fruit, decays. The ſtalk is like a reed, without branches, but running into very large leaves, which are firſt involved, as in the cannacorus, and afterwards expanded in the form of a circle at the top of the ſtalk. The flowers and fruit are diſpoſed in cluſters, and incloſed in ſheaths, as in the palma, or date-tree; the flower is polypetalous, anomalous, and grows on the apex of the ovary. The ovary is like that of a cucumber, ſoft, tricapſular, eſculent, full of ſeeds, and furniſhed with a long tube, which has a globular apex.

Muſa is the Arabic name for this plant, which by Pliny, as we ſuppoſe, is called pala, from the word bala, which is the name by which it is known to the Malabarians at this day. Though all botaniſts reckon it among trees, it hardly deſerves the name of a ſhrub, much leſs of a tree, ſince it has an annual ſtalk. By Oviedus, and others, it is called platanus; whence comes our Engliſh name, the plantain tree; unleſs we ſhould rather think it was ſo called from its reſemblance to plantain, in its ribbed and fibrous leaves.

The fruit is eſteemed delicious food; and, they ſay, was never known to create any diſorder, though eaten ever ſo freely. Linſchooten ſays, that it has a ſweet taſte like flour and butter mixed together, and, therefore, may ſupply the place of bread and milk-meals, with a ſimple kind of diet, by which the human body may be ſupported without any other food.

As to its virtues, Alpinus ſpeaks thus: the fruit is of a ſoft, viſcid, fat, and ſweet ſubſtance, extremely grateful to thoſe who uſe to eat it, and very nouriſhing, but burthenſome to the ſtomach, difficult of digeſtion, and generates a thick and viſcid juice, which cauſes obſtructions of the viſcera, and eſpecially of the liver; it is, however, beneficial in a cough, and an aſthma proceeding from heat. The Egyptians uſe the decoction with good ſucceſs in a cough, excited by a diſtillation of hot humours, and for inflammations of the pleura, lungs, and kidneys, and for a dyſury; it is, alſo, ſaid to ſtimulate to venery, eaten raw or boiled.

The authors of the Hortus Malabaricus tell us, that the root bruiſed, and taken in milk, cures the vertigo; that the water of it, mixed with ſugar, is drank with good ſucceſs, for a burning heat of the kidneys, and for pains excited by the urine; and relieves thoſe whoſe bodies have been infected with quick-ſilver. The pith of the tree, or the whitiſh medullary ſubſtance, which bears the fruit, being bruiſed, and taken inwardly with honey, is good for the affections of the eyes, as is alſo butter, in which ſlices of the fruit have been fried.

It grows in all parts of the Eaſt and Weſt-Indies, and alſo in Africa. The ficus Indica of Linſchooten I take to be only a variety, not a ſpecies, of the Muſa; for it appears to be the ſame with that deſcribed by the authors of the Hortus Malabaricus, both from the ſynonyma, and the place where it grows; for the Malabarians, he ſays, call it palan, and thoſe of Bengal, quelli, which are names much like the bala of the Hortus Malabaricus and Keli. Among the ſpecies, alſo, or varieties, I find one, both in the Hortus Malabaricus, and in Linſchooten, called cadalin. The leaves, which are an ell long, and three ſpans broad, or, according to Lerius, ſix feet long and two broad, equal in dimenſions to thoſe of the lapathum aquaticum, ſupply the Indians at Goa, with much uſeful furniture for their houſes, and the Turks make uſe of them inſtead of paper; a ſhoot is often loaded with a hundred plantains, cluſtered together like grapes; and the branches, from whence they hang, often grow to ſuch a bigneſs, that, when lopped off with the fruit, they can hardly be carried upon a pole between two porters. The plant bears fruit all the year, and ſupplies the Indians with proviſion every day. *Raii, Hiſt. Plant.*

MUS'CLE (*Dict.*)—The learned Dr. Morton, in his Inquiry into the cauſe of voluntary muſcular motion, propoſes and ſolves the following problem:

A Muſcle being given in its natural ſtate, in a living animal body, it is aſked how, or by what mechanical means, that Muſcle contracts, and is again relaxed, at the command of the will?

Every Muſcle of an animal body is obſerved to be an inſtrument compoſed of fibres or leſſer muſcles, which are joined together, every-where, by one common membrane or ſubſtance, called, from its appearance, cellular. This ſubſtance, when it arrives at the ſurface of the muſcle, becomes uniform, and makes one intire ſheath for the whole Muſcle, or bundle of fibres, and renders it diſtinct from others.

The conſtituent fibres in many Muſcles are obſerved to be partly fleſhy, and partly tendinous; the one changing, or being continued, into the other, for the conveniency of inſertion and motion. But the obſervation is univerſal, that the fleſhy fibres alone contract in muſcular motion, and that this contraction is always wave-like, or in alternate curls, from one extremity to the other of a given fibre.

We conſtantly obſerve, in every Muſcle, numerous arteries, veins, and nerves. Theſe are generally diſtributed together, or in the ſame courſe, by means of the connecting cellular ſubſtance, into every point of the fleſhy fibres. Injections, and the knife of the anatomiſt, have followed them a great way, and reaſon completes the diſtribution, ſince you can no-where wound the fleſh of a Muſcle, but it ſhall bleed, and witneſs a ſenſe of pain.

Therefore there is a circulation of blood, throughout the whole fleſhy ſubſtance of a Muſcle, and further the Muſcle feels in every part.

In a living animal, if you tie the artery and vein, which principally belong to a given Muſcle, that Muſcle is diſabled from acting, at the command of the will. Steno, a Daniſh anatomiſt of the laſt century, performed this experiment upon the deſcending aorta, and thereby took away the uſe of all the lower limbs (*vide Bgererum, p.* 296) at once, and reſtored them at pleaſure. Late anatomiſts have it tried upon leſſer veſſels, with the ſame conſtant ſucceſs. (*Vide Albini Hiſtor. Muſcul. p.* 19.)

In a living animal, if you tie the nerve that ſupplies a given Muſcle, that Muſcle is diſabled from acting at the command of the will. This experiment is diſtinctly mentioned by Galen in his treatiſe on the Muſcles, and is approved by the trials of later anatomiſts. (*Alb. p.* 19.)

From theſe two experiments it is clear, and generally agreed upon, that, in order to the performance of voluntary muſcular motion, beſides the particular ſtructure, there is required an abſolute freedom of the blood-veſſels and the nerves.

Muſcular motion is obſerved to be voluntary and involuntary. Of the firſt kind are all the Muſcles of an animal body; of the latter, the only complete inſtance is the heart. The firſt ſeems more complex than the latter, ſince, beſides the motion, it implies an additional act of the will. Effects, that are leſs compounded, ought naturally to precede effects that are more; theſe receiving light from the former, where both are homogeneous. For this reaſon, I have placed here two lemma's relating to automatic, or involuntary motion.

Lemma I. The heart, in its natural ſtate, in a living animal body, being given, its contraction proceeds ſolely from, or is mechanically cauſed by, the warm blood, flowing into and filling its fleſhy ſubſtance in every part.

If this be denied, let the body of an animal be taken quickly after death, and let a warm mild fluid of any kind be injected gently into the heart, ſo as to fill it. When this is done, we ſhall ſee the heart quicken and contract, as in the life of the animal. This experiment was firſt diſtinctly mentioned by Peyer, a Switzer, (ſee a ſmall treatiſe of his, printed anno 1682, at Amſterdam, and intitled, Miraculum anatomicum in cordibus ſuſcitatis) and is now known to every anatomiſt. But, if this effect is thus conſtantly produced ſoon after death, how much more, when the animal is alive? And if, by the introduction of any common fluid, with the bare addition of a warmth cogniſable by our ſenſes, how much more by the introduction of the living blood, an inimitable and wonderful fluid, and the immediate ſubject of the vital warmth?

If therefore it is granted, that we ought not to admit more cauſes of natural things than are real (and preſent for the occaſion) and ſufficient for explaining the appearances, and we muſt grant a rule, whoſe uſe is ſo obvious in the Newtonian, which is the philoſophy of nature; we ſhall, I ſay, alſo grant, that the contraction of the heart, in its natural ſtate, in a living animal body, proceeds ſolely from, or is mechanically cauſed by, the warm blood, flowing into, and filling, its fleſhy ſubſtance in every part. Which was to be proved.

Corollary. The ſubſequent relaxation admits no difficulty: for, if the blood is the immediate mechanical cauſe of the contraction, when the blood is removed, the effect ceaſes.

Lemma II. A Muſcle of voluntary motion, in its natural ſtate, in a living animal body, being given, it will contract, by the introduction of a warm mild fluid, into its fleſhy ſubſtance in every part.

If this be denied, let the body of an animal be taken quickly after death, and the crural artery be pierced, and a warm mild fluid be injected into it: we ſhall then ſee the Muſcles, to which the artery belongs, quicken and contract, as if the living animal moved them. This experiment was known to Mr. Cowper, and is confirmed by Albinus (ſee *Hiſt. Muſc.*) But, if this effect is conſtantly produced ſoon after death, how much more when the animal is alive?

Therefore a Muſcle of voluntary motion, in its natural ſtate, in a living animal body, will contract, by the introduction of a warm mild fluid, into its fleſhy ſubſtance, in every part: which was to be proved.

But here it may be objected, with ſome appearance of reaſon, that there is a warm fluid, the living blood, in every part of the fleſhy ſubſtance of all the Muſcles, during the life of the animals; and yet it is a fact, that no Muſcle of voluntary motion contracts, but at the command of the will, morbid caſes excepted. This objection comes cloſe to the original queſtion, and, however reaſonable it may ſeem, will quickly vaniſh before ſome common obſervations concerning the objects of ſenſe in general, and their manner of operating upon the different organs, ſo far as it univerſally agrees.

We muſt firſt beg leave to make an eaſy poſtulatum, viz. that the nerves are the immediate inſtruments of ſenſation, though they are differently organiſed for the different ſenſes.

It is a certain fact, that, in the ſeveral ſenſes, the proper objects being ſuppoſed preſent, the ſenſation is intirely relative; or, in other words, that the preſence of a powerful object always obliterates the preſent ſenſation of a weak object; and that the conſtant habitual preſence of any one object, in the ſame given degree, produces no ſenſation at all.

Thus we obſerve, that the light of the ſun extinguiſhes the light of the ſtars; a ſtronger taſte covers a weaker; the ſound of a drum drowns an ordinary human voice; itching is baniſhed by ſmart and pain; a weak ſcent, by one that is ſtrong; cold, or a leſs degree of warmth, by heat, or a greater degree of warmth; and, univerſally, our daily experience demonſtrates to us, that every organ of ſenſe, made familiar to a given degree of its object, affords no manner of ſenſation of the object in the given degree.

Thus it fares with the warm blood, which has conſtantly flowed through the whole minute ſubſtance of every Muſcle of voluntary motion in an animal body, from the time of their formation, or unfolding in the womb. And it is highly probable, that the quickening of the child in a woman is no other than the completion of that ſtate, in which the blood begins freely to flow through, and to affect the inſtruments of voluntary motion; and, till it becomes familiar to them, produces thoſe frequent ſhudders, or general muſcular contractions in the whole frame of the fœtus, which for a fortnight or more are the conſtant ſigns, that it has now obtained an animal life.

And here ariſes an apparent difference, though it will be found the greateſt uniformity, between the Muſcles of voluntary and thoſe of involuntary motion; and namely the heart; which, being appointed to protrude the vital fluids during the life of an animal, has a ſhort alternate remiſſion of its contracting cauſe; and is thereby rendered capable of admitting a conſtant and neceſſary ſupply of labour and ſtimulus together, without any force, or contradiction, to the natural order of the whole.

It follows undeniably from what has been ſaid, that if we can prove, that a given Muſcle of voluntary motion does really feel an increaſe of the familiar warmth of its contained blood, or an equivalent, to riſe and fall inſtantly at the command of the will, we ſhall then duly account for the ſubſequent motion. Or, more particularly, if we can prove, that the will has a direct power of heightening, increaſing, and rendering more acute, the ſenſe of any nerve, diſtributed to a given Muſcle, the ſame familiar poſitive degree of warmth in the contained blood will, to this more acute ſenſe, appear to be proportionably heightened and increaſed; and the Muſcle (by Lemma II.) will inſtantly contract, and continue in that ſtate during the action of the will; allowing for a ſmall feebleneſs, that will gradually ariſe from the gradual excluſion of the contracting cauſe; and from the blunting of this more acute, and, as it were, new ſenſation; which yet, as we ſee, may be proportionably compenſated, by the will, for a time, even to the deſtruction of the nerve, the blood-veſſels, and indeed the whole organ, by a mortification, which has been known to ſucceed a long muſcular contraction.

We know from daily experience, that the will hath a power over all the organs of ſenſe, to heighten, or render acute, and again to relax them, their proper objects, in a reaſonable degree, being ſuppoſed preſent. And the ſame experience teaches us, that this power is greater or leſs, according to the more or leſs frequent uſe and exerciſe that is made of it. For it is obvious to every one, that any ſound man is able to feel, to taſte, to ſmell, to hear, and to ſee, more accurately when he pleaſes. And it is equally obvious and certain, that any one of theſe five ſenſes, being exerciſed, with an uncommon degree of attention and induſtry, either from choice, or from neceſſity, arrives at an uncommon degree of accuracy and perfection. Indeed it is intirely from uſe and exerciſe, that a child learns to diſtinguiſh at all between the ſeveral objects of a given ſenſe, or, which are the ſame, between the ſeveral degrees, or modes, of its proper object.

All theſe particulars being demonſtrably true of every ſenſe, that we can directly examine, the inference is very fair to the ſingle ſenſe (Lem. II.) that we cannot directly examine; and, in truth, the induction, in this caſe, is but one ſtep below a complete experimental demonſtration.

It appears therefore, that the will hath a direct power of heightening, increaſing, and rendering more acute, the ſenſe or feeling of a given nerve, diſperſed throughout the whole contracting ſubſtance of a given muſcle, with all its gradations of accuracy and perfection, by repeated uſe and exerciſe.

Solution, or anſwer to the problem. — It follows, therefore, that, a muſcle being given, in its natural ſtate, in a living animal body, the blood, which is preſent in every part of its contracting ſubſtance, and which, in effect, to the ſenſe of the given Muſcle (which is occaſionally rendered more acute) puts on an increaſed heat, and again lays it down at the command of the will, is the immediate mechanical cauſe, by which the Muſcle does inſtantly contract, and is again relaxed, at the command of the will.

Therefore, a full ſolution is given to the queſtion propoſed: which was to be done.

Corollary 1. Hence it appears, that muſcular voluntary motion is performed merely as a ſenſation extremely acute, and under the niceſt management of the will: which explains its velocity in a great meaſure.

Corol. 2. Hence it appears, that the Galenic diſtinction of nerves, into nerves of ſenſation and nerves of motion, which greatly puzzles phyſiology, has no real foundation in an animal body.

A ſhort ſcholium. The ſolution, that is given to the problem, may be aſſumed in a philoſophical ſyntheſis, and the various appearances may thence be announced, as well in natural as in morbid caſes; which again may be ſubjected to a ſtrict examination. Some trial has been made of this, and a ſurpriſing agreement found: but the detail muſt be omitted. In the courſe of this inquiry, every foreign diſquiſition is induſtriouſly avoided, and ſuch at this time would be a further queſtion, why blood, in a certain, or apparent, degree of heat, contracts a muſcular fibre?

The buſineſs of natural philoſophy is, to obſerve and to note down facts that are conſtant; and, ſingling out thoſe that are ſimilar, to collect their proper univerſal, by a fair and regular induction; and to acquieſce in this, till a new collection of conſtant and ſimilar facts affords an higher univerſal, and leads nearer the firſt cauſe. *Philoſophical Tranſactions*, Vol. 47.

Muscle, in natural hiſtory; ſee the article MYTULUS.

Muscles *of vegetables*. — The Muſcles of animal bodies have been the ſubject of numerous diſſertations; but thoſe in vegetables have been leſs regarded. Mr. Tournefort, however, has plainly proved, that many of the veſſels of plants become in the drying fibres capable of tenſion; that in many plants there are great numbers of theſe fibres which have all the ſame direction, and always act all together, and can only ſhorten or contract themſelves in one particular direction; wherefore the parts compoſed of theſe fibres are very properly compared to the Muſcles of animals. By the word Muſcle we underſtand a part compoſed of theſe fibres ſo determinately arranged, that by their contraction they can only move the part in ſome certain and determinate manner; and, in this which ſeems the received ſenſe of the word, there are many inſtances in which it may be uſed to parts of plants, with the ſtricteſt juſtice.

All the pods of the leguminous plants, as peaſe, &c. are compoſed each of two valves, more or leſs convex on the outſide; theſe are placed evenly upon one another, and faſtened together by means of a great number of very fine veſſels; they are faſtened much more firmly together at the back, than at the fore-rim; and the large veſſels which carry nouriſhment both to the valves and ſeeds, are lodged there, and ſend many ramifications both to one and the other of the valves of the pod.

Each valve is formed of two ranges of fibres; the exterior arrangement is formed into a ſort of net-work, and the threads which compoſe it iſſue from the back of the pod, and are propagated longitudinally, and ſomewhat obliquely through the ſurface of the valves, and finally terminate at the edge or fore rim of the pod, after they have entered into the fleſhy part, with the net-like plexus of veſſels, of which they make frequent anaſtomoſes.

The anterior plan or arrangement of fibres croſſes the exterior, in the ſame manner as the interior intercoſtal Muſcles in the human body croſs the exterior; and theſe form the inner membrane of the pod: theſe fibres ariſe, like the others, from the back of the pod, and run obliquely to the edge. A neceſſary conſequence of this ſtructure is, that the arrangement of exterior fibres muſt become dry before the others, as muſt alſo the fleſhy ſubſtance in which they lie; and the conſequence of this is, that they muſt contract and draw the edge of the valve to which they belong at once upward and outward, and endeavour to ſeparate it from the edge of the other valve, drawing with it the anterior arrangement of fibres; this therefore pulls open the pod, and the air which is very hot at the ſeaſon when the ſeeds of theſe plants ripen, inſinuating itſelf into the interſtices of the internal arrangement of fibres which are expoſed to it by the opening of the pod, ſoon acts upon them, and they begin to contract in their turn. Theſe fibres were once the veſſels which conveyed the nutritive juices to the pods and ſeeds; but when that uſe is no longer neceſſary for them, and when no more juices aſcend, after the ſeeds have arrived at their deſtined ſize, they then ſhrink up, and no more perform the office of veſſels, but become mere fibres. As theſe do not all dry up, and ſuffer this change together, but neceſſarily it happens, firſt to thoſe which are ſituated at the greateſt diſtance from the pedicle, and, conſequently, thoſe are the firſt of the anterior fibres which act by ſhortening themſelves; this, therefore, begins at the extremity of the pod, and is continued up to the pedicle; and the effect is that, as theſe interior fibres are ſtronger and more numerous than the exterior, which are at this time as far ſhortened as they are capable of, they now draw backwards and inwards the lips of the edge of the pod towards the back. When the warm air acts upon theſe fibres to dry and contract them, it draws nearly equally at both their ends; and, therefore, if the two arrangements of fibres were regularly tranſverſe, each valve of the pod muſt be drawn by this action into a ſort of tube, or pipe; but as they are placed in an oblique direction, and parallel to one another, the natural effect of their contraction muſt be the drawing the valve into a ſpiral form, which we ſee is exactly the caſe. The lines which form the rim of each valve can make no reſiſtance to this contraction, becauſe they are ſo dried up by the warm air, and want of juices, that they may be crumbled to powder between the fingers, and eaſily break in any part with the ſmalleſt force. This claſs of plants gives numerous inſtances of this ſort of Muſcles in vegetables, and they are more obvious than moſt others, being not only common in the hedges, but cultivated in gardens for the uſes of the kitchen, &c. The ingenious author of the ſyſtem gives many other inſtances in other plants. *Mem. Acad. Par.* 1693.

MU'SHROOM (*Dict.*)— Mr. Miller ſays, that the true eatable Muſhroom is diſtinguiſhed from the poiſonous and unpleaſant kinds by theſe marks. When young, it appears of a roundiſh form like a button, the ſtalk as well as the button being white, and the fleſhy part very white when broken, the gills within being livid. As they grow larger, they expand their head by degrees into a flat form, and the gills underneath at firſt are of a pale fleſh colour, but, as they ſtand long, become blackiſh.

In order to propagate Muſhrooms, the meadows and paſtures ſhould be ſearched for them in Auguſt and September; and, wherever they are found, the ground ſhould be opened all about the roots, where there will be found abundance of ſmall white knobs. Theſe are to be taken up with lumps of earth about them. Then ſome new horſe-dung is to be procured, and, the litter being ſhaken out, the dung muſt be laid together on a heap to ferment for eight days. A trench muſt then be dug, and the dung laid in it a foot thick, and covered over ſix or eight inches thick with light rich earth; and into this, on each ſide, ſhould be put in the knobs of Muſhroom ſpawn, as it is called, at ſix inches diſtance. After this, another layer of dung is to be made upon this earth, to ſix or eight inches thickneſs, or more, but obſerving to draw in the ſides, ſo as not to cover the knobs of Muſhrooms above half an inch; then another layer of earth is to be laid on this, and ſome more knobs of the Muſhroom ſpawn placed on this at the ſides, as in the former; then put on a third layer of dung, drawing it in ſtill narrower, that it may not cover the ſecond plantation; and cover this with another layer of earth, drawing this up into a ridge at top, and planting more of the Muſhroom ſpawn in this, but ſtill laying it in ſideways as before. When all is thus finiſhed, the whole bed is to be covered half a foot thick with dry litter, to prevent the earth from drying too faſt. When the bed has been made a fortnight, it ſhould be carefully looked over, drawing away the litter with the hands, to ſee whether any young Muſhrooms appear; and they muſt be gathered as they grow large; for, if ſuffered to remain, they will rot upon the bed, and deſtroy all the young ſpawn that is about them. And, when they begin to produce, the bed muſt be ſearched every other day, all the year round, and every day in Auguſt and September, which is the time of their principal increaſe, to gather ſuch as are fit for uſe. The manner of gathering them is, to pull them gently out of the ground, ſo that no part of their ſtalk may be left behind; but, if any part of the ſpawn is pulled up with the ſtalk, that muſt be carefully returned into the bed. As the cold or wet weather comes on, the covering of dry litter over the whole bed muſt be increaſed. A bed, thus managed, will remain good many months, and produce vaſt abundance of Muſhrooms; and the ſpawn may be at times taken out from it to ſupply other new beds. At whatever time of the year this is taken up, it ſhould be carefully laid up in a dry place till the month of July following, which is the proper time for planting it in new beds. *Miller's Gard. Dict.*

MUSQUETEE'RS, *mouſquetaires*, in France, are troopers who fight ſometimes on foot, ſometimes on horſe-back; they are gentlemen of good families, and are divided into two troops, the one called the grey Muſqueteers, becauſe of the colour of their horſes; the other the black Muſqueteers, for the ſame reaſon.

MU'STARD, *ſinapi*, in botany. See SINAPI.

The common Muſtard is cultivated in many places, both in gardens and fields, for its ſeeds. It is propagated by ſowing the ſeeds in ſpring upon an open place, which has been well dug or plowed. When the young plants are come up, they muſt be cleared of weeds, and hoed up to about eight or ten inches aſunder. They will then grow ſtrong, and, when the ſeeds ripen, the whole plant is cut down, and the ſeeds thraſhed out. But, beſides this, there is another kind of Muſtard, commonly known by the name of the white or garden Muſtard, which is ſown for a ſallad herb in ſpring: the ſeeds of this are to be ſown very thick in drills on a warm border, or a moderate hot-bed; they will be fit to cut for ſallading in three weeks after the ſowing. *Miller's Gard. Dict.*

MUTA'TIONES, among the Romans, poſtages, or places where the public couriers were ſupplied with freſh horſes.

MUTEFE'RRIRA, a body of horſe kept up in Egypt, in the ſervice of the grand Signior; theſe, with the chaouſes, were originally the guards of the Sultan of Egypt. This is a body of the greateſt dignity, as is expreſſed by the word, which ſignifies a choſen people. *Pocock's Egypt.*

MYIA'GRUS *Deus*, in the heathen mythology, a name given ſometimes to Jupiter, and ſometimes to Hercules, on occaſion of their being ſacrificed to, for the driving away the vaſt numbers of flies which infeſted the ſacrifices on certain public occaſions. The word is generally ſpelt Myagrus; but this muſt be an error, as this word does not expreſs the fly-deſtroyer, but the mouſe-deſtroyer; and we have it ſufficiently teſtified by the ancients, that flies were the only creatures againſt whom this deity was invoked.

MY'STRUM, among the ancients, a liquid meaſure, which was the fourth part of the cyathus.

MY'RTUS, *the myrtle*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, and is compoſed of ſeveral petals, arranged in a circular form. The cup finally becomes a fruit or berry of the ſhape of an olive, coronated at the end, divided into three cells, and containing kidney-ſhaped ſeeds.

There are ſeveral ſpecies of this plant preſerved in our gardens; they are all eaſily propagated from cuttings. The beſt ſeaſon for this is July, and the ſtraighteſt and youngeſt vigorous ſhoots are to be choſen. Theſe ſhould be cut off about eight inches long, and the leaves of the lower part ſtripped off to about two inches high, and that part of the ſtalk twiſted which is to be placed in the ground; they are to be planted in pots of light rich earth, at about two inches diſtance from each other, obſerving to cloſe the earth very well about them, and give them a gentle watering. They are then to be removed into a moderate hot-bed, and ſhaded and watered once in two or three days, till they have taken root. In about a month's time they will be rooted, and will begin to ſhoot, and muſt then be inured, by degrees, to the air; and in Auguſt they ſhould be removed into the open air, but placed in a warm ſituation, and ſheltered from the winds; they ſhould ſtand here till October, and then be removed into a green-houſe, where they ſhould be placed ſo as to have as much air as poſſible. In the March following, they ſhould be removed into ſeparate pots of rich earth, and in May ſet out to the open air in a warm and well defended place. They will require in the ſummer frequent waterings, and the dead leaves ſhould be carefully picked off. As they advance in growth, they are to be ſhifted at times into pots of a larger ſize; and this ſhould be done either in April or in Auguſt; and, towards the end of October, they ſhould always be removed into the green-houſe. *Miller's Gard. Dict.*

MY'TULUS, *the muſcle*, in natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe: it is a bivalve ſhell, of an oblong form, ending in a point, and having its two extremities equal. It is ſometimes ſmooth, ſometimes rough. In ſome ſpecies flat; in others elate, and in ſome has the beak elate. The tellina and pinna marina, of each of which there are ſeveral ſpecies, are properly of this genus.

Muſcles are well known to have a power of faſtening themſelves very firmly either to ſtones, or to one another's ſhells, in a very ſtrong and firm manner; but the method of doing this was not well underſtood, till the obſervations of the accurate Mr. Reaumur explained it.

Every one who opens and examines a common muſcle will find, that in the middle of the fiſh there is placed a little blackiſh or browniſh body reſembling a tongue; this in a large muſcle is near half an inch long, and a little more than a ſixth of an inch in breadth, and is narrower at the origin than at the extremity; from the root of this tongue, or that part of it which is faſtened to the body of the fiſh, there are produced a great number of threads, which, when fixed to any ſolid ſubſtance, hold the muſcle firmly in its place: theſe threads are uſually from an inch to two inches in length, and in thickneſs, from that of a hair to that of a hog's briſtle. They iſſue out of the ſhell in that part where it naturally opens, and fix themſelves to any thing that lies in their way, to ſtones, to fragments of ſhells, or, which is the moſt common caſe, to the ſhells of other muſcles; whence it happens that there are uſually ſuch large parcels of muſcles found together. Theſe threads are expanded on every ſide, and are uſually very numerous; an hundred and fifty have been found iſſuing from one ſhell; they ſerve the office of ſo many cables, and each pulling in its proper direction, they keep the muſcle fixed againſt any force that can be offered from whatever part it comes. The filaments are well known to all who eat muſcles, who ever carefully ſeparate them under the name of the beard; and Mr. Reaumur has found, that while the animal is living in the ſea, if they are all torn away by any accident, the creature has a power of ſubſtituting others in their room: he found that, if a quantity of muſcles were detached from one another and put into a veſſel of any kind, and in that plunged into the ſea, they in a little time there faſtened themſelves both to the ſides of the veſſel and to one another's ſhells; the extremity of each thread ſeemed in this caſe to ſerve in the manner of a hand to ſeize upon any thing it would fix to, and the other part which was ſlenderer and ſmaller to do the office of an arm in conducting it.

To know the manner of the muſcle's performing this operation, this diligent obſerver put ſome muſcles into a veſſel in his chamber, and covered them with ſea water; he here ſaw that they ſoon began to open their ſhells; and each put forth that little body before deſcribed by its reſemblance to a tongue, and at the root of which theſe threads grow; they extended and ſhortened this part ſeveral times, and thruſt it out every way, often giving it not leſs than two inches in length, and trying before, behind, and on every ſide with it, what were the proper places to fix their threads at: at the end of theſe trials they let it remain fixed for ſome time on the ſpot which they choſe for that purpoſe, and then, drawing it back into the ſhell with great quickneſs, it was eaſy to ſee that they were then faſtened by one of theſe threads to the ſpot where it had before touched, and remained fixed for a few minutes; and, in repeating this workmanſhip, the threads are increaſed in number one at every time, and, being fixed at different places, they ſuſtain the fiſh at reſt againſt any common force.

The ſeveral threads were found to be very different from one another, the new formed ones being ever whiter, more gloſſy, and more tranſparent than the others; and it appeared, on a cloſe examination, that it was not, as might have been moſt naturally ſuppoſed, the office of the tongue to convey the old threads one by one to the new places where they were now to be fixed, but that theſe in reality were now become uſeleſs; and that every thread we ſee now formed, is a new one made at this time; and, in fine, that nature has given to ſome ſea fiſhes, as well as to many land inſects, a power of ſpinning theſe threads for their neceſſary uſes. And that muſcles and the like fiſh are, under water, what caterpillars and ſpiders are at land. To be well aſſured of this, however, Mr. Reaumur cut off all the beard or old threads of a muſcle as cloſe as he could, without injuring the part, and the proof of the opinion of their ſpinning new ones at pleaſure was now brought to this eaſy trial, whether theſe muſcles ſo deprived of their old ones could fix themſelves as ſoon as others which were poſſeſſed of theirs, and could throw out their threads to as conſiderable diſtances. The experiment proved the truth of the conjecture, for thoſe whoſe beards or old threads were cut off, fixed themſelves as ſoon as thoſe in which they were left, and ſpread their threads to as great diſtance every way.

When the mechaniſm of this manufacture was thus far underſtood, it became a natural deſire to enquire into the nature of the part by which it was performed: this has hitherto been mentioned under the name of the tongue, from its ſhape; but it is truly the arm of the fiſh, and, whenever it happens to be looſened from its company, or fixed in a wrong place, it ſerves the animal to drag its whole body, ſhell, and all along, and perform its ſeveral motions. It fixes itſelf to ſome ſolid body, and then, ſtrongly contracting its length, the whole fiſh muſt neceſſarily follow it, and be pulled towards the place where it is fixed. This is an uſe, however, that this part is ſo rarely put to, that it is not properly to be eſteemed a leg or an arm, for this; but, according to its more frequent employment, may much better be denominated the organ by which the threads are ſpun.

Though this body is flat in the manner of a tongue, for the greater part of its length, it is however rounded or cylindric about the baſe or inſertion, and it is much ſmaller there than in any other part; there are ſeveral muſcular ligaments faſtened to it about the root or baſe, which hold it firmly againſt the middle of the back of the ſhell; of thoſe ligaments there are four, which are particularly obſervable, and which ſerve to move the body in any direction. There runs all along this body a ſlit or crack, which pierces very deeply into its ſubſtance, and divides it as it were into two longitudinal ſections; this is properly a canal, and along this is thrown the liquor which ſerves to form the threads; and it is in this canal or ſlit that theſe threads are moulded into their form. Externally, this appears only a ſmall crack or ſlit, becauſe the two fleſhy ſections of the parts almoſt meet and cover it; but it is rounded and deep within, and is ſurrounded with circular fibres. This canal is carried regularly on from the tip of the tongue, as it is called, to its baſe, where it becomes cylindric; the cylinder in this part being no other than a cloſe tube or pipe, in which this open canal terminates. The cylindric tube contains a round oblong body, of the nature of the threads, except that it is much longer; and from the extremity of this all the threads are produced, this ſerving as a great cable to which all the other little cordages, diſperſed towards different parts, are fixed. The tube or pipe in which this large thread is lodged, ſeems the reſervoir of the liquor of which the other threads are formed; all its internal ſurface being furniſhed with glands for its ſecretion. *Mem. Acad. Par.* 1711.

N.

NA'BLUM, in Hebrew, nebel, an inſtrument of muſic among the Hebrews. The ſeventy and the vulgate tranſlate it ſometimes by Nablum, and at other times by pſalterion, or lyra, or even cithara.

The Nablum was a ſtringed inſtrument, very near of the form of a △, which was played upon by both hands, and with a kind of bow. See Calmet's Diſſertation concerning the inſtruments of muſic of the ancient Hebrews, prefixed to his ſecond volume of his Commentary upon the Pſalms. *Calmet's Dict. Bibl.*

NAILS, in building (*Dict.*) — The ſeveral kinds of Nails are very numerous.— As back and bottom Nails, made with flat ſhanks to hold faſt, and not open the wood.— Clamp Nails, thoſe proper to faſten the clamps in buildings, &c. Claſp Nails, whoſe heads, claſping and ſticking into the wood, render the work ſmooth, ſo as to admit a plane over it: they are of two kinds, viz. long, proper for fine buildings of fir, &c. and ſtrong, fit for oak, and other hard wood. — Clench Nails, thoſe uſed by boat, barge, &c. builders; proper for boarded buildings, that are to be taken down, becauſe they will drive without ſplitting, and draw without breaking.—Clout Nails, thoſe ordinarily uſed for nailing on of clouts to axle-trees. — Deck Nails, thoſe proper for faſtening of decks in ſhips, doubling of ſhipping, and floors laid with planks.— Dog Nails, proper for faſtening of hinges to doors, &c.—Flat points, are of two kinds, viz. longs, much uſed in ſhipping, and proper where there is occaſion to draw and hold faſt, yet no neceſſity of clenching. —Jobent Nails, thoſe commonly uſed to nail thin plates of iron to wood. — Lead Nails, uſed to nail lead, leather, and canvas to hard wood. — Port Nails, commonly uſed to nail hinges to the ports of ſhips.—Pound Nails, are four-ſquare in the ſhank; much uſed in Norfolk, Suffolk, and Eſſex, though ſcarce elſewhere, except for paling. — Ribbing Nails, uſed to faſten the ribbing, to keep the ribs of ſhips in their place in building. — Roſe Nails, are drawn four-ſquare in the ſhank, and commonly in a round tool.—Rother Nails, chiefly uſed to faſten rother-irons to ſhips. — Round-head Nails, proper to faſten on hinges, or other uſes, where a neat head is required. —Scupper Nails, much uſed to faſten leather and canvas to wood.—Sharp Nails, much uſed, eſpecially in the Weſt-Indies, made with ſharp points, and flat ſhanks. — Sheathing Nails, uſed to faſten ſheathing-boards to ſhips: the rule for their length, is to have them full three times as long as the board is thick. — Square Nails, of the ſame ſhape as ſharp Nails; chiefly uſed for hard woods.—To which may be added tacks; the ſmalleſt, ſerving to faſten paper to wood; middling, for wool-cards and oars; larger, for upholſterers and pumps.

In lathing, 500 Nails are ordinarily allowed to a bundle of five-feet laths.—In flooring, 200, i. e. 240, are allowed for a ſquare of flooring.

Nails are ſaid to be toughened, when too brittle, by heating them in a fire-ſhovel, and putting ſome tallow or greaſe among them.

NA'RDUS, an Egyptian muſical inſtrument, made like two plates of braſs, and of all ſizes, from two inches to a foot in diameter; they hold them by ſtrings faſtened to their middles, and ſtrike them together ſo as to beat time. They are uſed in the Coptic churches, and the Mahometan proceſſions. *Pocock's Egypt.*

NA'MUR-*marble*, a name given by our artificers to a ſpecies of black marble, which is very hard, and capable of a good poliſh, but has no variegations of any other colour. It is common in Italy, France, and Germany, and is the ſpecies called the Lucullean marble by the Romans. *Hill's Hiſt. of Foſſils.*

NA'PLES-*yellow*, the common name in the colour ſhops of London, and among our painters, for the ocre called giallalino. See GIALLALINO.

NA'PUS, in natural hiſtory, a name given to a ſpecies of voluta, approaching to the nature of the famous admiral ſhell, and more commonly known by the name of the falſe admiral, or baſtard admiral.

NA'RES, *the noſtrils.* — Among the various diſorders incident to the noſtrils, none are of greater importance than hæmorrhages, which ariſe from a copious conveyance of blood to the head; in conſequence of which, the ſmall arteries in the tunica pituitaria are preternaturally filled, and their extremities, being too much diſtended, are at laſt opened, and diſcharge their contained blood.

Such is the fabric of the noſtrils, that they are eaſily ſubject to eruptions of blood; for, in their internal parts, the blood veſſels, divided, into highly minute parcels, are copiouſly diſtributed through that coat which covers the vomer, the oſſa ſpongioſa, and the ethmoidal bones, and are, at the ſame time, externally covered with a very ſlender membrane. Hence, when the blood is copiouſly conveyed to the noſtrils, it is with difficulty returned through their ſmall veins, but eaſily ſtops in the minute arteries, diſtends their extremities, burſts them, and produces an hæmorrhage. It, alſo, ſometimes happens, that this blood elevates the extremities of theſe minute arteries into ſmall aneuriſms, which afterwards prove the occaſion of a copious dropping of blood.

That, in hæmorrhages of the noſe, there is a copious and violent afflux of the blood and humours to the head and noſtrils, is ſufficiently obvious from the violent motion of the heart and arteries, the ſtrong pulſe, eſpecially in the neck and temples, the ſenſe of the weight in the head, the redneſs of the face, the ſwelling of the face and whole head, a dryneſs and heat of the internal noſtrils.

The principal cauſe of this congeſtion is the unequal progreſs of the blood, eſpecially through the ducts of the internal parts, whether conveying arteries, or returning veins: by which means it happens, that the blood is too ſcantily conveyed to ſome parts, and too copiouſly to others, where it breaks the veſſels, and diſcharges itſelf.

Whatever, therefore, contributes to produce ſuch an unequal motion of the blood, in a proportionable degree, excites, hæmorrhages. Now, all hæmorrhages, and more eſpecially that from the noſtrils, are generally accompanied or preceded by a ſtricture of the ſkin and external parts, a detumeſcence of the veſſels, an horripilation, a refrigeration, coſtiveneſs, a retention of the flatulences, rumblings in the abdomen, laſſitudes of the limbs, and pains of the belly. Hence, it is obvious, that the cauſe of this unequal circulation of the blood is a certain ſtricture of the fibres and moſt minute veſſels, eſpecially in the extremities; for when, by means of this ſpaſmodic ſtricture, the veſſels, eſpecially ſuch as return the blood, lymph, or any other humours, as, alſo, the excretory ducts of the ſkin, through which, according to the laws of nature, the ſerous part of the blood ought to be eliminated, are compreſſed, the blood regurgitates to the large internal veſſels, by which means a greater and quicker contraction of the heart and arteries is produced, and the blood itſelf more powerfully conveyed to the weak parts, eſpecially where its congeſtion and diſpoſition lay a foundation for hæmorrhages, and other diſorders.

The cure. — When a violent hæmorrhage threatens danger, and too much impairs the ſtrength, the aſſiſtance of the phyſician becomes neceſſary. The principal intentions of cure are, after diſcovering the genuine cauſes, to remove them by proper meaſures.

When, therefore, a redundance of the blood and humours, together with their expanſive force and turgeſcence, hinders their free and equal paſſage through the minute veſſels, and produces enormous hæmorrhages, which principally happens to young perſons in the ſpring, after violent exerciſe, or the uſe of ſuch ſpirituous things as throw the blood into preternatural commotions, beſides veneſection, which diverts the courſe of the blood from the head, preparations of nitre are, above all other things, efficacious for checking the orgaſm of the humours, and relaxing the ſpaſmodic ſtricture of the parts. Thus Paracelſus and Hildanus, in all hæmorrhages, uſed purified nitre with great ſucceſs: and Riverius, in his Praxis and Obſervations, greatly extols this medicine for ſtopping all hæmorrhages. Of ſimilar, though ſomewhat inferior efficacy, are acids, whether of the mild kind, obtained from the vegetable kingdom, ſuch as the juices of lemons and barberries, the water and juice of wood ſorrel; or of the more ſtrong and powerful kind, obtained from the mineral kingdom, ſuch as the phlegm, or ſpirit of vitriol diluted, or the tincture of roſes, and flowers of the daiſy, prepared with water of wood ſorrel and ſpirit of vitriol, and drank with ſpring water; the efficacy of which is, alſo, very great in checking the inteſtine and elaſtic force of the blood.

But, becauſe, in theſe dangerous hæmorrhages, there is generally a certain ſpaſmodic ſtricture of the nervous parts, which is ſoon ſucceeded by an unequal motion of the fluids, beſides the preparation of nitre already recommended, we muſt have recourſe to gentle anodynes, ſuch as preparations of poppies, the water, for inſtance, the extract, or the ſyrup of wild poppies,

pies, the ſyrup of white poppies, and emulſions prepared of the four cold ſeeds, the ſeeds of white poppies, and the waters of the flowers of the Egyptian thorn, elder, the lime-tree, meadow-ſweet, the common chamomile, and primroſes.

In ſymptomatic hæmorrhages, and thoſe accompanying exanthematous diſorders, meaſles, ſmall-pox, ſcorbutic purple fever, and petechiæ, it is not expedient to exhibit any other medicines, than ſuch as, by moderating the intenſe heat, may gently promote perſpiration. For this purpoſe,

Take, of the water of chamomile flowers, four ounces; diſtilled vinegar, one ounce; of crabs eyes and diaſcordium, each one drachm; of nitre, one ſcruple; and, of the ſyrup of wild poppies, a ſufficient quantity; make into a mixture: of which, let the patient take two ſpoonfuls every two hours, and keep himſelf moderately warm in bed; and, if the diſorder is malignant, a powder, compoſed of diaphoretic antimony, depurated nitre, and camphire, is to be exhibited.

Apolypus in the noſtrils. — The internal parts of the noſe, as other parts of the body, are often ſubject to fleſhy excreſcences, called polypuſes, though they ſeldom have more feet or roots than one. This diſorder is, by ſome, called ſarcoma; and, by others, hyperſarcoma. But theſe caruncles are of various ſizes and conſiſtences; ſometimes ſoft, and capable of elongation, when drawn; ſometimes, though very ſeldom, hard, and, as it were, rigid; ſometimes white, and ſometimes of a pale red colour: at firſt, they are, for the moſt part, ſmall; but, in proceſs of time, they increaſe, ſome ſlower, ſome faſter; ſo that I have ſeen ſome, in three or four days, hang out of the noſe: though they are generally free from pain, yet, ſometimes, they are attended with pain and hardneſs, become livid, and incline to a cancer. Some are confined to the noſe, others hang down to the lips; ſome fill, greatly expand, and enormouſly dilate the noſe; ſome appear as one caruncle, with an equal ſurface; others like a cluſter. Some, again, grow backwards, through the aperture, by which the breath deſcends from the noſe to the fauces; and are viſible behind the uvula, and then occaſion not only a great difficulty of ſpeaking and ſwallowing, but likewiſe of breathing, and almoſt ſtrangle the patient. Sometimes, they expand themſelves both through the noſe, and fauces, though both noſtrils are ſeldom obſtructed by them. The polypus, as we have already obſerved, has generally but one root, and that ſlender; ſometimes, indeed, it is thick, and furniſhed with large veins; however, as it appears now and then with many roots, the ancients ſeem to have derived the name from thence. This excreſcence often proceeds from the inferior or middle part of the noſe, and, ſometimes, from the poſterior and upper part, and even from the ſinuſes of the cranium and os ethmoides; but it is, in general, formed in and from the pituitary membrane, and, particularly, from an obſtruction of one or more of its glands; which, being gradually increaſed by noxious humours, fills the noſe, or hangs down below it; and, conſequently, it ſeems nothing more, than a morbid expanſion and elongation of the glands, and that ſpongy membrane. But, in my opinion, the ſarcoma naſi is of a very different nature; for a polypus is generally ſoft, and hangs like a fig, by a ſlender or thick root, as by a ſtalk; whilſt the ſarcoma is ſometimes ſoft, ſometimes hard, and fixed upon a large, firm, and immoveable baſis.

From the preceding account of the nature and diſpoſition of a polypus, we cannot be at a loſs for the diagnoſtic and cauſes of it. And, firſt, a white, reddiſh, ſoft polypus, without pain, is of a mild nature: on the contrary, that is dangerous, which is painful, hard, livid, or black, or diſcharges a pus, or acrid and fœtid humours; for ſuch tend to a cancer. The cauſes are often latent and internal, though it is ſometimes produced by external violence. By a latent cauſe, we mean an inſpiſſation of corrupt and glutinous blood in the ſmall veſſels and glands of the pituitary membrane; for that ſoft and ſpongy membrane may be eaſily diſtended by a congeſtion of noxious humours. The external cauſes may be violent falls or blows, too frequent an introduction of the finger into the noſe, an irritation of the pituitary membrane, and too ſtrong ſternutatory powders. Laſtly, the manifeſt internal cauſes are frequent catarrhs, a defluxion, ulcers of the noſe, or too profuſe hæmorrhages. A ſarcoma proceeds from much the ſame cauſes; and both are ſometimes attended with a ſpina ventoſa, and caries of the bones of the noſe: inſtances of which have ſometimes occurred to me.

The cure is eaſier, and the danger is leſs, when the polypus is of a favourable kind; as when it is not ſeated very far in the noſe, when it has a ſlender root, and hangs looſely, or when it is capable of elongation, and laſtly, when the patient is of a good habit: on the contrary, when it is inacceſſible, has a thick root, and is incapable of elongation, the removal is more difficult, eſpecially if the patient is afflicted with a ſcorbutic or venereal diſorder at the ſame time. The danger of the cure is likewiſe increaſed, by the difficulty of ſuppreſſing the profuſe hæmorrhage, which attends the extirpation or evulſion of a polypus, eſpecially if it is fixed on a deep and large baſis. If it tends to a cancer, that is, if it becomes hard, livid, and painful, which is very common, it is ſafeſt to palliate the diſorder by lenitives; for it is dangerous to irritate this, as other cancers. In the like manner, when the polypus is inacceſſible, or ariſes from a ſpina ventoſa, as I have ſeen a large one, it is hardly poſſible, after a removal, to prevent its ſprouting again, unleſs the ſpina ventoſa be firſt cured. Further, if it extends to the fauces, ſpeech, deglutition, and even reſpiration, are ſometimes hindered, as Celſus obſerves, and the cure is extremely difficult. Laſtly, when it fills both noſtrils, the cure is very difficult, becauſe, generally, it proceeds from ſome worſe diſorder. Theſe obſervations are equally true, with regard to a ſarcoma, eſpecially if the bones of the noſe are afflicted with a ſpina ventoſa.

The cure of a polypus cannot be reaſonably expected from any thing but a total removal, which may be accompliſhed by cauſtic medicines, or proper inſtruments; and this, either all at once, or at different times. The firſt may be applied when the excreſcence is ſoft and ſmall, or ſhort and large, with this caution, that the cauſtic may not corrode the ſound parts of the noſe. Among the mild corroſive medicines proper for this purpoſe, the moſt celebrated is powder of ſavin, burnt alum, red precipitate, white vitriol, and hermodactyl root, either alone or mixed with honey, or ſome digeſtive ointment, laid on the polypus with a tent; or, if it is ſeated externally, without a tent, by which, ſlight ones are ſometimes removed. Poterius ſays, the powder of heliotropium, or ſcorpionwort, introduced into the noſe with cotton, twice a day, will remove a polypus very readily, and with little pain; but we are left in the dark as to the particular ſpecies of heliotropium, or ſcorpionwort, proper for this uſe. Rulandus recommends a mercurial water, with which he affirms he has cured a polypus, by wetting it every morning and evening. To this claſs alſo belong unguentum Ægyptiacum, the unguentum fuſcum of Wurtzen, the oil of tartar per deliquium, the eſſence of ſavin, and particularly an eſſence prepared of ſublimate mercury and ſpirit of wine, with which Wedelius informs us he cured a cetain polypus. According to Nuck, in Operat. Chirurg. Cap. de Polypo, great ſervice is done in polypuſes by lime-water, eſpecially if, after mixing a grain or two of ſublimate mercury with it, it is made into a phagedenic water. The ſame end is, alſo, anſwered by precipitate mercury, upon which ſome ſpirit of wine has been deflagrated; by water ſaturated with ſal ammoniac; and, if we may believe Muſitanus, by the acid ſpirit of ſal ammoniac. If theſe prove ineffectual, then ſtronger remedies muſt be applied, ſuch as the lapis infernalis, ſublimate mercury, the arcanum corallinum, and others of a like nature; but theſe ſhould be mixed with honey, or baſilicon, and laid on with great care, that they may not corrode the ſound parts; and, if the polypus lies concealed in the noſe, a ſmall portion of the medicine ſhould be introduced by a quill, or ſome other tube. Of equal virtue, in removing a mild polypus, are the ſpirit or oil of vitriol, aqua fortis, and butter of antimony, when applied with a feather or pledget: whatever is ordered muſt, at every dreſſing, be removed by ſciſſars, or a pair of forceps. Thibaut followed this method: he laid two plaiſters between the polypus and ſound part, for the preſervation of the latter; when he carefully applied to the former butter of antimony, with a tent or pledget; and next, to prevent too deep a penetration, he waſhed it off with warm water. By this method Garengeot affirms that he performed the operation in a moment; but this author does not tell us, whether he applied the cauſtic more than once, though, I am perſuaded, it muſt be frequently repeated; for a ſingle application will hardly produce the deſired effect.

But, in general, inſtruments are preferable to cauſtics; and this operation may be performed by various methods. Before the operation the patient ſhould be prepared, and then ſeated oppoſite to the light, an aſſiſtant reclining his head backwards, and ſecuring it with his hands. When this is done, the ſurgeon may chuſe either of the following methods, which ſeems to him beſt ſuited to the circumſtances of the caſe. We ſhall begin firſt with the method deſcribed by Celſus: ‘The polypus, ſays he, ſhould be ſeparated from the bone by a ſharp inſtrument, in the ſhape of a ſpatula, taking care not to wound the cartilage beneath it, which would be difficult to cure. After the ſeparation it muſt be extracted with a ſteel hook; then, to ſuppreſs the hæmorrhage, the cavities of the noſe ſhould be filled with a pledget, or ſome folded lint moiſtened with a proper medicine: after the ſuppreſſion of the hæmorrhage, the ulcer muſt be deterged with lint. When it is cleanſed, the cicatrix muſt be formed by injecting proper medicines, till the cure is completed.’ The method propoſed by Ægineta is not very different from this. He orders the patient to be placed againſt the light, the ſurgeon to open and dilate his noſe with his left hand, whilſt, with his right, he extirpates the polypus circularly, with a ſharp ſpatula, made for that purpoſe, in the ſhape of a myrtle leaf; applying the edge of the inſtrument to that part where it adheres to the noſe, then turning the inſtrument, to extract it with the handle. To induce a cicatrix, he uſes leaden pipes. We diſcover the whole polypus to be removed, firſt by the ſight, then by the voice, and freedom of reſpiration through the noſe. Albucaſis adviſes to extract the polypus out of the noſe with a ſteel hook or forceps, and then remove as much as can be reached by inciſion; and this to be repeated till the whole is taken off. If the excreſcence cannot be totally removed, Paulus and Albucaſis order a pretty thick piece of linen, like a cord, full of knots, at a finger's breadth, or leſs, from each other, to be tied to the remains, and tranſmitted from the noſe to the palate; then to be drawn out of the mouth, which may be done with a forceps. The two ends of this cord, one hanging from the noſe, the other from the mouth, ſhould be drawn backwards and forwards, till the remains of the polypus are deſtroyed: for which purpoſe the cord ſhould be dipped in unguentum Ægyptiacum. Fabricius ab Aquapendente rejects theſe methods, and endeavours to eſtabliſh one of his own, which is performed by a ſharp forceps. Theſe he gently introduces into the noſe, to the root of the polypus; and, with them, both extirpates and extracts the whole, or as much as he can reach. This he juſtly prefers to all others, and ſays, if the whole cannot be removed at once, it may be repeated, till nothing remains. If the wound bleeds plentifully, which is not very common, he orders the hæmorrhage to be ſuppreſſed with red wine alone, or mixed with alum. Sennertus and Glandorp followed this practice, and I myſelf have known it to ſucceed often.

NASTU′RTIUM, *garden-creſſes*, in botany, a genus of plants, whoſe characters are:

It reſembles, in all reſpects, the thlaſpi, or mithridate muſtard, with a leſs foliaceous margin, and multifid leaves, to diſtinguiſh it.

This creſs has a ſmall white ſtringy root, from which ſpring many finely laciniated winged leaves, three or four inches long, of a pleaſant, hot, biting taſte; the ſtalks about a foot high, ſmooth, and round; the leaves which grow on them are leſs cut in, and have larger and broader laciniæ. The flowers are ſmall, of four white leaves, ſet together in tufts on the top of the ſtalk, and are ſucceeded by little round ſeed-veſſels, flat on one ſide, containing red round ſeed. It is ſown every year in gardens, and flowers in May. The leaves and ſeed are uſed. The leaves are much uſed in ſpring as a ſallad herb, their warming quality being uſeful to correct the coldneſs of others mixed with them; they are good for the ſcurvy and dropſy, as alſo for the palſy and lethargy. A cataplaſm of the leaves, with hog's lard, cures ſcald heads. The ſeed, likewiſe, helps the ſcurvy and dropſy, and ſwelling of the ſpleen, and opens obſtructions in the female ſex. *Miller's Bott. Off.*

Another ſpecies of the Naſturtium is, water-creſſes, which are frequently eaten in the ſpring as a ſallad. The whole plant is of a very acrid taſte, and is a powerful attenuant and reſolvent. It is recommended as a kind of ſpecific in the ſcurvy, and is eaten in great quantities by many with that intent. It is good againſt all obſtructions of the viſcera, and, conſequently, in jaundices, and other chronic diſeaſes. It is alſo a powerful diuretic and promoter of the menſes. People have pretended to preſerve the virtues of this plant in waters, ſyrups, and conſerves; but the beſt way of taking it is, either to eat it as a ſallad, or to drink its expreſſed juice ſingly, or mixed with that of the other antiſcorbutic plants, as brooklime, &c. which is often done.

NA′TRON or NATRUM (*Dict.*)— There have been various opinions about the natrum of the ancients, and ſome have been of opinion, that our ſalt-petre or nitre was the ſame ſubſtance; but this has always been diſcountenanced by the more judicious. Dr. Hill, who had met with a ſalt from the ſame part of the world whence the ancients had their natrum, and which anſwered to all the characters they have given of it, defines it to be a ſalt ſometimes pure, and ſometimes fouled with earth, fermenting with acids, and forming flat oblong cryſtalliſations, with four unequal ſides, and two truncated ends. Theſe were the characters of that ſalt, and theſe perfectly agree with the accounts we have of nitre in the earlieſt ages, though we have none ſufficiently accurate, to take them all in. And, whatever may have been the opinion of ſome, that the natrum or nitre of the Hebrews was very early loſt, a careful examination of the ancients proves the contrary, and that this very ſalt was the nitre both of the Greeks and Romans, the nitrum and aphronitrum of Dioſcorides, and the nitrum of Pliny. It is found in broad and flat maſſes of various ſizes, but uſually ſmall, and, when broken, are found to be compoſed of faſciculi or bundles of ſmall fibres, of an oblong and flatted figure, and laid but looſely together.

It is naturally of a duſky white, but is ſometimes found of a brown colour, and ſometimes of a fine deep red. This is its pureſt ſtate; but, beſides this, it is frequently found in form of powder mixed with dirt, and riſing in little hillocks on the ſurface of the ground. It is of an acrimonious pungent taſte, and is more like the alkaline ſalts produced by burning vegetables, than any of the native ſalts. It diſſolves in a very ſmall quantity of water, and ferments violently with aqua-fortis, or any other weaker acid menſtruum.

It is found in great plenty in Iindy, a province in the inner part of Aſia, and in many other parts of the Eaſt, and might be had in any quantities. Perhaps it would be worth conſidering as a branch of commerce, as it would ſupply the place of pot-aſhes in the making ſoap and glaſs, as the ſame author has tried.

The characters recorded of the nitre of the ancients are, 1. That it would ferment with vinegar; and, 2. That it had an abſterſive quality. Theſe we have from the ſcriptures: and the reſt were, that it was of an acid taſte; that is was found native in the eaſtern parts of the world; that it ſerved in the place of ſoap, and that, with ſand, it would make glaſs. All theſe properties this ſalt has; and it may be added, that no other native ſalt has them. *Hill's Hiſt. Foſſ.*

NA′TURAL, in muſic, is applied to a ſong, the notes whereof move eaſily and gracefully, giving the performer as little trouble as poſſible; as when it is not carried too high, or ſunk too low, whereby the voice or inſtrument is in no wiſe forced or ſtrained. *Vid. Broſſ. Muſ. Dict. in voc.*

NAVE *of a wheel*, is that ſhort thick piece in the center of the wheel, which receives the end of the axle-tree, and in which the ends of the ſpokes are fixed; it is bound at each end with hoops of iron, called the Nave bands; it has likewiſe, in each end of the hole, through which the end of the axle-tree goes, a ring of iron called the wiſher, which ſaves the hole of the Nave from wearing too big.

NAVIGA′TION (*Dict.*)— The principal articles, in the act of navigation, paſſed in the twelfth year of Charles II, are the following:

1. That no goods or commodities ſhall be imported or exported to or from any of the Engliſh colonies in Aſia, Africa, or America, but on veſſels built within the dominions of England, or really belonging to Engliſhmen; and whoſe maſters, and at leaſt three-fourths of the crew are Engliſh *, on pain of forfeiture of the goods and veſſel.

> * Under the name Engliſh, here, are comprehended all the king's ſubjects of England, Ireland, and the Plantations; as was explained in a ſubſequent act, 13 and 14 Car. II. c. 11.

2. That no perſon born out of the ſubjection of England, or not naturaliſed, ſhall exerciſe any commerce in thoſe colonies for himſelf, or others.

3. That no merchandizes of the growth of Aſia, or America, ſhall be imported into any of the dominions of England on any other than Engliſh veſſels.

4. That no goods of foreign growth or manufacture that ſhall be brought into England, Wales, Ireland, iſlands of Jerſey or Guernſey, or town of Berwick on Tweed, in Engliſh built ſhipping, or other ſhipping belonging to the foreſaid places, and navigated by Engliſh mariners as aforeſaid, ſhall be ſhipped or brought from any other place or country, but only from thoſe of the growth or manufacture thereof.

5. That all kinds of dried and ſalted ſea-fiſh, train-oils, blubber, and whale-fins, not caught by Engliſh veſſels, imported into England, ſhall pay double duties.

6. That the commerce from port to port in England and Ireland ſhall be carried on wholly by Engliſh veſſels, and Engliſh merchants: the crew to be always three-fourths Engliſh.

7. That none but Engliſh veſſels ſhall reap the benefit of the diminutions made, or abatements to be henceforth made, in the cuſtoms.

8. All veſſels are prohibited importing into England and Ireland any of the commodities of Muſcovy, or even any maſts, or other timber, foreign ſalt, pitch, roſin, hemp, raiſins, prunes, oil of olive, any kind of corn, or grain, ſugars, aſhes, and ſoap, wine, vinegar, or brandy, except veſſels, whereof Engliſh are owners or part-owners, and where the maſter and three-fourths of the mariners are Engliſh.—And that no currants, or other commodities, the growth or manufacture of the Turkiſh empire, ſhall be imported, but in veſſels of Engliſh build, and navigated as aforeſaid; except only ſuch veſſels as are of the building of the country or place whereof ſuch commodities are the growth or manufacture, or of ſuch part where ſuch goods are uſually ſhipped for tranſportation, and unleſs the maſter and three-fourths of the crew be natives of the country where they are laden.

9. All timber, maſts, boards, ſalt, pitch, tar, roſin, hemp, flax, raiſins, figs, prunes, olive oils, corn, or grain of any kind, ſugar, pot-aſhes, brandies, and wines, and all goods of the growth and manufacture of Muſcovy, all currants and Turkiſh goods imported into England, &c. in other than ſuch ſhipping, and ſo navigated, ſhall be deemed aliens goods, and pay accordingly.

10. That, to prevent frauds in buying and diſguiſing foreign veſſels, the proprietors ſhall take an oath, that they really belong to them, and that no alien has any part in them.

11. That Engliſh veſſels, and navigated by Engliſh, may import, into the dominions of England, any merchandizes of the Levant, though not taken up in the places where they grow, or are manufactured: provided it be in ſome part of the Mediterranean beyond the ſtreights of Gibraltar. And the ſame is underſtood of commodities brought from the Eaſt-Indies, provided they be taken up in ſome port beyond the cape of Good Hope: and thoſe from the Canaries, and other colonies of Spain; and the Azores, and other colonies of Portugal, which are allowed to be ſhipped, the one in Spaniſh ports, the other in Portugueſe.

12. Theſe penalties, prohibitions, and confiſcations, not to extend to goods taken by way of repriſal from the enemies of England, nor to fiſh caught by the Scots, or their corn, and ſalt, which may be imported into England by the Scotch built ſhips.

13. Five ſhillings per ton duty is impoſed on every French veſſel arriving in any port of England, ſo long, and even three

months longer, as 50 ſols per ton lies on the Engliſh veſſels in France.

Laſtly, That ſugars, tobacco, and other commodities of the growth of the Engliſh colonies, ſhall not be imported into any other part of Europe, but the dominions of England. And that veſſels, going out of the ports of the ſame crown for the Engliſh colonies, ſhall give 1000 l. ſecurity, if under one hundred tons, and 2000 l. if above, before they depart, that they will import their cargo into ſome port in the ſaid dominions; and the like, before they quit thoſe colonies, that they will land their whole cargo in England.

NAU'TILUS, in natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe: it expreſſes, in general, in every ſpecies, the figure of a boat or veſſel, made for ſwimming on the water; but, in the different ſpecies, it is of very different figures, roundiſh, or oblong, thin, or thick, furrowed, or ſmooth, and ſometimes is auriculated, ſometimes not. Bonani obſerves that this genus of ſhell-fiſh is very well named from the Greek ναυτίλος, which ſignifies both a fiſh, and a ſailor, for that the ſhells of all the a Nautili carry the appearance of a boat, or ſhip, with a very high poop.

Different authors, among the ancients and moderns, have called the Nautilus by the name of pompilus, nauplius, nauticus, ovum polypi, polypus teſtaceus, and the French call it le voilier. It is ſuppoſed, that men firſt learned the method of ſailing in veſſels, by what they ſaw practiſed by this creature.

NE'CTARINE, a fruit greatly eſteemed for its delicious flavour, and ſuppoſed to have its name from the nectar of the gods, in heathen ſtories.

It differs in nothing from the peach, but in having a ſmoother ſkin, and a firmer pulp. See PEACH.

We have ten kinds of Nectarines cultivated by the curious in gardening.

1. Fairchild's early Nectarine; this is a ſmall fruit of a red colour, and very well taſted, and ripens in July, the earlieſt of all this kind.

2. The Elruge Nectarine; this is a larger fruit of a purple colour, on that ſide which was towards the ſun, and of a greeniſh yellow on the other parts. This is a very well flavoured Nectarine, of a ſoft, melting juice, and parts from the ſtone: it ripens towards the end of July.

3. The Newington Nectarine; this is a fair large fruit, of a fine red toward the ſun, and of a yellowiſh green towards the wall. It has a very rich juice, but the pulp adheres to the ſtone: this ripens in Auguſt.

4. The ſcarlet Nectarine; this is of a fine glowing red towards the ſun, and of a pale red towards the wall; it ripens in the end of July.

5. The Brugnon, or Italian Nectarine; this is a fair, large fruit, of a deep red next the ſun, but of a ſoft yellow next the wall. The pulp is firm, and of a rich flavour, but cloſely adheres to the ſtone, and is red in that part: this ripens in the middle of Auguſt.

6. The Roman red Nectarine; this is a very fair large fruit, of a deep purple towards the ſun, and of a greeniſh yellow next the wall. The pulp is very firm and well taſted, but it is red about the ſtone, and adheres firmly to it: this is ripe in the middle of Auguſt.

7. The murry Nectarine; this is a middle-ſized fruit, of a dirty red next the ſun, and of a greeniſh yellow next the wall. The pulp is tolerably well flavoured, and ripens in the middle of Auguſt.

8. The golden Nectarine; this is a fair handſome fruit, of a ſoft red next the ſun, but of a gold yellow next the wall; and its pulp is very yellow, but of a faint red about the ſtone to which it adheres: it is a very well flavoured kind, and ripens at the end of September.

9. Temple's Nectarine; this is a very fine kind; it is of a ſoft red towards the ſun, and of a yellowiſh green next the wall. It parts from the ſtone, and is of a very rich flavour; the pulp is white in other parts, but yellowiſh about the ſtone: this ripens in the middle of September.

10. The Peterborough Nectarine, called by ſome the late green Nectarine; this is a middle-ſized fruit, of a pale green colour towards the ſun, and of a whitiſh green toward the wall; the pulp is firm, and well flavoured: it ripens towards the end of September.

The pruning, planting, and whole culture of this plant are the ſame with that of the peach. *Miller's Gard. Dict.*

NEE'DLE (*Dict.*)—Needles make a very conſiderable article in commerce; and the conſumption thereof is almoſt incredible.—The ſizes are from N°. 1, the largeſt; to N°. 25, the ſmalleſt.

There is ſcarce any commodity cheaper than Needles; which will appear ſomething extraordinary to the reader, after he has been ſhewn the great number of operations they undergo before they are brought to perfection.

Manufacture of NEEDLES.—German and Hungary ſteel is of moſt repute for Needles. The firſt thing is to paſs it through a coal fire, and under a hammer, to bring it out of its ſquare figure into a cylindrical one. This done, it is drawn through a large hole of a wire-drawing iron; returned into the fire, and drawn through a ſecond hole of the iron, ſmaller than the firſt: and thus, ſucceſſively, from hole to hole, till it have acquired the degree of fineneſs required for that ſpecies of Needles; obſerving every time it is to be drawn, that it be greaſed over with lard, to render it the more manageable. See WIRE-DRAWING.

The ſteel, thus reduced into a fine wire, is cut in pieces of the length of the Needles intended. Theſe pieces are flatted at one end on the anvil, in order to form the head and eye. They are then put in the fire, to ſoften them farther, and thence taken out, and pierced at each extreme of the flat part, on the anvil, by force of a punchion of well tempered ſteel, and laid on a leaden block, to bring out, with another punchion, the little piece of ſteel remaining in the eye.

The corners are then filed off the ſquare of the heads, and a little cavity filed on each ſide the flat of the head. This done, the point is formed with a file, and the whole filed over.

They are then laid to heat red-hot, on a long, flat, narrow iron, crooked at one end, in a charcoal-fire; and, when taken out thence, are thrown into a baſon of cold water to harden.—On this operation, a good deal depends; too much heat burns them; and too little leaves them ſoft; the medium is only to be learnt by experience.

When hardened, they are laid in an iron-ſhovel, on a fire more or leſs briſk, in proportion to the thickneſs of the Needles; taking care to move them from time to time. This ſerves to temper them, and take off their brittleneſs; care here, too, muſt be taken of the degree of heat.

They are then ſtraightened one after another with the hammer; the coldneſs of the water uſed in hardening them having twiſted the greateſt part of them.

The next proceſs is the poliſhing.—To do this, they take twelve or fifteen thouſand Needles, and range them in little heaps againſt each other on a piece of new buckram, ſprinkled with emery duſt. The Needles thus diſpoſed, emery duſt is thrown over them, which is again ſprinkled with oil of olives. At laſt, the whole is made up into a roll, well bound at both ends.

This roll is then laid on a poliſhing table, and over it a thick plank loaden with ſtones, which two men work backwards and forwards a day and a half, or two days ſucceſſively. By which means, the roll thus continually agitated by the weight and motion of the plank over it, the Needles within ſide, being rubbed againſt each other with oil and emery, are inſenſibly poliſhed.

In Germany, inſtead of hands, they poliſh with water-mills. After poliſhing, they are taken out, and the filth waſhed off them with hot water and ſoap: then wiped in hot bran a little moiſtened, placed, with the Needles, in a round box ſuſpended in the air by a cord, which is kept ſtirring till the bran and the Needles be dry.

The Needles, thus wiped in two or three different brans, are taken out and put in wooden veſſels to have the good ſeparated from thoſe whoſe points or eyes have been broken either in poliſhing or wiping; the points are then all turned the ſame way, and ſmoothed with an emery-ſtone turned with a wheel.

This operation finiſhes them; and there remains nothing but to make them into packets of two hundred and fifty each.

NEEDLE-*makers*.—Their buſineſs is a branch of the ſmithery, and light eaſy work, therefore fit for ſlight-made lads; but they ought to have good eyes, the finer ſorts requiring much nicety.

This trade is more extenſive than moſt people apprehend, their goods being not only conſumed in families, but uſeful to a great many trades: ſome of them alſo make fiſh-hooks, &c. and keep ſhops; others travel the country, to ſupply dealers there, though theſe are chiefly furniſhed by the haberdaſhers with finer ſorts, and by the ironmongers with the very large ſizes, as pack-needles, &c. by both which ſhop-keepers they are principally taken off the maker's hands, who moſtly work privately, and will take an apprentice with five pounds, whoſe hours are from ſix to eight; in which time a journey-man can earn two ſhillings, or two ſhillings and ſix-pence; and fifty pounds will ſet him up, if he makes for the ſhops only; but, if he intends to deal for himſelf, or keep ſhop, not leſs than 200 l. will be ſufficient.

They were incorporated into a company in the year 1656, in the time of Oliver Cromwel: livery-fine 3 l. 6 s. 8 d. But have no hall, therefore meet in Guild-hall to tranſact their buſineſs.

NE'GATIVE *power*, in algebra, is uſed for thoſe powers of a quantity which have a Negative ſign. Thus a^{-m} is called a Negative power. Negative powers ariſe from the diviſion of any power of a quantity by a greater power of the ſame quantity. Thus, $\frac{a^4}{a^6} = a^{4-6} = a^{-2}$; and in general, $\frac{a^m}{a^{m+n}} = a^{-n} = \frac{1}{a^n}$ for $\frac{a^m}{a^{m+n}} = \frac{1}{a^n}$. See POWER.

NE'GRO (*Dict.*)—We have a diſſertation on the colour of Negroes by Dr. John Mitchell, of Virginia, in the Philoſophical

Tranſactions, N°. 476, where he advances theſe propoſitions, and enters into a learned detail to ſupport them.

1. The colour of white people proceeds from the colour which the epidermis tranſmits; that is, from the colour of the parts under the epidermis, rather than from any colour of its own.

2. The ſkins of Negroes are of a thicker ſubſtance, and denſer texture, than thoſe of white people, and tranſmit no colour through them.

3. The part of the ſkin which appears black in Negroes, is the corpus reticulare cutis, and external lamella of the epidermis: all other parts are of the ſame colour in them, with thoſe of other people, except the fibres which paſs between thoſe two parts.

4. The colour of Negroes does not proceed from any black humour, or fluid parts contained in their ſkins; there being none ſuch in any part of their bodies, more than in white people.

5. The epidermis, eſpecially its external lamella, is divided into two parts by its pores and ſcales, two hundred times leſs than the particles of bodies on which their colours depend. This is founded on Leuwenhoek's obſervation that a portion of the epidermis, no bigger than what can be diſcerned with the naked eye, is divided into 125000 pores, and theſe pores muſt divide ſuch a portion of the ſkin into as many particles. But the particles of bodies on which their colours depend, are, by Sir Iſaac Newton's Optics, Lib. 2, p. 3, Prop. 7, 600 times leſs than theſe which can be diſcerned by the naked eye. Therefore, the particles of the ſkin muſt be about 200 times leſs than theſe, ſince $\frac{125000}{609} = 208\frac{1}{3}$. It may alſo be obſerved, that ſuch a ſmall portion of the epidermis is diviſible into 250 ſcales, which muſt increaſe the number of its parts.

6. From theſe propoſitions, and from Sir Iſaac Newton's Theory of Light and Colours, the doctor thinks he may conclude, that the proximate cauſe of the colour of Negroes is threefold; viz. the opacity of their ſkin, proceeding from the thickneſs and denſity of its texture, which obſtructs the tranſmiſſion of the rays of light; from the red and white parts under the ſkin, together with its greater refractive power, which abſorbs theſe rays; and the ſmallneſs of the particles of this ſkin, which hinders it from reflecting any light.

7. The influence of the ſun, in hot countries, and the manner of life of their inhabitants, are the remote cauſes of the colour of the Negroes, Indians, &c. And the ways of living, in uſe amongſt moſt nations of white people, make their colours whiter than they were originally, or would be naturally.

In ſupport of this propoſition, the doctor obſerves, that the ſkin is deprived of its white colour, by the force and influence of the ſun, four ways. 1. By being rendered opaque, from a diſſipation of its more aqueous and pellucid juices. 2. By a concretion of its veſſels and glandules, from this diſſipation of their aqueous contents, which renders the ſkin both thicker and denſer, or more callous and rigid. 3. By a new accretion of many new membranes, which render it thick and opaque. 4. By increaſing thoſe parts or principles in this compoſition of the epidermis, which have the greateſt refractive power, as the terreſtrial and fixed ſaline; but eſpecially the tenacious ſulphureous, which refract and abſorb light more ſtrongly than any other ſubſtances; while the more tranſparent and pellucid principles, as the aqueous, ſpirituous, and volatile ſaline, are evaporated by the heat, which cauſes the other more fixed principles to be accumulated; and theſe particles, being likewiſe more comminuted by the ſun, will, on this account, be black; as happens to oil, when boiled. Theſe cauſes, with thoſe firſt-mentioned, may, the doctor thinks, by conſpiring, make the ſkin quite black; eſpecially if we add another effect of the ſun's power, a peculiar necroſis of the epidermis, occaſioned by the forcible vibrations, contractions, and exſiccations of its fibres by the ſun-beams, which cauſe it to turn black, as theſe, or other parts do, by the heat of an inflammation, or a fever, in gangrenes, black tongues, &c.

We cannot pretend to follow the author in all the detail of his obſervations on this ſubject, nor of his anſwer to a material objection already mentioned from Mr. Boyle, that the ſun cannot be the cauſe of the colour of Negroes, becauſe ſeveral nations, in the ſame latitude with thoſe Negroes, are not made black by it. He ſeems to think the heat of Africa greater than that of other parts of the world. Whether it be ſo, or not, is, we doubt, not eaſy to determine; but it would be a ſtrong confirmation of his doctrine, if we could ſee any people, originally white, become black and woolly by tranſplantation, or vice verſa.

NE'IEM-*el-ſalib*, *Egyptian cock's-foot-graſs.* It is a ſlender ſort of graſs, with white, geniculated, and creeping roots. The branches are geniculated, and adorned with four ſpikes, which repreſent the perfect figures of a croſs; whence the Egyptians call it Neiem-el-ſalib, that is, gramen crucis, the graſs of the croſs, or croſs-graſs.

The ſeeds, which are very minute, and like thoſe of common graſs, are very much uſed by all thoſe who are afflicted with the ſtone in the kidneys, or bladder, being eſteemed a good lithontriptic for diſſolving ſtony concretions in the bladder, which is a diſtemper very familiar, and, in a manner, endemial in Egypt. The women make very great uſe of the root in decoctions for their children, when ſeized with the ſmall-pox, or meaſles; and, alſo, for themſelves, when labouring under a ſuppreſſion of the menſes. Some regard a decoction of the ſeeds, moderately bruiſed, as a great ſecret, and a choice remedy for promoting the exanthematous eruptions, which we call peticulæ or petechiæ, in peſtilential fevers. The whole herb, but eſpecially the root, are much employed, alſo, in the cure of wounds in ulcers. The root is ſaid to be cold and dry, and of very fine parts, though the decoction thereof is very commonly uſed to provoke ſweats. *Raii, Hiſt. Plant.*

NEPHRI'TIS (*Dict.*)— The ſimple Nephritis is carefully diſtinguiſhed from the calculoſe one; for the former may, for a long time, affect a patient without any thing of a ſtone being in the caſe; and, on the contrary, a ſtone may be long lodged in the kidneys, without its bringing on any ſuch complaint as the Nephritis.

In the ſimple Nephritis there is always a ſenſation of pain and heat about the loins, which is plainly perceived to lie deep within the fleſh, but is never very acute. On the contrary, in the calculoſe Nephritis, the pain is violently ſharp.

In the ſimple Nephritis, the urine, after it has ſtood ſome time, ſhoots to the ſides of the pot pellucid cryſtals of a rediſh colour. But, in the calculoſe, the heavy matter immediately precipitates itſelf to the bottom, and is ſabulous and gritty; and the ſimple Nephritis is always greatly relieved by a gentle motion of the body, as walking, or the like; whereas all motion of the body exaſperates the calculoſe Nephritis.

The Nephritis is diſtinguiſhed alſo from the iſchiatic pains, which ſometimes run up to the ſame parts, by its being evidently perceived to lie deep within the fleſh, whereas thoſe pains affect the external muſcles; yet there is ſuch a connection and conſent of parts in theſe caſes, that not unfrequently the one is taken for the other.

Signs of it. Theſe are a pain in the region of the loins, which does not uſually affect both, but only, or, at leaſt, principally, one ſide, uſually the left. The pain is at firſt tenſive and dull, but afterwards becomes more acute; in the beginning it is often attended with a chillneſs, and general trembling, which is ſucceeded by a heat, and acrid gnawing, ſcarce to be ſupported; and this is uſually attended with a want of appetite, and loſs of ſtrength, and a continual, though not violent, thirſt. The ſleep is unſound, and there uſually is either a dull pain in the head, or a vertiginous complaint, more or leſs violent; and very frequently nauſeas, and reachings to vomit, attend the fits, or prognoſticate the acceſs of them.

The pain never extends itſelf down the whole thigh, nor is that ever wholly numbed, or rendered torpid by it; and the diſorder does not ſeem continual, but attacks the patient at different times, and theſe, after conſiderably long intervals, if he live regularly.

The diſorder, when the inflammation is known to be preſent, by its peculiar ſigns is to be cured, firſt, by the general remedies appropriated to the cure of all inflammations; ſuch as veneſection, revulſion, and dilution. Secondly, by mild, emollient, and antiphlogiſtic decoctions, drank in large quantities: thus: Take of the recent leaves of chervil, brook-lime, and pellitory of the wall, each two handfuls; of the roots of woodſorrel, ſuccory, and burdoc, each two ounces; of red chiches, an ounce and an half; of the bruiſed ſeeds of white poppy and lady's thiſtle, each four drachms. Boil in three pints of water for half an hour, and let the patient take two ounces of the decoction every quarter of an hour.

Or take, of the roots of graſs, ſix ounces; of bruiſed melon-ſeeds, an ounce and an half; and, of liquorice, one ounce. Boil in three pints of water, and let the patient uſe the decoction in the ſame manner, and for the ſame purpoſes, with the former.

And, by this method alone, a Nephritis, ariſing from a ſtone impacted in the ureters or kidneys, may be ſafely cured.

The remedies, moſt conducive to the cure of this ſpecies of Nephritis, are agrimony, vervain-mallow, ladies-mantle, marſh-mallows, brook-lime, the leſſer daiſy, middle conſound, chervil, wild carrot, dandelion, fennel, liquorice, ſtrawberries, graſs, rupture-wort, lettuce, hart's-tongue, Engliſh mercury, moneywort, white lily, reſt-harrow, pellitory of the wall, arſe-ſmart, ſcabious, golden-rod, and nettles, Fernelius's ſyrup of marſh-mallows, ſyrup of maiden-hair, ſyrup of ſuccory with rhubarb, ſyrup of white poppies, ſyrup of wild poppies, and ſyrup of violets, ſal ammoniac, ſal-gemmæ, and ſea-ſalt.

If the cauſes of a Nephritis are ſo ſtrong and powerful, that the diſorder can neither be removed by reſolution, nor any other method, but is protracted beyond the ſeventh day, an abſceſs is to be dreaded, the formation of which may be known from a remiſſion of the pain, which is ſucceeded by a pulſation, a frequently returning horror, a weight and ſtupor of the part. That an abſceſs is already formed, is obvious, from the former ſigns having preceded, from the pulſation, heat, and tenſion in the part, and from the purulent, fœtid, and apparently ſaline and putrified urine. As ſoon as we are certain that the abſceſs is formed, we are firſt to uſe powerfully maturating and emollient medicines; then, when the urine appears purulent, we muſt exhibit diuretics, conſiſting of pure medicated waters, whey, and other liquors of a like nature, uſing, at the ſame time, balſamics.

But, if this ſuppuration ſhould continue for a long time, the whole kidney, being conſumed, forms a kind of bag, of no uſe; and, in this caſe, a tabes renalis is frequently preſent.

If a ſchirrhus is formed here, there ariſes an incurable palſy, or lameneſs of the ſubjacent leg. Hence, alſo, are frequently produced a ſlow conſumption and a dropſy.

But, if a ſmall quantity of the inflammatory matter remains coagulated in the minute ſollicule of the urine, it forms a kind of baſis or ground-work, to which the ſabulous matter of the urine gradually adhering, forms a ſtone in the kidnies, which is by degrees augmented.

A Nephritis, alſo, ſometimes degenerates into a gangrene, as is obvious from the violence of the cauſe and ſymptoms; the want of relief by remedies; and the ſudden remiſſion of the pain, without any apparent cauſe, accompanied with a cold ſweat, a weak and intermitting pulſe, a hiccup, either no diſcharge of urine at all, or an evacuation of ſuch as is livid, black, full of hairs, fœtid, and rendered unſeemly by brown or black caruncles; and a ſudden and conſiderable loſs of ſtrength. In this caſe no meaſures are of any ſervice, either for the relief or ſafety of the patient.

From what has been ſaid it is obvious, that there are almoſt an infinite number of various ſpecies of a Nephritis; that their different cauſes are as numerous; that one of theſe cauſes is the ſtone; and that, at the ſame time, all theſe different ſpecies are to be cured almoſt in the ſame manner. Hence we underſtand the criſis of a Nephritis, and why this diſorder ſo often happens in fevers. Hence, alſo, we are enabled to know and cure an iſchury, ariſing from a fault of the kidnies or ureters.

NEPHRO'TOMY, in ſurgery, the cutting into the kidnies, in caſe of the ſtone being lodged there, and taking it out in the ſame way as from the bladder.

This is an operation which has been very little practiſed, and uſually ſuppoſed to be attended with very great danger: few authors who have treated of theſe diſeaſes have ſo much as mentioned this operation, and the few that have named it, have generally condemned it. Sinibaldus, fancying that it was an operation anciently practiſed, ſtrove very earneſtly, indeed, to have it revived. He has called in the opinion of Hippocrates to ſupport his account of its having been done with ſafety, and adviſes the ſurgeons to try their hands on brutes firſt, and accuſtom themſelves to the operation, and, then, not to fear it in regard to men.

It is certain that a ſtone in the kidney is ſo terrible a diſeaſe, that it is very much to be wiſhed that ſome ſafe operation could be invented to cure it; but it is making too free with Hippocrates, to ſay, that he countenances or directs ſuch an operation in general. His words ſeems to expreſs only the making an inciſion near the kidney; but, even if they are to be underſtood as directing the cutting into it, it is under ſuch reſtrictions, that opportunities will very ſeldom offer; and, when they do, a common ſurgeon would not ſcruple performing all that is directed, without either conſulting Hippocrates, or trying his ſkill upon brutes. Hippocrates only adviſes it in caſe of a ſwelling and impoſthumation, where there is matter formed, and the tumor manifeſts itſelf upon the ſurface. In this caſe every ſurgeon would know it was his buſineſs to make an inciſion. *Phil. Tranſ.* N°. 223.

Caſes requiring this are frequent, and that even without a ſtone. An inflammation in a kidney degenerates into an abſceſs, and, when matter is formed, the ſurgeon opens the tumor, and the matter is diſcharged. Sometimes ſtones, bred in the kidnies, cauſe impoſthumations; the ſurgeon opens theſe, and the ſtones are brought away together with the matter. Nay, nature herſelf has done the whole for ſome people, and the ſtones have made way through the kidnies, and through the integuments, &c.

Tulipus gives an account, from his own obſervation, of a man who had a ſtone in his kidney, which, after many years, diſcharged itſelf through the loins, and occaſioned a fiſtula in the part, through which the urine was long voided, together with the matter. The attempts of many ſurgeons to heal this fiſtula were vain, and, at length, one ſucceeding ſo far as to ſtop up the mouth of the ulcer, the matter which was uſed to be diſcharged from it was thrown into the abdomen, and the man died of a fever. Tulipus gives the death of this perſon as an objection againſt the operation of Nephrotomy in general, as he ſuppoſes a ſimilar fate might attend the wounds made in theſe parts by the ſurgeon.

From an impartial examination of the works of Hippocrates, it does not appear that the cutting for the ſtone in the kidnies was regularly practiſed in his time, nor, indeed, for many ages after; for Celſus makes no mention of it, although he is very particular upon the operation of cutting for the ſtone in the bladder. Galen is ſo copious a writer, that he never miſſes any thing practiſed either in his own time, or before it, in his account of diſeaſes; yet, he mentions nothing of this operation, though he is very long upon the article of the diſeaſes of the kidnies. Cardan, indeed, mentions this operation, as one of thoſe of the ancients, which were practiſed in his time. His haſty reading the works of Hippocrates has led him into this error, and he lays the fault of its being now loſt, in a great meaſure, on Galen's omitting to mention it. It is wrong to accuſe Galen of this omiſſion, ſince neither Celſus, nor Ruffus, who preceded him, nor Aretæus who was his contemporary, nor, indeed, any of the Greek or Latin phyſicians, have named it, though they, as well as the moderns, mention, occaſionally, an abſceſs in the kidnies, and the manner of curing it.

The Arabians, indeed, mention the operation as practiſed and countenanced by ſome perſons before their time; but they all join in condemning it as a bold and hazardous operation, from which very little good is to be expected, and which ſets the life of the patient in the moſt imminent danger. Avicenna ſpeaks of it as the act of a madman, and it ſeems, that it was ſometimes practiſed in his time, but, by his manner of naming it, ſeems to have been only done by ſome mountebanks, who, having no reputation to loſe, ventured boldly, and ſometimes had ſucceſs. The reſt of the Arabians are ſilent about the operation, and it ſeems to have been only practiſed by a few people in the days of this author, and wholly diſcountenanced afterwards, from its bad ſucceſs.

Among the moderns, the firſt who has named it is Rouſſet, in his treatiſe on the Cæſarian Section. In order to invite men to countenance the Cæſarian operation, he recommends ſeveral other deſperate ones, and, among the reſt, this of Nephrotomy: but he is not able to produce one inſtance of its having been practiſed, either in his own, or earlier times, but when there was an abſceſs and an external tumor. Cælius Rodiginus gives, indeed, a very remarkable inſtance of an operation of this kind being performed by chance, by a woman, who, in the agony of her pain from the ſtone in the kidney, ſcratched with her own nails, till ſhe tore through the fleſh ſo deep, that eighteen ſtones were diſcharged at the wound.

The general opinion of authors is thus againſt the operation; and the moſt famed among thoſe who have treated of wounds of the kidnies, ſay, that any wound which enters into the pelvis is mortal. Yet, this opinion, though general, is not certain or determinate; and we have an account, in the Philoſophical Tranſactions, of the operation of Nephrotomy being performed with ſucceſs, by Marchetti of Padua, on Mr. Hobſon, the Engliſh conſul at Venice.

NE'RVE (*Dict.*)—*Wounds of the* Nerves.—Upon the diviſion of Nerves, the limb to which that Nerve was extended becomes inſtantly rigid, void of ſenſation, and withers: ſo that it is no wonder that a man inſtantly expires, upon the diviſion of thoſe Nerves which are ſent to the heart or diaphragm: a wound alſo is attended with great danger where the Nerve is only partially wounded, and not intirely divided; for the wounded fibres contract themſelves, and thoſe which remain undivided ſuffer too great extenſion, which will bring on moſt violent pain, ſpaſms, convulſions, inflammations, and gangrenes, and ſometimes death itſelf. *Heiſter's Surgery.*

NET.—The places for uſing fowling nets to moſt advantage, are the morning and evening haunts where the birds come to feed. The Sportſman is to be at the place at leaſt two hours before the time of their coming, and the Net muſt immediately be ſpread flat and even upon the ground, and the two ends faſtened down with ſtakes. At the lower part there is to be a long cord fixed to the upper edge of the Net, by means of which it may be immediately raiſed and pulled over. The ſportſman is to hide himſelf behind ſome natural or artificial ſhelter, at the extremity of his line, and ſome cut graſs muſt be ſtrewed all over the Net as it lies on the ground, to hide it from the fowl: and ſome live bird, that has been taken before, ſhould be ſtaked down before the Net, by way of a ſtale to draw in the others.

As ſoon as a ſufficient number of birds are within the compaſs of the Net, it is to be pulled ſwiftly over them, and the fowler, having taken thoſe that are under it, may ſtake down two or three more live ones, and ſpread the Net, covering it with graſs as before. This ſort of ſport may be continued from as ſoon as it is light in the morning, till an hour after ſun-riſe; but, after that time, the birds have done feeding ravenouſly, and the ſport is over for that day.

NEWT, or Eft.—The land Newt, or, as naturaliſts often call it, the land ſalamander, has ſomething very remarkable in its outer coat. Its ſkin often appears dry, like that of the lizard kind, but often, alſo, it appears wetted, and as if covered with a fine ſhining varniſh: the change from one to the other of theſe ſtates is uſually performed in an inſtant, and is frequently wet all over on the touching it. It alſo contains, under the ſkin, a ſort of milky liquor, which ſpurts out to a diſtance on preſſing the body of the animal.

The paſſages for this milk are a vaſt number of pores or holes, many of which are plainly viſible to the naked eye; and very probably the firſt-mentioned liquor, which covers the ſkin in manner of a varniſh, may be the ſame with this, its white colour not being diſtinguiſhable, when it is ſpread ſo thin over the ſurface of the animal. This milk reſembles very much the milky juice which the lithymals, and many other of the ſucculent plants, afford on being cut or broken. It is of an inſupportably acrid and ſtyptic taſte; and, though the tongue receives no injury from touching it, yet the ſenſation is ſo violent,

lent, that one is apt to imagine there muſt be a wound made in it. This animal, when bruiſed, yields alſo a very diſagreeable ſmell.

It has generally been ſuppoſed, that this animal is of a poiſonous nature; and the famous ſalamander of the old writers ſeems to be of the ſame genus, if not the ſame animal. Mr. Maupertuis, determined to inform the world of the truth, in regard to theſe remarkable particulars, cauſed a large number of theſe animals to be brought to him, which the country people, who had caught them about the bottoms of old walls, brought to him with as much caution as if they had been vipers.

The firſt experiment he made, was that of the incombuſtible quality of theſe animals: to this purpoſe, he threw ſeveral of them into a common fire; moſt of them periſhed immediately, but a few made ſhift to crawl out; but theſe could not get away on a ſecond trial, but periſhed like the reſt. It was obſerved, however, that, the moment they were thrown into the fire, the whole quantity of milky juice they contained was driven out at all the pores, and drying in an inſtant, ſtood in round globules, like ſo many pearls, till wholly conſumed by the heat.

It is poſſible, that the obſerving this creature to have a power of throwing out theſe juices, and covering itſelf at pleaſure with wet, might give riſe to the imaginary property of its ſubſiſting by the ſame means unhurt in the fire.

This trial being made, the next was to be certainly determined whether the creature were poiſonous or not. This Mr. Maupertuis propoſed to try two ways; the firſt, by making the creature bite ſome animals; the other, by making ſome other creature eat the Newt. But theſe experiments were attended with more difficulties than might be imagined, for it was neither eaſy to make it bite any thing, nor to make any creature eat it. No provocation could make the Newt bite, and, when its jaws were opened by force, its teeth were found ſo ſmall, and ſo placed, that they ſeemed rather intended to ſaw, or cut things to pieces, than to bite with; and when a chicken was brought to be bit, and the feathers removed from the part, the jaws had no force to make the teeth penetrate, and, when preſſed together, the teeth rather broke, or were put out of their places, than entered the animal, ſo that it was neceſſary to take off the ſkin, and the chicken then received ſeveral wounds, by forcibly preſſing the jaws of the Newt, together with parts of the raw fleſh between: after this, the lips and tongue of a dog, and the tongue of a turkey, were bitten in the ſame manner by other Newts. The animals were let looſe, and not one of them received the leaſt injury from the bite.

The following trial was made, whether the fleſh of the creature, or its milky juice, were poiſonous, when received into the ſtomach. Several animals were kept hungry a conſiderable time, on purpoſe to make them eat the animal, but none of them would touch it; ſo well has nature defended this little creature by the acrid juice under its ſkin, of which other animals are warned, as by inſtinct, and refuſe to ſwallow ſo diſagreeable a repaſt. A dog was at length compelled to ſwallow a Newt cut into ſeveral pieces while alive, and a turkey was forced to ſwallow, in like manner, a ſmall one. The dog's mouth was tied up for half an hour, and, half an hour after it was untied, he vomited up the tail and the feet of the animal, and received no injury; nor did the turkey, which ſwallowed the young one. After this, pieces of bread were ſoaked in the milky juice alone, and chickens were made to ſwallow them, and wounds inflicted with weapons dipped in the ſame juice, but no harm ever enſued to the creatures from either.

From all theſe trials, it appears very evident, that the ſtories of this creature's being poiſonous are as idle, and groundleſs, as thoſe of its living in the fire.

One thing remarkable this gentleman obſerved in his diſſections of the animal, which was, that he found in ſeveral of the females, at once, cluſters of eggs and living young ones. The eggs formed cluſters reſembling thoſe of the ovaries of birds, and the young ones were contained in two tubes, or long pipes, the coats of which were perfectly tranſparent, and the young ones were eaſily diſtinguiſhed through them, and there were counted in one female fifty-four of theſe, all living and vigorous. *Mem. Acad. Par.* 1721.

NICETE'RIA *Athenas*, in antiquity, an Athenian ſolemnity, in memory of Minerva's victory over Neptune, when they contended which of them ſhould have the honour of giving a name to the city afterwards called Athens. *Potter, Archæol.*

NI'COL, in natural hiſtory, a word uſed by the miners in Germany, to expreſs a greeniſh cruſt covering ſeveral of the ſpecies of marcaſites and cobalt; it emits fumes that ſmell of garlic in the calcination, and is very injurious to the workmen, cauſing contractions of their limbs, and other diſorders. It is ſometimes found in maſſes alone, but that more rarely.

NI'GHTINGALE, *philomela*, in zoology. See PHILOMELA.

Virginian Nightingale, in zoology, the common, but improper, name of a bird of the groſs-beaked kind, called by authors the coccothrauſtes Indica criſtata.

It is a little ſmaller than our blackbird; it has a black ring ſurrounding the eyes and noſtrils; the beak is very large and thick, but not altogether ſo large as in the common groſsbeak; and its head is ornamented with a very high and beautiful creſt, which it moves about very frequently. It is all over of a very fine and lively red, but paler on the head and tail than elſewhere. It is brought to us from Virginia, and is valued in England, for its beauty and delicate manner of ſinging. It is very fond of almonds, and the like fruits. *Ray's Ornithol.*

NI'GHTSHADE. See SOLANUM.

NINTH, in muſic, one of the diſſonant intervals in muſic. It is properly the ſecond doubled, but is differently uſed. When an upper part ſyncopates, the ſecond is accented and treated as a Ninth; i. e. it is reſolved by an eighth, and accompanied by a third or fifth, and often a ſyncopated ſeventh. But, when the lower part ſyncopates, the ſecond is not thus uſed, but is accompanied by the fourth and ſixth. In thorough baſs, the Ninth has always, or, at leaſt, commonly, an eighth placed after it, thus, 9 8; to ſhew that this is reſolved by deſcending to the octave. *Broſſ. Dict. Muſ.*

NI'PPERS, in the manege, are four teeth in the fore-part of a horſe's mouth, two in the upper, and two in the lower jaw. A horſe puts them forth between the ſecond and third year. See TEETH.

Nippers, is alſo an inſtrument in uſe among ſmiths and farriers, being a kind of pincers, wherewith, in ſhoeing a horſe, they cut the nails before they rivet them. It is alſo uſed in taking off a ſhoe.

Nippers, *in a ſhip*, are ſmall ropes, about a fathom or two long, with a little truck at one end, and ſometimes only a wale-knot. Their uſe is to help to hold off the cable from the main, or jeer capſtan, when the cable is ſo ſlimy, ſo wet, or ſo great, that they cannot ſtrain it to hold it off with their bare hands.

NI'TRE (*Dict.*)— This ſalt gives the greateſt of all proofs of the effects of ſynthetical or recompoſing chemiſtry. It is firſt ſeparated or analyſed, in the following manner: take two pounds of refined ſalt-petre in fine powder; pour upon it one third of its weight of oil of vitriol, and diſtil it in a glaſs retort, in a ſtrong ſand heat, there will be produced a ſtrong acid ſpirit of Nitre, which cannot, by any experiment, be found to participate at all of the nature of the oil of vitriol uſed in its preparation. Then take a pound of freſh Nitre, melt it in a crucible, and throw into it, at times, pieces of charcoal, till it will no longer keep in fuſion with the ſame degree of fire; then increaſe the fire, and melt it, and then pour it into a proper veſſel; leave it to cool itſelf. This is fixed nitre, and is an alkali: now diſſolve this fixed Nitre in water, and exactly ſaturate that water with the acid ſpirit of Nitre before diſtilled; this compound liquor will, by ſtanding, ſhoot into true and perfect cryſtals of nitre. And the experiment ſucceeds as well, if a ſolution of pot-aſhes, or any other fixed alkali, be uſed inſtead of that of fixed Nitre. *Shaw's Lectures.*

If there is any highly penetrating and corroſive liquor, which, inſinuating itſelf into all bodies, corrodes, diſſolves, deſtroys, and changes their craſis and mixture, it is certainly the highly acid and concentrated ſpirit of nitre, deprived of all its phlegm, rendered inflammable, and totally volatile, and by the application of which, excreſcences, warts, and preternatural tumors of the human body, may be commodiouſly deſtroyed and eradicated. Notwithſtanding theſe circumſtances, this ſpirit, by the addition of the volatile ſalt of ſal ammoniac, or ſalt of tartar, is, after its efferveſcence, totally deprived of its corroſive quality, ſince the mixture degenerates into a nitrous ſalt; which, when diſſolved in water, affords a powerful diuretic liquor, excellent for provoking urine, in ſerous and cachectic diſorders: beſides, the corroſive quality of this ſpirit is excellently corrected, by mixing eight parts of highly rectified ſpirit of wine with one part of it, and diſtilling from an alembic, by means of a ſand heat; by which means, there is yielded a ſpirit of a fragrant ſmell, an acrid penetrating taſte, entirely free from a corroſive quality, excellently adapted for diſcuſſing and reſolving viſcid humours, and, conſequently, carminative. This dulcified ſpirit, in conſequence of the vaporous ſulphur it contains, is, alſo, poſſeſſed of an anodyne and ſedative virtue, highly efficacious in pains and ſpaſms; for which reaſon it is of far more uſe in practice, than the common ſpiritus nitri dulcis.

The reaſon of the proceſs is this, that highly rectified ſpirit of wine is nothing but a very ſubtile oil, immediately mixed with phlegm; for which reaſon, it is united and intimately mixed with this corroſive ſpirit, and both of them, when united, form a mixture of a third nature; which, when diſſolved in the inflammable ſpirit, comes over the helm, and conſtitutes the dulcified ſpirit of Nitre. But it is to be obſerved, that, at leaſt, five, ſix, or eight parts of the rectified ſpirit of wine ought to be added to one part of this ſpirit; for, if only two or three of the former were uſed, a violent conflict would be produced, and the corroding acid quality of the latter not totally deſtroyed: but, in the preparation of this ſpirit, it is to be obſerved, that the ſpirit of wine is not to be poured into the corroſive ſpirit; otherwiſe a violent conflict is produced, accompanied with a thick red ſmoke, which is prejudicial to the health of the by-ſtanders, and ſometimes ſucceeded by the breaking of the glaſs. But when the corroſive ſpirit is in ſmall quantities, and gradually mixed with the ſpirit of wine, all theſe diſadvantages are prevented.

This dulcified ſpirit, when poured into a ſilver ſpoon, and ſet on flame, leaves behind it a greeniſh ſpot on the ſpoon, which is a proof of an acidulated ſubtile nitrous ſalt: in ſuch a caſe, it is, therefore, expedient to dulcify theſe ſpirits more, and augment its virtues, by pouring into it a proper quantity of the vinous ſpirit of ſal ammoniac: when the acid of this ſpirit is thus corrected, it no longer leaves any ſpot on the ſpoon, and its anodyne and ſedative virtues are at the ſame time rather augmented.

This dulcified ſpirit of Nitre differs from the common ſort ſold in the ſhops, ſince the former is of a far more penetrating taſte and ſmell, and conſequently more efficacious. They alſo differ with reſpect to the preparation, ſince that of the ſhops is prepared with aqua-fortis, and mine with a duly dephlegmated ſpirit, impregnated with a vitriolic and highly concentrated ſulphur: my ſpirit produces a violent conflict and efferveſcence, with highly rectified ſpirit of wine; but the common dulcified ſpirit of Nitre none at all: hence it alſo happens, that there is not an intimate union of the acid of Nitre with the oleous parts contained in the rectified ſpirit of wine, which happens in my highly concentrated ſpirit. In the preparation of my ſpirit, nothing remains in the cucurbit, but all the fluid aſcends; whereas, in the preparation of the common ſpiritus nitri dulcis, the acid and corroſive liquor of the Nitre remains after diſtillation.

My dulcified ſpirit of Nitre, by the addition of a proper quantity of ſalt of tartar, loſes almoſt all its acid acrimony, and may for this reaſon be commodiouſly mixed with common water, for drink in burning fevers: thus, if two drachms of it are mixed with about two pints of ſpring water, they make a drink which powerfully allays thirſt, provokes urine, and procures ſleep. In inflammations of the fauces, eſpecially ſuch as attend quinſies, nothing affords more immediate relief, than this ſpirit mixed with ſugar, and a ſmall quantity of the ſpirit of camphire, diluted in common water, and uſed as a gargariſm. Sugar itſelf, alſo, ſwallowed in a ſmall quantity, affords relief in inflammations of the fauces.

This dulcified ſpirit of Nitre, when mixed in a ſmall quantity with rectified volatile ſpirit of hartſhorn, acquires a bezoardic and diaphoretic virtue; for which reaſon it is highly beneficial in all malignant fevers, where ſweating is neceſſary. *Hoff. Obſ. Phyſ. Chym.*

NI'TRUM *calcarium*, in natural hiſtory, a name given by Dr. Liſter to a peculiar ſpecies of neutral ſalt, which he firſt publickly deſcribed in his book on the Medicinal Waters of England. He very improperly calls it nitre; becauſe it has none of the properties or qualities of nitre, but only a ſort of general reſemblance in its external form. He obſerves that this ſalt, though very little known, was abundantly the moſt copious of all the ſorts afforded by the mineral waters in general; and ſays, its cryſtals were long and ſlender, and conſiſted of four ſides, and were terminated by a point compoſed of two triangular planes. He adds, that this ſalt doubtleſs had its origin from a mixture of the acid of ſulphur and a calcarious earth of an alkaline nature.

This ſalt is found in almoſt all the mineral waters of Germany, and is very juſtly obſerved by Hoffman to be of the nature of Glauber's ſalt: that it is not nitre, is evident from this, that it is not inflammable, nor will yield aqua-fortis by diſtillation. It ſeems, indeed, true Glauber's ſalt, compoſed of the acid of vitriol or ſulphur, for this is in both the ſame, and of that alcaline earth which is the baſis of ſea ſalt: this is its origin, in the veſſels of the chemiſt, as well as in the bowels of the earth; and probably the figure of the cryſtals of that obſerved by Dr. Liſter was the ſame in the point, as well as in the body, both being quadrilateral columns, terminated by pyramids compoſed of a number of triangular planes. *Hoff. Opera.*

NITRUM *nitratum*, in chemiſtry, the name of a preparation of nitre, made by adding a ſufficient quantity of ſpirit of nitre to a lixivium of pure nitre, and afterwards evaporating it to a pellicle, and ſetting it by to ſhoot. The cryſtals formed by this liquor are perfectly nitrous in their figure, but they will be of an acid taſte.

We ſee, by this, that it is poſſible to alter a ſalt, and to reduce it into the appearance of a different body, by means of ſubſtances before ſeparated from itſelf; and, in this caſe, the alteration is made, in almoſt any degree, at pleaſure; the ſalt produced being more or leſs acid, as more or leſs of the acid ſpirit is uſed: but it is to be obſerved, that, the more acid there is uſed, the more difficultly the ſalt dries, and the more difficultly it is kept dry, it being always ſubject to run in the air. This preparation of nitre is a good medicine in burning fevers. *Boer. Chem.*

NOAH's *ark-ſhell*, in natural hiſtory, the name of a kind of ſea ſhell, which authors were always puzzled about referring to any genus, till a late French author has referred it to a new genus he has made under the title cordiformis taking in the bucardia and triangular heart-ſhells. The cabinet of the curious affords us three ſpecies of this ſhell; the common kind, a yellow and white kind, with broad irregular lines, and a variegated kind. *Hiſt. Nat. Eclair.*

NOCTA'MBULI, (*Dict.*)—This is a very ſtrange and remarkable diſtemperature of the imagination, and, in different perſons, differs greatly in degree. Thoſe who are but moderately affected with it, only repeat their actions of the day, and, getting out of the bed, go quietly to the places they frequent at other times; but thoſe who are afflicted with it in the moſt violent degree, go up to dangerous places, and do things that would terrify them to think of, when awake: theſe are by ſome called lunatic night-walkers, becauſe fits are obſerved to return with moſt frequency, and violence, at the changes of the moon.

Cauſes of it. The only material cauſe that can be aſſigned, in this caſe, is a plethora, or over-fulneſs of blood; but this is influenced by an immaterial one, that is, by the fancy, which is buſily employed in dreams about particular objects.

Method of cure. The primæ viæ are firſt to be cleared of all their foulneſſes by a ſtrong purge; after this it is proper to bleed in the foot, taking away eight or ten ounces; then powders compoſed of nitre, cinnabar, and crabs eyes, ſhould be taken three or four times a day, and particular regard ſhould be had to the changes of the moon. It will be proper to ſet a veſſel of water by the bed-ſide, in ſuch a manner that the perſon will naturally ſtep into it on getting out, and be awaked by that means; and, if theſe things fail, a perſon ſhould be ſet up to watch him, and beat him, every time it happens. *Junker's Conſp. Med.*

NOCTU'RNA. The Roman catholics beſtow this name on that part of the church office or prayers, which they alſo call matutina or mattins, which are commonly divided into three nocturns, ſo called, becauſe they were uſed to be ſung only by night; which is ſtill obſerved in ſome cathedral churches, where they ſing their mattins at midnight, in imitation of the primitive Chriſtians, who, by reaſon of the Heathen emperors perſecutions, were forced to meet at nights, which gave their adverſaries occaſion of loading them with moſt abominable calumnies. *F. Simeon.*

NOMO'THETÆ, Νομοθέται, among the Athenians, were a thouſand in number, and choſen by lot out of ſuch as had been judges in the court Heliæa. Their office was not (as their name ſeems to imply) to enact new laws by their own authority, for that could not be done without the approbation of the ſenate, and the people's ratification; but to inſpect the old, and, if they found any of them uſeleſs, or prejudicial, as the ſtate of affairs then ſtood, or contradictory to others, they cauſed them to be abrogated by an act of the people. Beſide this, they were to take care that no man ſhould plough, or dig deep ditches, within the Pelaſgian wall; to apprehend the offenders, and ſend them to the archon. *Potter. Archæol. Græc.*

Fracture of the NOSE.—In the Noſe both bone and cartilage are ſubject to fractures, which happen ſometimes on either ſide, and ſometimes in the middle, from blows or falls; if either of the bones in the front of the Noſe are fractured, it produces a flatneſs in the Noſe, and the air meets with obſtructions in its paſſage through the noſtrils; and, if the bone on either ſide is fractured, the part becomes hollow. When the cartilage is diſturbed, the Noſe inclines too much on one ſide. Theſe fractures ſometimes happen without a wound, but more uſually they are attended with a wound of the common integuments. If the injury of the Noſe is very great, the fracture can never be ſo perfectly cured, but that ſome deformity will remain. The vicinity of this part to the brain alſo, which is frequently injured at the ſame time, renders caſes of this kind often dangerous. A caries alſo, or an ozæna, or polypus, are no uncommon attendants on this diſorder. In order to reſtore the bones of the Noſe to their proper ſituation, the patient is to be placed in a ſeat oppoſite to the light, and his head held back by an aſſiſtant. The ſurgeon is to raiſe the depreſſed parts with a ſpatula, a probe, or a quill, applying externally the thumb of one hand, and the fore-finger of the other. If the bones of the Noſe are fractured on both ſides, they are to be on each in this manner, and the cavity of the noſtrils is to be filled up with long doſſils, to prevent the bones from collapſing; covering the part alſo for this end with ſome plaiſter, and applying firſt the dreſſings common to recent wounds. If the bone is fractured into ſeveral ſplinters, they are to be reduced into their proper places by the fingers; but if a ſplinter is ſo entirely ſeparated from the bone, that it will not eaſily unite with it again, it is to be taken out with the forceps. The bones will unite, when properly replaced, in about fourteen days, if no caries or abſceſs intervene. If the bone ſhould require a ſtronger ſupport than what has hitherto been mentioned, one may be formed out of ſtrong paper, either ſingle, or double, and adapted to each ſide of the Noſe, and ſupported by bolſters, and the whole muſt be kept in its place by a four-headed bandage not tied too tight. *Heiſter, Surg.*

NOTA'RICON, the third part of the Jewiſh cabala. Rabbi Nathan, in his great Aruch, ſays, that Notaricon is when a ſingle letter is taken for the ſign of a thing, i. e. for a whole name.—He adds, that the word comes from the Latin notarius, a perſon who writes in notes, or ſhort-hand.—And Rabbi Elias Levita gives the ſame account in his Theſbites, except that, in lieu of one letter for a word, he mentions 2 or 3.

But, after all, neither the one nor the other ſeems alone ſufficient: for, as ſingle letters frequently make a word, ſo, in the Notaricon, a whole word ſometimes ſtands for a ſingle letter.

There are therefore two principal kinds of Notaricon: the firſt is, when by aphæreſis, or apocope, the firſt or laſt letter of ſeveral words are joined to make a ſingle word, or phraſe; which therefore is of two kinds, the one initial, the other final: and each is done ſeveral ways, viz either by taking the letters the common way, or backwards: though there is alſo a third kind, made, as the Rabbins call it, by leaps, i. e. by ſkipping over ſome letters. The firſt of theſe kinds, which the rabbins call raſche theboth, appears very antient; and is ſuppoſed by ſome, well verſed in the Hebrew, to have taken its origin from the pſalms, and other places of ſcripture, proceeding alphabetically; i. e. the firſt verſe beginning with א, the firſt letter of the alphabet; the ſecond with ב, the ſecond letter, &c.

The ſecond kind is alſo very common, and called ſophe thehoth, i. e. the end of words. For inſtance, by telling the laſt letters of the words, מ ה שמו מה לי Mihi quodnam nomen eſt. Quodnam? they find the name of God, Jehovah. This becomes ſtill more puerile, when they take the letters backwards.

The third kind is more modern, more groſs, and perplexed: here a letter gives a whole word, inſtead of a word's only giving a letter; ſo that a word ſhall furniſh a whole phraſe. Thus, for an example, in the firſt word of Geneſis, בראשית bereſchit, is found, "he created the heaven and the earth, "the ſea, the abyſs," &c.

NOTES, in muſic, (*Dict.*)—Of the ſeven muſical Notes, ut, re, mi, fa, ſol, la, ſi; the firſt ſix are aſcribed to Aretine, who is ſaid to have invented them at Pompoſa, in the dutchy of Ferrara. The ſeventh, viz. ſi, was added, according to ſome, by Vander Putten; according to others, by de Muris. It ſerves very good purpoſes, in avoiding the difficulty of the diviſions remaining in Guido's ſcale.

Indeed Voſſius will not allow Guido the honour of inventing any of them, but ſhews the Egyptians had uſed them long before him; in which he is confirmed by the teſtimony of Halicarnaſſeus: however, common fame aſcribes to him not only the notes, but alſo the lines, letters, or cleffs, flats, and ſharps.

The Notes ut, re, mi, &c. he is ſaid to have taken from a hymn, in the veſpers of St. John Baptiſt, Ut queant laxis reſonare fibris, &c.

Hitherto, the Notes only ſerved to expreſs the degrees of tune: they were all of equal value as to time, till about the year 1330, when John de Meurs, or de Muris, a doctor of Paris, gave different figures to the ſeveral points, to expreſs the quantity of time each was to be dwelt upon.

There are three things to be conſidered in theſe Notes. 1ſt, The quantity, i. e. the ſize and figure of the head. 2dly, The quality, i. e. the colour of the head, whether it be white or black, full or open. 3dly, The properties, as the Italians expreſs themſelves; viz. whether the Note is accompanied with a virgula, or comma, or not. It muſt likewiſe be conſidered whether the Notes be ſeparate and diſtinct, or bound together.

The ſeveral muſical Notes are, the large, which contains 8 meaſures; though Merſennus and ſeveral others make it 12; the long, containing 4 meaſures; the breve, containing 2; the ſemibreve, containing 1; the minim, $\frac{1}{2}$; the crotchet, $\frac{1}{4}$; the quaver, $\frac{1}{8}$; the ſemiquaver, $\frac{1}{16}$; and the demiſemiquaver, $\frac{1}{32}$.

Uſually we only diſtinguiſh ſix principal Notes, repreſented by as many different characters; viz. the ſemibreve, equal to two minims; the minim, equal to two crotchets; the crotchet, equal to two quavers; the quaver, equal to two demiquavers; and the ſemiquaver, equal to two demiſemiquavers. The mathematicians compute, that one may make 720 changes, or varieties, with ſix Notes, without ever repeating the ſame twice; and that of the Notes of each octave one may make 40320 different tunes or ſongs.

NOVE'MVIRI, (*Dict.*) — Theſe nine magiſtrates of Athens government laſted but for one year; the firſt of which number was called archon, or prince; the ſecond baſileus, or king; the third polemarchus, or general of the army; and the ſix others were called the ſmothetæ or legiſlators. They took an oath exactly to obſerve the laws, and, in caſe of failure, obliged themſelves to beſtow upon the commonwealth a golden ſtatue as big as themſelves. Thoſe who diſcharged their office with honour, were afterwards received into the number of the ſenators of the Areopagus. *Plutarchus in Solon. & Pericle.*

NOVENDIA'LE, (*Dict.*) —This ſacrifice the Romans continued for nine days to divert the miſchiefs wherewith they were threatened by prodigy, and to appeaſe the anger of the Gods, in caſe the ſenate ſent an order to the high prieſt or prætor of the city, for the obſervation of this ſolemnity. Tullus Hoſtilius, the fourth king of Rome, was the firſt inſtitutor of theſe ſacrifices, after he had been informed of the prodigious hail which fell upon mount Aban, in the country of Latium, the bigneſs and hardneſs whereof made them to be taken for ſtones. *Titus Livius.*

NOVE'NSILES, certain Gods thus called by the Romans, either becauſe they were of ſhort ſtanding, or nine in number, as Health, Fortune, Veſta, Hercules, Romulus, Æſculapius, Bacchus, Æneas, and Faith; or, that they thought they preſided over novelties and changes. Others will have it, that was a name given to the nine muſes. *Lib. Gyrald. de Syntagm. Deor.*

NUAY'HAS, *the ague-tree*, a name given by the Indians to a ſort of bamboe cane, the leaves of which, falling into the water, are ſaid to impregnate it with ſuch virtue, that the bathing in it afterwards will cure the ague.

They uſe alſo a decoction of the leaves to diſſolve coagulated blood, giving it internally, and, at the ſame time, rubbing the bruiſed part externally with it. It is ſaid that this plant bears its flowers only once in its life, that it lives ſixty years before theſe appear, but that, when they begin to ſhew themſelves, it dies away in about a month afterwards, that is, as ſoon as it has ripened the ſeed; and from theſe ſeed only the vegetable can be propagated.

NUDIPEDA'LIA, ſacrifices which the Jews ſolemniſed with their bare feet, to be delivered from ſome great incumbent affliction. After having continued their prayers for thirty days together, and abſtained from wine, they ſhaved their heads, and went bare-foot to the temple, and offered their ſacrifices. The Jews finding themſelves oppreſſed by Florus, governor of Judea, for the emperor Nero, celebrated this bare-foot ceremony with extraordinary ſolemnity; Berenice, king Agrippa's ſiſter, accompanying them therein, and appearing alſo bare-foot in behalf of the Jews, before the tribunal of Florus, but without ſucceſs. Joſeph de Bello Judaic. S. Hieron. adverſ. Jovinian. The Greeks, Romans, and other nations alſo obſerved the like ſolemnities, as Tertullian informs us in his Apologetic.

NUM'BER, (*Dict.*)—*Figurate* NUMBERS. Thoſe of the firſt order are 1, 1, 1, 1, &c. Thoſe of the ſecond order the ſucceſſive ſums of thoſe of the firſt order, viz. 1, 2, 3, 4, 5, &c. and form an arithmetical progreſſion. Thoſe of the third order are the ſucceſſive ſums of thoſe of the ſecond, viz. 1, 3, 6, 10, 15, and are the triangular Numbers. Thoſe of the fourth order are the ſucceſſive ſums of the third, viz. 1, 4, 10, 20, 35, and are the pyramidal numbers, and ſo on.

The figurate numbers of any order may be found without computing thoſe of the preceding orders, by taking the ſucceſſive products of as many of the numbers 1, 2, 3, 4, 5, &c. in their natural order, as there are units in the Number, which denominates the order of figurates required, and dividing thoſe products always by the firſt product. Thus the triangular numbers are found by dividing the products 1 × 2, 2 × 3, 3 × 4, 4 × 5, 5 × 6, &c. each by the firſt product 1 × 2. The pyramids alſo are found by dividing the products, 1 × 2 × 3, 2 × 3 × 4, 3 × 4 × 5, 4 × 5 × 6, &c. each by 1 × 2 × 3. In general, the figurate numbers of any order denoted by M are found by ſubſtituting ſucceſſively 1, 2, 3, 4, 5, &c. in the place of x in the general expreſſion $\frac{x\,.\,x+1\,.\,x+2\,.\,x+3,\ \&c.}{1.\quad 2.\quad 3.\quad 4.\quad \&c.}$ where the factors in the numerator and denominator are ſuppoſed to be multiplied by each other, and to be continued, till the Number in each be equal to that which expreſſes the order of the figurates required, diminiſhed by unity. And, when a figurate Number of any order is divided by the correſponding figurate of any higher order, the numerator of the quotient is invariable, and x. is in its denominator of as many dimenſions as there are units in the difference of the numbers that denote thoſe orders.

NUME'RIA, a Heathen goddeſs preſiding over numbers and accounts. *Auguſtin. de Civit. Dei.*

NUMMULA'RIA, *moneywort*, in botany, a genus of plants whoſe characters are:

The leaves are orbicular and conjugated; the calyx is quinquefid, incloſing a ſeminal veſſel, and conſiſting of five long ſlender ſegments, which expand themſelves in form of a ſtar. The flower is monopetalous, rotated, quinquefid, being cut even to the nail, or unguis, and furniſhed with five ſtamina, which, ariſing from the circumference of the baſe of the flower, grow together into one, in proceeding from the wings of the leaves. The placenta is ſeated in the bottom of the calyx, and on it grows the ovary, which becomes a round veſſel cloſely lodged within the calyx, and ſhooting forth a long tube.

Its leaves are ſouriſh, ſtyptic, and give a deep red tincture to blue paper: the acid abounds in the moneywort, and produces with the earth an aluminous ſalt, involved in a little oil, ſo that it is very aſtringent and vulnerary. Camerarius affirms, that, being boiled with milk, it is good for the ſcurvy. Fragus adviſes to boil it with wine and honey, and to give the decoction to drink to thoſe that have an ulcer in the lungs. The ſame author commends it in the dyſentery, loſs of blood, and the whites. Fuchſius preſcribes the herb, applied as a cataplaſm, to dry up ulcers. Matthiolus ſays it is very good for ruptures in children. *Martyn's Tourneſort.*

NUN, in zoology, the common Engliſh name for the parus cæruleus, or blue tit-mouſe, diſtinguiſhed from the common by its having a blue head, ſurrounded by a white line. *Ray's Ornithol.*

Nun, is alſo the name of a peculiar ſpecies of pigeon, called by Moore the columba veſtalis. It is but a ſmall pigeon, but ſomething larger than the jacobine, and has a very particular plumage, from which it has taken its name, its head being as it were covered with a veil.

The body of this ſpecies is all white; the head, tail, and ſix of the flight feathers black, red, or yellow; the eyes are pearl coloured, and the hood white: this is a large tuft of feathers on the hinder part of the head, and, the more numerous they are, the more the bird is eſteemed.

This is a very beautiful ſpecies of pigeon, and is very much eſteemed. Some of its feathers, however, will vary ſometimes from their true colour. Theſe birds are called foul-feathered. But it is a mere accidental variety, the young of ſuch being often as perfect and beautiful as of any others. *Moore's Columbarium.*

NU'RSERY, in gardening (*Dict.*) — Of this ſort there are great numbers in the different parts of this kingdom, but particularly in the neighbourhood of London, which are occupied by the gardeners, whoſe buſineſs it is to raiſe trees, plants, and flowers for ſale; and in many of theſe there is at preſent a much greater variety of trees and plants cultivated than can be found in any other part of Europe. In France, their Nurſeries (which are but few, when compared with thoſe in England) are chiefly confined to the propagation of fruit-trees, from whence they have the appellation of pepinier. For there is ſcarce any of thoſe gardens, where a perſon can be ſupplied either with ever-greens, flowering ſhrubs, or foreſt-trees. And, in Holland, their Nurſeries are principally for flowers: ſome few of them indeed propagate tender exotic plants. But thoſe Nurſeries in the neighbourhood of London do, ſeveral of them, include all theſe; and from hence moſt of the curious perſons abroad are ſupplied with furniture for their gardens. But I do not propoſe, in this place, to treat of theſe extenſive Nurſeries, or to give a deſcription of them; therefore ſhall confine myſelf to treat of ſuch Nurſeries only as are abſolutely neceſſary for all lovers of planting to have upon the ſpot, where they deſign to make their plantation. For, if theſe are large, the expence of carrying a great number of trees, if the diſtance is great, will be no ſmall article, beſides the hazard of their growing; which, when plants have been trained up in good land, and removed to an indifferent one, is very great. Therefore it is of the utmoſt conſequence to every planter, to begin by making of a Nurſery. But in this article I muſt beg leave to obſerve, that a Nurſery ſhould not be fixed to any one particular ſpot: I mean by this, that it would be wrong to continue the raiſing of trees any number of years upon the ſame ſpot of ground; becauſe hereby the ground will be ſo much exhauſted by the trees, as to render it unfit for the ſame purpoſe. Therefore all good Nurſery-gardeners ſhift and change their land, from time to time; for, when they have drawn off the trees from a ſpot of ground, they either plant kitchen herbs, or other things, upon the ground for a year or two, by which time, as alſo by dunging and trenching of the land, it is recovered, and made fit to receive other trees. But this they are obliged to from neceſſity, being confined to the ſame land; which is not the caſe with thoſe gentlemen, who have a large extent of ground in the country. Therefore all ſuch perſons I would adviſe to make Nurſeries upon the ground which is intended for planting, where a ſufficient number of the trees may be left ſtanding, after the others have been drawn out, to plant in other places; which, for all large-growing trees, but particularly ſuch as are cultivated for timber, will be found by much the moſt advantageous method: for all thoſe trees which come up from the ſeed, or which are tranſplanted very young into the places where they are deſigned to remain, will make a much greater progreſs, and become larger trees, than any of thoſe which are tranſplanted at a greater age. Therefore the Nurſeries ſhould be thinned early, by removing all thoſe trees which are intended for other plantations, while they are young; becauſe hereby the expence and trouble of ſtaking, watering, &c. will be ſaved, and the tree will ſucceed much better. But in expoſed ſituations, where there are Nurſeries made, it will be neceſſary to permit the trees to ſtand much longer, that, by growing cloſe together, they may ſhelter each other, and draw themſelves up: and theſe ſhould be thinned gradually, as the trees advance; for, by taking away too many at firſt, the cold will check the growth of the remaining trees. But then thoſe trees which are taken out from theſe Nurſeries, after a certain age, ſhould not be depended on for planting; and it will be prudence rather to conſign them for fuel, than by attempting to remove them large, whereby, in endeavouring to get them up with good roots, the roots of the ſtanding trees will be often much injured.

What has been here propoſed, muſt be underſtood for all large plantations in parks, woods, &c. but thoſe Nurſeries which are only intended for the raiſing of ever-greens, flowering ſhrubs, or plants which are deſigned to embelliſh gardens, may be confined to one ſpot, becauſe a ſmall compaſs of ground will be ſufficient for this purpoſe. Two or three acres of land, employed this way, will be ſufficient for the moſt extenſive deſigns; and one acre will be full enough for thoſe of moderate extent. And ſuch a ſpot of ground may be always employed for ſowing the ſeeds of foreign trees and plants; as alſo, for raiſing many ſorts of biennial and perennial flowers, to tranſplant into the borders of the pleaſure garden; and for raiſing many kinds of bulbous-rooted flowers from ſeeds; whereby a variety of new ſorts may be obtained annually, which will recompenſe for the trouble and expence, and will moreover be an agreeable diverſion to all thoſe perſons who delight in the amuſements of gardening.

Such a Nurſery as this ſhould be conveniently ſituated for water: for, where that is wanting, there muſt be an expence attending the carriage of water in dry weather. It ſhould alſo be as near the houſe as it can with conveniency be admitted, in order to render it eaſy to viſit at all times of the year; becauſe it is abſolutely neceſſary, that it ſhould be under the inſpection of the maſter; for, unleſs he delights in it, there will be little hopes of ſucceſs. The ſoil of this Nurſery ſhould alſo be good, and not too heavy and ſtiff; for ſuch land will be very improper for ſowing moſt ſorts of ſeeds; becauſe, as this will detain the moiſture in the ſpring and winter, ſo the ſeeds of moſt tender things, eſpecially of flowers, will rot in the ground, if ſown early. Therefore, where perſons are confined to ſuch land, there ſhould be a good quantity of ſand, aſhes, and other light manures buried, in order to ſeparate the parts, and pulveriſe the ground; and, if it is thrown up in ridges, to receive the froſt in winter, it will be of great uſe to it; as will alſo the frequent forking or ſtirring of the ground, both before and after it is planted.

The many advantages which attend the having ſuch a Nurſery, are ſo obvious to every perſon who has turned his thoughts in the leaſt to this ſubject, that it is needleſs for me to mention them here: and, therefore, I ſhall only beg leave to repeat here what I have frequently recommended, which is, the carefully keeping the ground always clear from weeds: for, if theſe are permitted to grow, they will rob the young trees of their nouriſhment. Another principal buſineſs is, to dig the ground between the young plants at leaſt once a year, to looſen it for the roots to ſtrike out: but, if the ground is ſtiff, it will be better to be repeated twice a year, viz. in October and March; which will greatly promote the growth of the plants, and prepare their roots for tranſplanting.

The ground you intend for the flower Nurſery ſhould be well ſituated to the ſun, but defended from ſtrong winds by plantations of trees, or buildings; and the ſoil ſhould be light and dry, which muſt always be obſerved, eſpecially for bulbous-rooted flowers, which are deſigned to be planted therein.

In this Nurſery ſhould be planted the off-ſets of all your bulbous-rooted flowers, where they are to remain until they become blowing roots; when they ſhould be removed into the pleaſure garden, and planted either in beds or borders, according to the goodneſs of the flowers, or the management they require.

You may alſo, in this ground, raiſe the ſeveral ſorts of bulbous-rooted flowers from ſeeds, by which means new varieties may be obtained; but moſt people are diſcouraged from ſetting about this work, from the length of time before the ſeedlings will come to flower: however, after a perſon hath once begun, and conſtantly continued ſowing every year, after the parcel firſt ſown has flowered, the regular ſucceſſion of them, coming annually to flower, will not render this method ſo tedious as it at firſt appeared.

The ſeedling auricula's, polyanthus's, anemonies, carnations, &c. ſhould be raiſed in this Nurſery, where they ſhould be preſerved until they have flowered; when you ſhould mark all ſuch as are worthy of being tranſplanted into the flower garden; which ſhould be done in their proper ſeaſons: for it is not ſo well to have all theſe ſeedling flowers expoſed to public view in the flower garden; becauſe it always happens, that there are great numbers of ordinary flowers produced among them, which will make but an indifferent appearance in the pleaſure garden. *Miller's Gard. Dict.*

NYCTE'LIA, feaſts in honour of Bacchus, ſo called, becauſe they were celebrated in the night; from the Greek word Νὺξ, which ſignifies night, and τελεῖν, to ſacrifice, or perform any religious ceremony. Theſe feaſts were celebrated every three years, in the beginning of the ſpring, by night, with flambeaus and drinking, and accompanied with the worſt of inſolences and impurities; wherefore, alſo, the Romans forbad the ſolemniſing of them, becauſe of the horrid diſorders committed at them. *S. Auguſt. de Civitate Dei. Dempſter Paralipom. in Roſin. Antiq.*

NYC'TEUS, the ſon of Neptune by Celene, daughter of Atlas. He had two daughters, Antiope and Nyctimene, by Amalthæa, a nymph of Crete; Nyctimene, by the help of an old nurſe, as the ſtory goes, lay with her own father: but, the thing coming to be known, the father would have ſlain his daughter, had not Minerva out of pity turned her into an owl. *Propert. Ovid.*

NY'MPHA (*Dict.*)—*Nymphs of flies*, in natural hiſtory, is that ſtate of the fly-claſs, which is between their living in the form of a worm, and their leaving that form for that of their parent fly.

In this ſtate, in many genera of the flies, the worm, or maggot,

got, makes a ſhell of its own ſkin, which hardens, and becomes brown, or reddiſh, while the whole of its body becomes detached from it; and, after having lain ſome time in the form of an oblong ball, without any viſible parts of the creature that is to be produced from it, acquires, by degrees, the form of the fly, and all its limbs, and appears an embryo fly wrapped up in an extremely thin and fine membrane. This is properly the nymph ſtate, and, in theſe flies, when the parts of this nymph are more confirmed, and hardened, it is, in reality, no other than the fly wrapped up in this bag, which is ſo very tranſparent that every lineament of the inſect it contains may be clearly diſcerned through it. The wings, however, in this ſtate, appear as if they were not yet perfectly formed, but the truth is, that they are only very nicely and regularly folded together. The creature, however, in this ſtate, though ever ſo perfect, ſeems quite inanimate. When all the parts, however, have acquired their due ſtrength, the creature puts itſelf into motion, and gets looſe from its covering, which is no ſmall difficulty; for, though the ſkin of this is very fine and thin, yet, as it ſerves as a nice caſe to every part of the animal, the effects by which it is to get rid of it muſt be ſomewhat difficult to the creature. A much greater difficulty, however, it will neceſſarily be imagined to be for the embryo fly to get out of the outer ſhell, or caſe, which is uſually firm, hard, and rigid; but nature has ſo ordered it, that no more force ſhall be required for this great work than the creature is able to exert.

One of the two ſorts of ſhells of theſe inſects, the one in form of an egg, and the other of the worm itſelf, are the two ways for the fly's egreſs.

For the firſt of theſe, it is always from the ſame end of the ſhell, in form of an egg, that the embryo fly is ſeen to make its way out. This is always that end which is near the head of the fly, and which was, originally, the head of the worm.

The head of the fly, however, is provided with no inſtrument to make this great opening. The point of the trunk is yet very ſoft, and, even when at its utmoſt hardneſs, it could only make a very ſmall and, in a manner, imperceptible hole. Nature has furniſhed the creature with another means of freeing itſelf from this ſhell. The cap at the top of this is made, as it were, of two halves, and they ſo looſely attached both to one another, and to the other part of the ſhell, that they very readily ſeparate with a ſmall force, and fall off from it. But this is not all; for, in every one of theſe ſhells, towards the joining on of the cap to the head part, there are two ribs, or prominent lines, diametrically oppoſite to one another, and reaching to ſome diſtance in the ſhell. Theſe ſeem formed to ſtrengthen the ſhell, but are, in reality, intended to weaken it, and are the places at which it not only eaſieſt breaks, but even ſplits and opens with a ſmall force. This, with the falling off the cap, gives ſufficient room of egreſs to the fly, and may be eaſily diſcovered to be intended ſo to ſeparate by nature itſelf; ſince, in breaking any other parts of the ſhell, it cracks irregularly and indeterminately, but here it ſeparates only at theſe lines.

It is eaſy, indeed, for us by a ſlight force to ſeparate the two pieces of the cap of the ſhell in theſe caſes, and a ſmall force does it; but this, though ſmall to us, is great in proportion to the ſtrength and circumſtances of the nymph, incloſed as it is on all ſides.

The ſkull of the fly to be conſidered, however, is ſolid and cruſtaceous, and of a conſtant and regular figure, as in other larger animals; yet, the fly, in this ſtate, is able to inflate and contract its head alternately, and by that means effects much of the great buſineſs of its liberty. This, extending the bulk of the head, is aſſiſted by a ſort of bladder, which the creature, at each of theſe inflations, puſhes out to ſome diſtance from its head, and which, ſometimes, even equals the head itſelf in ſize.

The air is the only means by which the fly can, in this manner, inflate and ſwell its head; and, when neceſſary, it ſwells its whole body in the ſame manner. The inflation of the head, and the throwing out this ſort of bladder, which is an operation the fly is never able to do afterwards through its whole life, are evidently meant to diſlodge and throw off the cap, and open the ſide lines of the ſhell. *Reamur, Hiſt. Inſect.* Vol. IV.

NYMPHÆ'A, *the water-lily*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roſaceous kind, conſiſting of ſeveral petals arranged in a circular form; the ſeed veſſel ariſes from the cup of the flower, and is, when ripe, of a globoſe or conic figure, multicapſular, and filled with oblong ſeeds.

The beſt method to propagate theſe plants is, to procure ſome of their ſeed veſſels, juſt as they are ripe, and ready to open: theſe ſhould be thrown into canals, or large ditches of ſtanding water, where the ſeeds will ſink to the bottom; and, the following ſpring, the plants will appear floating upon the ſurface of the water, and, in June and July, will produce their beautiful large flowers. When they are once fixed to the place, they will multiply exceedingly, ſo as to cover the whole ſurface of the water in a few years.

In ſome ſmall gardens, I have ſeen theſe plants cultivated in large troughs of water, where they have flouriſhed very well, and have annually produced great quantities of flowers; but as the expence of theſe troughs is pretty great (their inſides requiring to be lined with lead, to preſerve them) ſo there are few people who care to be at that charge. *Miller's Gard. Dict.*

The plant is of a nitrous, paregoric, aperitive, moiſtening, refrigerating, and ſomewhat narcotic quality. The juice is drank in inflammations of the kidney and bladder. Of the flowers is prepared an oil, which has the ſame virtue as oil of olives, or oil of roſes. The leaves, bruiſed, make an excellent cataplaſm for inflamed parts; and a decoction of the roots and flowers is beneficial in burning fevers, by refrigerating; and the more, if the ſame remedy be applied to the ſoles of the feet and the groins. Of the expreſſed juice of the ſtalks, leaves, and fruit, boiled, is prepared a ſyrup, which is a moſt efficacious remedy for a gonorrhœa, and not the leſs proper when the diſorder is attended with an immoderate heat; for it was always a celebrated medicine for heat of urine. This ſyrup partakes ſomewhat of a narcotic quality, and is, therefore, extolled as a ſpecific in want of ſleep; it, alſo, prevents nocturnal pollutions, and extinguiſhes thirſt. *Hiſt. Plant. adſcript. Boerhaave.*

NYMPHÆ'UM, the name given to a ſort of public baths in the city of Rome, of which there were twelve in number; they were places of pleaſure, adorned with pleaſant fountains, cool grotto's, and curious ſtatues of nymphs, which were very delightful. Hiſtory tells us of many places of this kind that were built in Rome and Conſtantinople, but are now ruined by length of time. Only there is a building ſtill to be ſeen of this kind between Naples and mount Veſuvius in Italy. It is all of marble, and of a ſquare figure, and hath only one gate of entrance, which by ſome ſteps leads down to a large grotto paved with marble of divers colours, and the walls are all covered with ſhell work, in a curious manner repreſenting the twelve months of the year, and the four cardinal virtues. The water of a curious fountain, at the entry of the grotto, fills a canal that ſurrounds the place; and the whole is adorned with the ſtatues and pictures of divers nymphs, and abundance of other pleaſant figures. *Roſin. Ant. Rom.*

NYMPHOI'DES, in botany, the name of a genus of plants, approaching to the nature of the water-lily, or nymphæa, in external appearance, and thence uſually eſteemed a ſpecies of that genus, but improperly.

The characters of this genus of plants are theſe: the flower conſiſts of one leaf, uſually of a rotated form, and divided into ſeveral ſegments at the edge. The piſtil ariſes from the cup, and perforates the bottom of the flower, and finally ripens into a ſoft fruit, or capſule, of an oblong, compreſſed figure, having only one cell, and containing many ſeeds wrapped up in a calyptra.

O.

OAK (*Dict.*)—The characters are:

All the ſorts of Oaks are propagated from acorns, which ſhould be ſown as ſoon as poſſible after they are ripe; for, if they are kept too long out of the ground, they ſeldom grow.

The manner of ſowing theſe acorns, if deſigned for a ſmall plantation, or to be removed, is, to prepare ſome beds of freſh earth, neither too ſtrong and heavy, nor too light and dry; in theſe beds you ſhould place the acorns in rows one foot aſunder, and about two inches diſtance in the rows, covering them about two inches thick with the ſame freſh earth; obſerving to leave none of them uncovered, to entice the vermin, which may, in a ſhort time, deſtroy all the ſeeds.

In the ſpring, when the plants begin to appear, you muſt carefully clear them from weeds; and, if the ſeaſon proves dry, you ſhould refreſh them now-and-then with a little water, which will greatly promote their growth. In theſe beds the plants ſhould remain until the following autumn, obſerving conſtantly to keep them clear from weeds; at which time you ſhould prepare a ſpot of good freſh earth, in ſize proportionable to the quantity of plants, which ſhould be trenched and levelled: then, towards the middle or latter end of October, you ſhould carefully take up the plants, ſo as not to injure their roots, and plant them out in rows three feet aſunder, and eighteen inches diſtance plant from plant; obſerving never to ſuffer the plants to abide long out of the ground, becauſe their roots would dry, and endanger the growth of the plants.

When they are planted, you ſhould lay a little mulch upon the ſurface of the ground, near their roots, to prevent the earth from drying too faſt; and, if the ſeaſon ſhould prove very dry, you ſhould give them a little water, to ſettle the earth to their roots.

When the plants have taken root in this nurſery, they will require little more care than to keep them clear from weeds, and dig the ground between the rows every ſpring; in doing of which, you ſhould cut off ſuch roots as extend very far from the trunk of the trees, which will render them better for tranſplanting again: you ſhould alſo prune off ſuch ſide-branches as extend themſelves very far, and would retard the upright ſhoot: but you ſhould by no means cut off all the ſmall lateral branches, ſome of which are abſolutely neceſſary to be left on, to detain the ſap for the augmentation of the trunk; for I have often obſerved, where trees have been thus cloſely pruned, that their heads have overgrown their bodies, ſo that they have bent downward and become crooked.

When theſe trees have remained in the nurſery three or four years, they will then be large enough to tranſplant to the places where they are to remain; for it is not proper to let them grow very large before they are planted out; becauſe theſe are very hazardous trees to remove when old, or after they have taken deep root.

The ſeaſon for this work is, as I ſaid before, in the autumn; at which time, if they are carefully taken up, there will be little danger of their ſucceeding. When they are planted, the ſurface of the ground ſhould be mulched about their roots, to prevent its drying too faſt: and, if the ſeaſon is very dry, they ſhould be watered, to ſettle the earth to their roots, which may be repeated two or three times in very dry weather: but you muſt carefully avoid giving them too much water, which is very injurious to theſe trees, when newly removed.

You ſhould alſo ſtake them to prevent their being ſhaken and diſturbed by the winds, which would retard their rooting. In tranſplanting of theſe trees, you ſhould by no means cut their heads, which is too much practiſed: all that ſhould be done, muſt be only to cut off any bruiſed or ill-placed branches, which ſhould be taken off cloſe to the place where they are produced: but there can be no greater injury done to theſe trees, than to ſhorten their ſhoots; for, when the leading bud, which is abſolutely neceſſary to draw and attract the nouriſhment, is taken off, the branch often decays intirely, or, at leaſt, down to the next vigorous bud.

The trees, thus raiſed and managed, will, if planted in a proper ſoil, grow to a conſiderable magnitude, and are very proper for a wilderneſs in large gardens, or to plant in clumps in parks, &c. but, if they are deſigned for timber, it is much the better method to ſow the acorns in the places where they are to remain; in order to which, you ſhould provide yourſelf in autumn with a ſufficient quantity of acorns, which ſhould be always taken from ſtraight, upright, vigorous-growing trees; theſe ſhould be gathered from under the trees as ſoon as may be after they are fallen, and, if poſſible, in a dry time, laying them thin in ſome open room to dry; after which they may be put in dry ſand, and preſerved in a dry place until the end of November, when you ſhould prepare the ground for planting them.

The directions here given are deſigned only for ſmall plantations in a garden or park, which are only for pleaſure: but, where theſe trees are cultivated with a view to profit, the acorns ſhould be ſown where the trees are deſigned to grow; for thoſe which are tranſplanted will never grow to the ſize of thoſe which ſtand where they are ſown, nor will they laſt near ſo long ſound. For, in ſome places, where theſe trees have been tranſplanted with the greateſt care, and they have grown very faſt for ſeveral years after, yet, they are now decaying, when thoſe which remain in the place where they came up from the acorns, are ſtill very thriving, and have not the leaſt ſign of decay. Therefore, whoever deſigns to cultivate theſe trees for timber, ſhould never think of tranſplanting them, but ſow the acorns on the ſame ground where they are to grow; for the timber of all thoſe trees which are tranſplanted, is not near ſo valuable as that of the trees from acorns. I ſhall therefore add ſome plain directions for the ſowing of acorns, and managing of the young trees, during their minority, until they are out of danger, and require no farther care.

The firſt thing to be done is that of fencing the ground very well, to keep out cattle, hares, and rabbits; for, if either of theſe can get into the ground, they will ſoon deſtroy all the young trees. Indeed, they will in a few years grow to be out of danger from the hares and rabbits; but it will be many years before they will be paſt injury from cattle, if they are permitted to get into the plantation; therefore, durable fences ſhould be put round the ground. If, in the beginning, a pale fence is made about the land, which may be cloſe at the bottom, and open above; and within the pale a quick-hedge planted; this will become a good fence, by the time the pale decays, againſt all ſorts of cattle; and then the trees will have got above the reach of hares and rabbits, ſo that they cannot injure them; for the bark of the trees will be too hard for them to gnaw.

After the ground is well fenced, it ſhould be prepared, by plowing of it three or four times, and, after each plowing, to harrow it well, to break the clods, and cleanſe the ground from couch, and the roots of all bad weeds. Indeed, if the ground is green ſward, it will be better to have one crop of beans, peaſe, or turneps, off the ground, before the acorns are ſown, provided theſe crops are well hoed to ſtir the ſurface, and deſtroy the weeds: for, if this is obſerved, the crop will mend and improve the land for ſowing; but, in this caſe, the ground ſhould be plowed as ſoon as poſſible, when the crop is taken off, to prepare it for acorns; which ſhould be ſown as ſoon as may be after the acorns are ripe: for, although theſe may be preſerved in ſand for ſome time, yet they will be apt to ſprout; and, if ſo, the ſhoots are in danger of being broken and ſpoiled: therefore, I ſhould adviſe the ſowing early, which is certainly the beſt method.

In making choice of the acorns, all thoſe ſhould be preferred, which are taken from the largeſt and moſt thriving trees: and thoſe of pollard trees ſhould always be rejected, though the latter are generally the moſt productive of acorns; but thoſe of the large trees commonly produce the ſtrongeſt and moſt thriving plants.

The ſeaſon for the ſowing of the acorns being come, and the ground having been plowed, and levelled ſmooth, the next work is to ſow the acorns; which muſt be done by drawing of drills acroſs the ground, at about four feet aſunder, and two inches deep; into which the acorns ſhould be ſcattered, at two inches diſtance. Theſe drills may be drawn either with a drill plough, or by hand, with an hoe; but the former is the moſt expeditious method, therefore, in large plantations ſhould be preferred. In the drawing of the drills, if the land has any ſlope to one ſide, theſe ſhould be made the ſame way as the ground ſlopes, that there may be no ſtoppage of the wet by the rows of plants croſſing the hanging of the land. This ſhould be particularly obſerved in all wet ground, or where the wet is ſubject to lie in the winter. When the acorns are ſown, the drills ſhould be carefully filled in, ſo as to cover the acorns ſecurely; for, if any of them are expoſed, they will entice the birds and mice; and, if either of theſe once attack them, they will make great havock with them.

The reaſon of my directing the drills to be made, at this diſtance, is for the more convenient ſtirring of the ground between the rows, to keep the young plants clean from weeds: for, if this is not carefully done, it cannot be expected, that the young plants ſhould make much progreſs; and yet this is generally neglected by many who pretend to be great planters, who are often at a large expence to plant, but ſeldom regard them after: ſo that the young plants have the difficulty to encounter the weeds, which frequently are four or five times the height of the plants, and not only ſhade and draw them, but alſo exhauſt all the goodneſs of the ground, and conſequently ſtarve the plants. Therefore, whoever hope to have ſucceſs in their plantations, ſhould determine to be at the expence of keeping them clean for eight or ten years after ſowing, by which time the plants will have obtained ſtrength enough to keep down the weeds: the neglecting of this has occaſioned ſo many young plantations to miſcarry, as are frequently met with in divers parts of England.

About the end of March, or beginning of April, the young plants will appear above ground; but, before this, if the ground ſhould produce many young weeds, it will be good huſbandry to ſcuffle the ſurface over with Dutch hoes, in a dry time, either the latter end of March, or the beginning of April, to deſtroy the weeds, whereby the ground will be kept clean, until all the plants are come up ſo as to be plainly diſcerned; by which time it may be proper to hoe the ground over again; for, by doing it early, while the weeds are ſmall, a man will perform more of this work in one day than he can in three or four, when the weeds are grown large: beſides, there will be great hazard of cutting off or injuring the young plants, when they are hid by the weeds; and ſmall weeds, being cut, are ſoon dried up by the ſun; but large weeds often take freſh root, and grow again, eſpecially if rain ſhould fall ſoon after, and then the weeds will grow the faſter for being ſtirred; therefore, it is not only the beſt method, but alſo the cheapeſt huſbandry, to begin cleaning early in the ſpring, and to repeat it as often as the weeds are produced.

The firſt ſummer, while the plants are young, it will be the beſt way to perform theſe hoeings by hand; but afterwards it may be done with the hoe-plough; for, as the rows are four feet aſunder, there will be room enough for this plough to work; and, as this will ſtir and looſen the ground, it will be of great ſervice to the plants: but there will require a little hand labour where the plough is uſed, in order to deſtroy the weeds, which will come up in the rows between the plants; for theſe will be out of the reach of the plough, and, if they are not deſtroyed, they will ſoon overgrow and tear down the young plants.

After the plants have grown two years, it will be proper to draw out ſome of them, where they grow too cloſe; but, in the doing of this, great care ſhould be had not to injure the roots of thoſe left; for, as the plants which are drawn out are only fit for plantations deſigned for pleaſure, ſo theſe ſhould not be ſo much regarded in their being removed, as to ſacrifice any of thoſe which are deſigned to remain. In the thinning of theſe plantations, the plants may, at the firſt time, be left about one foot aſunder, which will give them room enough to grow two or three years longer: by which time it may be eaſy to judge which are likely to make the beſt trees. Therefore theſe may be then fixed on, as ſtandards, to remain: though it will be proper to have a greater number at this time marked than can be permitted to grow, becauſe ſome of them may not anſwer the expectation: and, as it will be improper to thin theſe trees too much at one time, ſo the leaving double the number intended at the ſecond thinning will not be amiſs. Therefore, if they are then left at about four feet diſtance in the rows, they will have room enough to grow three or four years longer: by which time, if the plants have made good progreſs, their roots will have ſpread over the ground; therefore it will be proper to take up every other tree in the rows. But, by this, I do not mean to be exact in the removing, but to make choice of the beſt plants to ſtand, whichever rows they may be in, or if they ſhould not be exactly at the diſtance here aſſigned: all that is deſigned here, is, to lay down general rules, which ſhould be as nearly complied with as the plants will permit: therefore every perſon ſhould be guided by the growth of the trees in the performance of this work.

When the plants have been reduced to the diſtance of about eight feet, they will not require any more thinning. But, in two or three years time, thoſe which are not to remain will be fit to cut down, to make ſtools for underwood; and thoſe which are to remain, will have made ſuch progreſs as to become a ſhelter to each other; for this is what ſhould be principally attended to, whenever the trees are thinned: therefore, in all ſuch places which are much expoſed to the wind, the trees ſhould be thinned with great caution, and by ſlow degrees: for, if the air is let too much at once into the plantation, it will give a ſudden check to the trees, and greatly retard their growth; but, in ſheltered ſituations, there need not be ſo great caution uſed as in thoſe places; the plants will not be in ſo much danger of ſuffering.

The diſtance which I ſhould chuſe to allow to thoſe trees which are deſigned to remain for timber, is, from twenty-five to above thirty feet, which will not be too near, where the trees thrive well; in which caſe their heads will ſpread, ſo as to meet in about thirty or thirty-five years: nor will this diſtance be too great, ſo as to impede the upright growth of the trees. This diſtance is intended that the trees ſhould enjoy the whole benefit of the ſoil. Therefore, after one crop of the underwood, or, at the moſt, two crops are cut, I would adviſe the ſtubbing up the ſtools, that the ground may be intirely clear, for the advantage of the growing timber, which is what ſhould be principally regarded: but, in general, moſt people have more regard for the immediate profit of the underwood than the future good of the timber, and, frequently, by ſo doing, ſpoil both: for, if the underwood is left after the trees have ſpread ſo far as that their heads meet, the underwood will not be of much worth; and yet, by their ſtools being left, they will draw away a great ſhare of nouriſhment from the timber trees, and retard them in their progreſs.

The ſoil in which Oak makes the greateſt progreſs, is a deep rich loam, in which the trees grow to the largeſt ſize; and the timber of thoſe trees which grow upon this land, is generally more pliable than that which grows on a ſhallower or drier ground; but the wood of the latter is much more compact and hard. Indeed there are few ſoils in England in which the Oak will not grow, provided there is proper care taken in their cultivation; though this tree will not thrive equally in all ſoils: but yet it might be cultivated to a national advantage upon many large waſtes in many parts of England, as alſo to the great profit of the eſtates where theſe tracts of land now lie uncultivated, and produce nothing to the owner. And, ſhould the preſent temper of deſtroying the timber of England continue in practice ſome years longer, in the ſame degree which it has for ſome years paſt, and as little care be taken to raiſe a ſupply, this country, which has been ſo long eſteemed for its naval ſtrength, may be obliged to ſeek for timber abroad, or be content with ſuch a naval ſtrength as the poor remains of ſome frugal eſtates may have left growing: for, as to the large foreſts, from whence the navy has been ſo long ſupplied, a few years will put an end to the timber there: and how can it be otherwiſe, when the perſons to whoſe care theſe are committed, reap an advantage from the deſtruction of the timber? *Miller's Gard. Dict.*

OAK-*leaf galls.*— Theſe are of ſeveral kinds; the remarkable ſpecies, called the muſhroom gall, is never found on any other vegetable ſubſtance but theſe leaves; and, beſides this, there are a great number of other kinds.

The double gall of theſe leaves is very ſingular, in that, as the generality of productions of this kind affect only one ſide of a leaf, or branch, and grow all one way, this kind of gall extends itſelf both ways, and is ſeen on each ſide of the leaf, in form of two protuberances, oppoſite the one to the other. Theſe are of differently irregular ſhapes, but their natural figure ſeems that of two cones, with broad baſes, and very obtuſe points, though, ſometimes, they are round, or very nearly ſo. Theſe make their firſt appearance on the leaf in April, and remain on till June, or longer. They are at firſt green, but afterwards yellowiſh, and are ſofter to the touch than many other of the productions of this kind: they are uſually about the ſize of a large pea, but ſometimes they grow to the bigneſs of a nut. When opened, they are found to be of that kind which are inhabited each by one inſect only, and each contains one cavity. The cavity in this is, however, larger than in any other gall of the ſize, or even in many others of three times the ſize; the ſides of it being very little thicker than the ſubſtance of the leaf.

On opening theſe leaf galls, which are properly the habitation only of one animal, it is common to find two, the ſtronger preying upon the body of the other, and ſucking its juices, as it does thoſe of the leaf; often, it is found wholly employed in devouring its unoffending neighbour at once: this is probably the caſe when its time of eating is nearly over; and, in fine, when we find the gall inhabited by only one inſect, or containing only one chryſalis, as it ought in its natural ſtate to do, we are never certain that this is the proper inhabitant, as it may be one of theſe deſtroyers who has eaten up the other, and ſupplied its place. *Reaumur's Hiſt. Inſ.*

OAK *puceron*, a name given by naturaliſts to a very remarkable ſpecies of animal of the puceron kind. The generality of ſuch animals live on the ſurface of the branches and leaves of trees and plants; but theſe bury themſelves in the clefts of the Oak, and ſome other trees, and, getting into the crevices, where the bark is a little ſeparated from the wood, they there live at eaſe, and feed to their fill, without being expoſed to their common enemies.

Black OATS.— Theſe are commonly ſown upon an etch crop, or on a lay, which they plow up in January, when the earth is moiſt, taking care to turn the turf well, and to lay it even and flat. Oats are to be ſown earlier in the northern parts of England than in the ſouthern.

Oats are ſown with a broad caſt, at twice, as they do barley, harrowing it well in; but this muſt always be harrowed the ſame way that the furrows lie of a lay, or but very little croſs, for fear of raiſing the turf, but upon an etch, as ſoon as the land is plowed on an edge, they ſow and harrow it in once; then ſow it a ſecond time, the full quantity, and harrow it five or ſix times over, obſerving to harrow once or twice acroſs, which breaks the clods, and covers the ſeed better than harrowing all one way. They commonly ſow them upon a broad ridge, which they give the land but one plowing for. The uſual time for ſowing black Oats, is, in the beginning of February, or a very few weeks later, ſometimes not till the beginning of March: they are a hardy grain, and will bear any thing of wet or cold. Four buſhels of ſeed is the quantity for an acre; but they grow beſt on a moiſt land, though they will not miſs any where. The farmer knows that his Oats are ripe when the ſtalks turn yellow, the grain feels hard, and the huſk begins to open, and ſhew the ſeed. After they are cut, they ſhould lie for the dew and the rain to plump them, and make them thraſh well; and, if weedy, to kill the weeds: but, if there happen much rain, they muſt be got in again as ſoon as dry, otherwiſe the Oats will ſoon fall out of the huſks, and great part of the crop be loſt.

Red OATS.—The red Oat is a kind of corn very common in Staffordſhire, and ſome of the northern counties; it is a ſort of naked Oat, and is very proper for making Oat-meal, becauſe the kernel thraſhes out of the hull, without carrying it to the mill, or drying of it. This Oat is cultivated in the ſame manner as barley.

White OATS.—This kind of Oats is commonly ſown upon an etch, after wheat, rye, or barley: they only give the land one plowing, and ſow them, and harrow them, as they do the black Oats, except the land is ſubject to weeds; in that caſe, it is good to plow up the wheat, or rye ſtubble, in November, which will make it rot the better, and be a kind of winter fallowing. Only, if you have a very dry burning ground, which black Oats will not delight in, in that caſe, they often ſow them upon a lay. March and April are the uſual time of ſowing white Oats, and the drier the weather is when they are ſown, the better; they grow beſt upon a dry, gravelly, or ſand, land, and they are the beſt of all to be ſowed upon a land very ſubject to weeds, becauſe, being ſowed late, they allow a very late plowing, and, growing very quick after this, they over-top the weeds ſooner than any other plant. The reaping of white Oats is the ſame with that of the black, and they generally yield about the ſame quantity, that is, twenty buſhels, or there abouts, from an acre. *Mortimer's Huſbandry.*

Wild OAT, in huſbandry, a kind of Oat, or Oat-graſs, which comes up of itſelf, without ſowing, and is much hated and dreaded by the farmers. This, in many counties of England, is the greateſt of all hindrances of the good crops of barley, and often of other grain. It is a rough and hairy Oat, and uſually black. In the wetter years, and after much froſt, this is found to be moſt troubleſome.

The beſt remedy the farmer has againſt this, is, to ſow the land moſt apt to produce it with beans, and, when they are come up to about three inches high, to turn in ſheep upon the ground, about twenty ſheep to an acre; theſe will eat up all the ſhoots of the wild Oat, and not touch the beans, ſo long as there is any of the Oat ſhoots left. *Moreton's Northampt.*

O'CCUPIERS *of walling*, a term in the ſalt works for the perſons who are ſworn officers, that allot, in particular places, what quantity of ſalt is to be made, that the markets may not be overſtocked, and ſee that all is carried fairly and equally between the lord and tenant. Theſe perſons always appoint how many houſes ſhall work at a time; and, when there is ſalt to be made, theſe appoint a cryer to proclaim it to all the workers, that they may put to their fires at the ſame time; and a like proclaiming of the time when they ſhall leave off; and thoſe who continue to work, after this prohibition, are to have their ſalt ſpoiled or deſtroyed. *Ray's Engliſh Words.*

O'CHRA *vitrioli*, in natural hiſtory, a name given to that yellow earth or ochre, which is one of the principles or conſtituent parts of all vitriol. This is ſeparated from it by ſolution in water, and falls to the bottom of the veſſel; and the yellow ſubſtance that tinges the ſides of fountains, and ſprings of chalybeate waters, in many places, is the ſame ſubſtance, and ſhews that they are only ſolutions of vitriol; which, as ſuch, muſt needs depoſit that earth, which, though retained imperceptibly in the vitriol, yet cannot be ſuſtained in water ſo well as while that ſalt was ſolid. A great proof of the earth called Ochra vitrioli being contained in a large quantity in that ſalt is, that it requires no earth beſides to be mixed with it in diſtillation: whereas common ſalt, nitre, and the other ſalts, require a great quantity of common earth to be added to them, to prevent their fuſion. Alum, and vitriol alone, require no ſuch additions, the firſt of theſe containing a very large quantity of an alcalious white earth, as the other does of an ochreous yellow one.

O'CHRE, in natural hiſtory, the name of a large genus of earths, uſed principally by the painters. The moſt common kinds are either yellow or red, though there are brown, blue, and green Ochres, and a number of diſtinct ſpecies of all theſe colours. Of the yellow Ochres, Dr. Hill, in his Hiſtory of Foſſils, deſcribes eleven ſpecies. Of the red, the ſame number. Of the brown, two. Of the blue and green, one ſpecies each; and, of the black, two.

The greater number of theſe are, or have been, at one time, or other, in uſe in painting, in different parts of the world. Some, however, there are, eſpecially of the yellow and red kinds, which that author has, himſelf, diſcovered in different parts of our own and other kingdoms, which are worthy the trials of the perſons concerned in that branch of trade, as they have already been proved, at his requeſt, in ſmall quantities, and found to anſwer very well. *Hill's Hiſt. of Foſſ.*

Dr. Liſter obſerves, that ochreous earths are ſeparated, in greater or leſs quantities, from all the medicinal ſprings in England, and it is to theſe and the nitrous and muriatic ſalts that they all owe their virtues. The Ochre they contain, is uſually of the nature of that which our painters, to diſtinguiſh it from the yellower kind, call brown Ochre. This is produced from the iron ores that are met with in the way of the current of theſe waters; and, among the reſt, the pyrites afford a great deal of them. All kinds of the pyrites, and all the lime-ſtones of England, when they are ſubject to be much moiſtened under ground, will, in time, ſhoot out their ſalts, and part with their earths. *Liſter. de Font. Med. Angl.*

The earth of the pyrites is Ochre, and the ſalt of the lime-ſtone is the calcarious nitre, an alkaline ſalt of the nature of the natrum of Egypt; and from theſe two ſubſtances, and a ſmall portion of common ſalt, which the waters take up in their paſſage through the earths that contain it, all the virtues of them are owing. The ſalt of the pyrites being green vitriol, it might be expected, that this ſhould be found in the waters impregnated by that ſubſtance; but Dr. Liſter obſerves, that, though there are many ſprings in England which are well known to receive their virtues from this foſſil, yet there is no ſuch thing as vitriol to be obtained from any of them; and this is not wonderful, ſince we know that the pyrites will not yield its vitriol, when newly taken out of the earth, but muſt be expoſed a conſiderable time firſt to the air; ſo that the Ochre is the only ſenſible thing that it receives from this ſubſtance, and, perhaps, with it ſome ſaline matter which is the baſis of vitriol, and would be vitriol in time, on a due expoſition to the air.

OCTA'NDRIA, in botany, a claſs of plants with hermaphrodite flowers, and eight ſtamina, or male parts, in each. See *Plate* XXXVI. *fig.* 4.

* The word is formed of the Greek ὀκτὼ, eight, and ἀνὴρ, male.

The plants of this claſs are the maple-tree, heath, &c.

OCU'LUS *beli*, in natural hiſtory, the name of one of the ſemi-pellucid gems of the genus of the hydrophanæ, and called by Dr. Hill hydrophanes albido-cinereus, flavo-variegatus, nucleo centrali nigerrimo, or the greyiſh white hydrophanes, variegated with yellow, and with a black, central, nucleus. See *Plate* XXXVI. *fig.* 5.

It is a very elegant and beautiful gem. Its baſis, or ground, is a whitiſh grey, variegated with yellow, and ſometimes with red, and a little black, but that more rarely, and is found in ſmall maſſes from half an inch to an inch in diameter; of a rounded figure, and thickeſt in the middle, tapering away gradually to the ſides. The outer part of the ſtone, or that toward the edges all round, is ever of a whitiſh grey, more or leſs variegated with yellow, &c. and its central nucleus is always of a deep and fine black, ſurrounded by a broad circle, of a pale yellow, and repreſenting very beautifully the pupil and iris of the eye; theſe are incloſed in the matter of the ſtone, and are often ſurrounded by other very fine concentric circles, of a pale flame colour; but more frequently there is only the black pupil, ſurrounded by the yellow iris, and that placed in the body of the ſtone which repreſents the white of the eye: the ſhape of the ſtone alſo favours its reſemblance of an eye, and the whole is very elegant. It is of the hardneſs of the agate, and takes a tolerable poliſh; when thrown into water, it has, in a great meaſure, the property of the oculus mundi, the whole ſtone becomes greatly more bright and lucid, and the grey part becomes of a plainly yellowiſh caſt.

There are many things improperly called Oculus Beli by our jewellers, but the genuine ſpecies is very rare. Nothing is more common than to find in the agates little circular veins of different colours round a central ſpot; theſe the lapidaries frequently cut out, with a proper quantity of the ſtone about them, and call them Oculus beli. They are not peculiar to the agate, but are common alſo in the cornelian, and ſtand ſometimes ſingle, ſometimes two or three together, and, according to the colours of the circles, repreſent the eyes of various animals.

OCULUS *mundi*, in natural hiſtory, the name of one of the ſemi-pellucid gems of the genus of the hydrophanæ. It is of one plain and uniform colour, which is a whitiſh grey, and has no veins, or other variegations. It is found in ſmall maſſes, of the ſhape of our common flints and pebbles. It has but a very obſcure degree of tranſparence, and is not capable of a fine poliſh. This ſtone, however, though of little beauty, has this ſingular property, that, when thrown into a baſon of water, in the ſpace of half a minute, it begins to change its appearance, and, very ſoon, inſtead of a pale grey, becomes of a very bright, and conſiderably pellucid, pale yellow, like that of amber, or the yellow cornelian; this it retains as long as it remains in the water, but as ſoon as taken out, and dried, it reſumes its grey colour, and becomes as opake as before. It is found, ſo far as is yet known, only in China; but the ſhores of ſome of our own rivers afford us ſtones coming up to its qualities in ſome degree, though not ſo beautifully tranſparent in water as the oriental. *Hill's Hiſtory of Foſſils.*

OLDENLA'NDIA, in botany, a genus of plants, whoſe characters are:

It hath a roſe-ſhaped flower, conſiſting of one leaf, which is divided into four parts, almoſt to the bottom, and reſts on the empalement; which empalement, afterwards, becomes an almoſt globular fruit, having two cells, which contain many ſmall ſeeds.

This plant was diſcovered in America by father Plumier, who gave this name to it, in honour to Henry Bernard Oldenland, a German, who was a diſciple of Doctor Herman, at Leyden, and was a very curious botaniſt. *Miller's Gard. Dict.*

OEDE'MA (*Dict.*)—The immediate cauſe of an Oedema is doubtleſs to be aſcribed to the too great ſeroſity or viſcidity of the blood, which ſtagnates in the minute veſicles of the fat or tunica celluloſa, and diſtends the ſkin. This diſorder of the blood proceeds either from a cold and phlegmatic habit, or old age; and it happens moſt frequently in cold weather, when the inclemency of the air increaſes the diſeaſe, by coagulating the ſtagnating blood. It is not, therefore, ſurpriſing, that the tumor prodigiouſly increaſes, though it may ſeem favourable and much diminiſhed in the morning; which is certainly to be aſcribed to the warmth of the bed. This diſorder may, alſo, proceed from an irregularity in diet, from an exceſs in eating and drinking, or from the uſe of cold, crude, and hard meats. Fevers, particularly thoſe of the intermitting kind, frequently conduce to this diſeaſe, eſpecially if the patient has indulged himſelf in intemperate drinking, while the heat and thirſt are upon him. Another cauſe may be a profuſe diſcharge of blood, either by wounds or vomiting, or from the noſe, lungs, hæmorrhoids, or uterus. It may, alſo, ariſe from obſtructions of the menſtrual diſcharge in women, or from a compreſſion of the vena cava by the fœtus or a ſcirrhus in the abdomen, by which means the reflux of the blood from the lower extremities is greatly impeded. It may likewiſe be aſcribed to a life too ſedentary, or too great an indulgence of lying in bed and ſleeping; or to a phthiſis, and difficulty of breathing; or to any other diſeaſe or fatigue of the body, which weakens the natural vigour of the heart in propelling the blood.

Hence it may eaſily appear, by what ſymptoms an Oedema may be known; but it is neceſſary to obſerve, that the harder the tumor is, and the longer it retains the print of the finger, the ſtagnating blood or humour is the thicker and more tenacious.

An Oedema upon the feet can ſcarcely be cured without removing the diſtemper whence it ſprings. In pregnant women, eſpecially thoſe of a robuſt conſtitution, œdematous tumors are attended with little or no danger; for they generally diſappear ſpontaneouſly after delivery, the vena cava being then freed from its compreſſion. In weakly women the danger is greater, if they continue after delivery; as they are frequently ſucceeded by a dropſy, an aſthma, and even a ſuffocation. The longer the duration is of theſe phlegmatic tumors, the greater is the danger, and the cure more uncertain; but, when they are recent, and attended with no other diſeaſe, the cure may be readily effected. Thoſe, alſo, which follow an intermitting fever are milder than thoſe which proceed from a too copious diſcharge of blood, or any other weakneſs. If they proceed from the obſtruction of a natural evacuation, they are beſt cured by removing that obſtruction. This diſorder of the feet is eaſily remedied in young perſons, but in the aged it is often incurable. When the feet are violently tumefied, and remedies, eſpecially external applications, have little effect upon them, the conſequence is, generally, a difficulty of breathing, ſuffocation, and, at laſt, death.

The cure of oedematous tumors is different, according to the different diſeaſes whence they proceed; and, therefore, it is, in the firſt place, neceſſary to inquire into their cauſe. When they appear to ariſe from an internal diſorder, recourſe muſt not only be had to outward application, but principally to internal medicines. With regard to external applications, 1. Uſe frequent frictions, with warm cloths every morning and evening, till the feet grow red, and glow with heat. 2. In order to defend them from the inclemency of the air, eſpecially in winter, let the legs be wrapped in furs, or other thick coverings; and, at night, let warm ſtones, or pieces of oak, be laid under the feet in bed, for attenuating the blood. 3. Let a proper bandage be applied, beginning with the foot, and proceeding gradually to the knee, which will greatly ſtrengthen the relaxed limb, prevent any collections or ſtagnations of the blood, and the ſkin from being diſtended by the inſpiſſated blood. 4. Digeſtive and ſtrengthening medicines ſhould likewiſe outwardly be applied; thus let the affected leg be placed over burning rectified ſpirit of wine, and ſo covered with cloths, as to receive and retain the vapour: by this method the ſtagnating blood will either be perſpired in ſweat, or returned to the circulation; and the relaxed leg will be wonderfully ſtrengthened. 5. A remedy, often uſed by the vulgar, is the greater celandine, bruiſed and applied with cloths to the feet. Others uſe in the ſame manner water-pepper, either alone, or mixed with celandine, and not without ſucceſs; for they are both powerful reſolvents. Others apply the ſcrapings of horſe-radiſh, or a warm cataplaſm of dittander, boiled in wine. An excellent diſcutient, for this purpoſe, is a cataplaſm of pigeons dung mixed with ſalt and vinegar, which muſt be often applied warm. Of equal efficacy are the following fomentations, a lixivium prepared from the aſhes of oak, and the water in which blackſmiths cool their hot iron, which may likewiſe be mixed with ſome ounces of ſpirit of wine and a ſmall quantity of alum, and applied warm with compreſſes; or the feet may be bathed twice a day in this liquor. Lime-water applied in the ſame manner, either alone, or mixed with ſpirit of wine and alum, is very beneficial in this caſe, as is the following mixture:

Take of ſpirits of wine, and wine vinegar, each a pound; crude alum, an ounce and an half; vitriol, a drachm: mix them together.

It is neceſſary to obſerve, that, after the uſe of the friction and fomentations, the leg muſt be carefully wrapped up with bandages, and warm ſtockings, or coverings; and the patient muſt not only be very moderate in eating and drinking, but muſt alſo uſe frequent motion and exerciſe, and never neglect proper internal medicines, without which all the external applications will nothing avail. Sometimes the mineral waters are very efficacious, in this diſorder, though they do not always ſucceed. Dr. Harris ſays, that he has frequently removed this diſeaſe, by exhibiting the aperitive crocus of iron, mixed with the Peruvian bark; others aſſert, that they have done it with the bark alone, though ſome condemn theſe remedies. It is therefore, proper, in this point, to take the advice of a phyſician. *Heiſter's Chirurg.*

OENA'NTHE, *water dropwort*, in botany, the name of a genus of umbelliferous plants, the characters of which are theſe: the flower is of the roſaceous kind, compoſed of ſeveral heart-ſhaped petals, which are irregular in ſize, and are diſpoſed in a circular form, on a cup, which afterwards becomes a fruit compoſed of two oblong gibboſe ſtriated ſeeds, which are flatted and ſmooth on their inner ſide, and end in a ſort of prickles, the middle one of which is longer and ſtronger than the others.

One of the ſpecies of this plant, diſtinguiſhed by its yellow juice, and by its growing near waters, is a very terrible poiſon. Many accounts have been given of people dying by it, but none which ſets its terrible effects in ſo juſt a light, as one which happened very lately to ſome French priſoners with us, and which is recorded in the Philoſophical Tranſactions. Eleven French priſoners had the liberty of walking in, and about, the town of Pembroke; three of them, being in the fields, a little before noon, found, and dug up, a large quantity of this fatal plant, with its roots, taking it to be wild celeri, in order to eat with their bread and butter, after dinner; and, when they had waſhed it, they all three taſted, or eat a ſmall quantity of it, in the fields.

As they were entering the town, one of them, without any previous notice of ſickneſs at the ſtomach, or diſorder in the head, was immediately ſeized with convulſions; the other two ran home, and ſent a ſurgeon to him, who attempted to relieve him by bleeding, but in vain, for he died in a very little time. The other two priſoners, wholly ignorant of the cauſe of their comrade's death, and of their own danger, gave the roots they had brought in to the other eight priſoners, who all eat more or leſs of them with their dinner. A little while after dinner, the two remaining perſons who had gathered the roots, were ſeized in the ſame manner as the firſt, and one of them died, but the other recovered, having been blooded, and a vomit having been, with great difficulty, forced down his throat, as his jaws were, in a manner, locked together. The other eight were all immediately bled and vomited, and all recovered.

It is obſervable, that none of theſe perſons had thoſe comatoſe ſymptoms which are well known to attend thoſe who have eaten the common cicuta, or hemloc.

This root is well known in all that part of England, under the name of the five-fingered root, and is in frequent uſe externally with the common people, for the felon, or worſt ſort of whitloe. The Frenchmen eat only the root, and none of the leaves or ſtalk.

It is extremely neceſſary that this dangerous plant ſhould be well known, as it grows very plentifully with us all about the banks of the Thames; and Mr. Watſon has cauſed a fine drawing, both of this, and another poiſonous plant, which it is often confounded with, the cicuta aquatica, or water hemlock of Wepfer, to be prefixed to that number of the Tranſactions where this account is given: and, this ſeems the more neceſſary, as the plant appears to have been miſtaken, in a manner, by all the world, not only the common people, but the more verſed in plants, having miſtaken it at times for ſeveral very different things. The ſame gentleman informs us, from various authors, that eight lads in Ireland had been poiſoned by it, miſtaking it for the root of the water parſnip; two men died by miſtaking it for the Macedonian parſley; and Wepfer, who wrote an expreſs treatiſe on the poiſonous nature of the water hemlock, has confounded this plant with it, ſaying, that Lobel had deſcribed the water hemlock, under the name of this Oenanthe, or dropwort; and the generally accurate Hoffman, when treating of the vegetable poiſons, makes no mention of the difference between theſe two plants.

OESO'PHAGUS (*Dict.*)—Conſtrictions, whether in the pharynx, or middle of the gullet, when neglected, not only become chronical, but, alſo, by hindering the deglutition of the aliments, readily bring on a conſumption, they, therefore, deſerve to be expeditiouſly treated by proper and ſuitable remedies: and theſe remedies are of two kinds; the one calculated for allaying the ſpaſms, and the other for removing the cauſes contributing to their production.

The former of theſe intentions is obtained by antiſpaſmodics and anodynes, joined with diſcutients, and uſed both internally and externally; but, the more violent the conſtriction is, the more expedient it is to begin the cure with external applications, becauſe internal medicines can hardly be ſwallowed without the greateſt difficulty. Some of theſe external medicines, by drawing the afflux of the humours to the inferior parts, and rendering the circulation of the blood equal, breaks the force of the ſpaſms: of this kind are clyſters, and bathing the feet. The clyſters ought to be prepared of emollient ſubſtances, with an addition of corroboratives, and repeated twice or thrice. The baths for the feet are to be pretty warm, and the legs are to be immerſed pretty deeply in them. The topics to be applied to the part affected are generally paregoric and nervous linaments, which may be prepared of aqua Anhaltina, ſpirit of ſal ammoniac, the eſſences of ſaffron and nutmeg, caſtor, and camphire, and the balſam of life; which, if mixed with the anodyne mineral liquor, is an excellent medicine, when the diſeaſe is at its greateſt height. It alſo proves beneficial, when a few drops of it are poured upon ſugar, kept in the mouth, and ſlowly ſwallowed. This intention is, alſo, anſwered by a few grains of theriaca, kept under the tongue, and ſpit out. An ox's bladder full of ſome warm emollient decoction, and applied to the part affected, is, alſo, of conſiderable ſervice in relaxing the ſpaſms.

Among internal antiſpaſmodics, the moſt valuable are the oils of ſweet almonds, and of olives, mixed with ſperma-ceti; antiſpaſmodic powders, prepared of cinnabar; the pulvis Marchionis, prepared amber, and the extracts of ſaffron and caſtor, or the nitrous powders, with one or two grains of camphire; as, alſo, the anodyne liquor, either alone, or mixed with eſſence of caſtor; the ſpiritus beſoardicus buſſii, or the ſuccinated ſpirit of hartſhorn, or the ſpiritus nitri dulcis, mixed with a few drops of the genuine oils of chamomile or mace: but, when the diſorder becomes chronical, we may uſe alternately, every other day, with theſe, antiſpaſmodic pills, which I generally prepare of the extracts of yarrow, chamomile, and St. John's-wort, mithridate, the extracts of ſaffron and caſtor, and the diſtilled oils of mace or mint.

When the ſpaſms are alleviated, the phyſician who intends to remove the material cauſes of the diſorder, ought carefully to inquire, which of them contribute to its production; for, if the diſorder is produced by acrid ſubſtances, poiſons, draſtic purgatives, or emetics, their force is, with all expedition, to be obtunded with mucilaginous and oleous ſubſtances, and with preparations of milk. This intention is anſwered by pretty pinguious broths, and draughts of warm water continued to a nauſea, that, thus, a gentle vomiting being excited, the poiſon may be again carried off.

Sometimes acids ſubdue the force of poiſon: and by theſe Hoechſtetterus, in a caſe of this nature, affirms that he cured a conſtriction of the gullet, produced by malmſey wine in which conſound had been boiled. And Foreſtus, in the part before-mentioned, informs us, that a conſtriction of the gullet, produced by aqua-fortis, was happily cured by mucilage of quinces.

When violent anger, excited at meals, brings on ſpaſms of the gullet, there generally happens, at the ſame time, an effuſion of bile into the ſtomach. In this caſe, beſides the mitigation of the commotions, the bile is to be corrected, leſt it acquire a corroſive and virulent quality; after which, it is to be eliminated from the body by gentle emetics or cholagogues. The bile is corrected by abſorbent or mucilaginous ſubſtances, ſuch as decoctions of oats or barley. The bile, on the other hand, is moſt commodiouſly eliminated by preparations of manna, joined with thoſe of rhubarb, or by vomit, when theſe preparations are heightened by one or two grains of emetic tartar or ipecacuanha. But we are to take care, that the emetic, or the purgative, be not exhibited immediately after the fit of anger.

But if the ſpaſms of the gullet are produced by a dyſcraſy of the whole maſs of humours, or, particularly, if acrid and viſcid ſordes of the primæ viæ lay a foundation for a long-continued diſorder of this kind; theſe ſordes are to be corrected by inciding, reſolvent, digeſtive, and abſorbent medicines; and evacuated by preparations of manna, rhubarb, and the pilulæ balſamicæ. But as the diſorder frequently proves obſtinate to this treatment, there will be no medicine found more efficacious, than medicinal waters; among which, the beſt are thoſe of Sedlitz drank for about four days, and then ſucceeded by thoſe of Egra. In hypochondriacal diſorders, alſo, where the excretions of blood, whether by the uterus or hæmorrhoidal veins, are ſuppreſſed, beſides veneſection and exerciſe, the Caroline baths, duly uſed, are, of all other things, the moſt beneficial.

Chronical ſpaſms of the Oeſophagus, which depend on a weakneſs of the nervous ſyſtem, and often recur, are rather to be cured by dietetic preparations and aliments, than by ſtrong medicines; for, in this caſe, we are, for ordinary drink, to chuſe decoctions prepared of viper's-graſs, ſuccory, and cinnamon. All malt liquors are to be abſtained from, and the patient is to uſe generous wine moderately. The aliments are to be light, and ſmall in quantity, but exerciſe is to be frequently uſed. For corroborating the ſtomach, balſamic elixirs, prepared without a ſpirituous menſtruum, are to be uſed. The redundance of the blood is to be diminiſhed by properly repeated veneſections; and the generation of ſordes in the primæ viæ is to be prevented by gentle laxatives. But, above all, the paſſions of the mind, which ſo greatly contribute to the production of ſpaſms, are to be careſully guarded againſt; then the Caroline ſprings, and afterwards the baths of Toeplitz, are to be uſed. *Frederic Hoffman.*

O'FFA *Helmontiana*, the name of a celebrated chemical medicine prepared in the following manner:

Take of the alcaline ſpirit of ſal ammoniac, ſo ſtrong as to leave much of its ſalts undiſſolved at the bottom; put it into a cold and dry cylindrical glaſs, with a narrow mouth, ſo as to fill about one half thereof; pour to it, gradually, a quantity of pure cold alcohol, ſo as to run gently down the ſides of the veſſel, till it be full; a white coagulation will be made upon the ſurface, where the lighter alcohol reſts upon the alcaline ſpirit. If the glaſs be now inverted, there will inſtantly appear a white opake coagulation, where the alcohol and alcaline ſpirit mix; and, when they are both well ſhaken together, the whole becomes a white opake conſiſtent maſs, concreted together like ſtone, ſo that not a drop will fall out of the glaſs, while inverted. Stop the veſſel cloſe, and ſet it by: thus the mixture will ſoon reſolve into a fluid, that floats at top, and a denſe, ſaline concretion, that falls to the bottom; ſo that, in a year's time, the ſalt will almoſt become ſolid below, with a liquor floating above it. If the whole maſs, thus produced, be diſtilled with a ſoft fire, an alcaline, balſamic, oily, ſolid ſalt will ſublime. The colder the ſeaſon, and the place, in which the experiment is made, the better it will ſucceed.

Remarks.— This is one of the moſt difficult experiments in chemiſtry, as it requires both the liquors to be perfect, and the obſervance of ſeveral circumſtances, any one of which, being wanting, will cauſe it to miſcarry; but, if they all be obſerved, it will ſucceed. Here, then, we ſee, that pure volatile alcaline ſalt will cloſely attract to itſelf the moſt ſubtile oil that is known, that is, alcohol; whence the ſoap ſo produced is the moſt ſubtile and penetrating of all ſoaps, conſiſting of an exceeding ſubtile and volatile alcali and oil, wonderfully united together in an inſtant. If this medicine be diluted with canary, and taken upon an empty ſtomach, it paſſes, perhaps, through all the veſſels of the body, reſolves concretions, open obſtructions, excites the vital powers, and thus ſucceſsfully cures many dangerous diſtempers, proceeding from an obſtructing matter, capable of being reſolved by it. But its virtue vaniſhes too ſoon, as being ſo extremely volatile, and therefore becomes unequal to the more ſtubborn diſtempers. It is highly commended in the jaundice, unattended with an acute inflammation; it does not diſſolve the ſtone, or prevent the concretion or increaſe thereof; it ſeems to agree with ſalt of tartar rendered volatile; it diſſolves in a gentle heat, like ice, and returns to a ſolid form in the cold. If pure alcohol be thus mixed with one third of dry volatile alcali, it makes a much more ſolid ſoap, as being without water, which is always double the quantity in the ſtrongeſt alcaline ſpirit, with reſpect to the pure ſalt. Helmont needed not have apprehended the ſudden generation of the ſtone from hence; for this matter is not the ſtone, but diſſolves with heat, dilutes with water, and proves totally and ſpontaneouſly volatile, ſo that it has nothing in common, nor like to the ſtone. Helmont was not the inventor of the experiment, though the production be called Offa helmontiana; but Raymond Lully, long before him, and the Engliſh author upon the Alcahiſt, ſuppoſed to be George Starkey, inconſiderately pretends, that this ſoap, brought to a liquor by repeated diſtillation, will become the alcaheſt of Helmont. *Boerhaave's Chemiſtry.*

OIL (*Dict.*)— In the diſtillation of Oils there is a conſiderable difference, with reſpect to the quantities yielded; for ſome vegetables afford a large portion, others a moderate quantity, and others but very little. Among all the productions of the earth, I know no ſimple, which, beſides its turpentine, yields a larger quantity of Oil, than ſavine; ſince one pound of it, in the alembic, yields almoſt three ounces of Oil. Hence, from two pounds of it, if the diſtillation is duly managed, at leaſt five ounces of Oil may be obtained. Savine is ſucceeded by nutmegs, a pound of which yields one ounce of oil, which, by diſtillation from an alembic, is raiſed, whilſt, at the ſame time, there is left at the bottom a large quantity of Oil which does not paſs over the helm, but is generally expreſſed from the nutmegs. Hence, it is obvious, that theſe nuts abound with a large quantity of mild and fixed Oil, which is obtained by expreſſion, as, alſo, with a ſubtile Oil procured by diſtillation.

Among flowers, thoſe of the ſpike abound moſt in Oil. Hence, four pounds of thoſe flowers, when dried, afford full three ounces of Oil; but a ſmaller quantity is obtained from the flowers of lavender, ſince four pounds of them yield only one ounce of Oil; which, however, is of a far more grateful and fragrant ſmell, than that of ſpike. Four pounds of the leaves of mint, gently dried, yield an ounce and an half of Oil; whilſt, from an equal quantity of the leaves of marjoram, hardly one ounce can be obtained. From fifty pounds of calamus aromaticus I only obtained two ounces of Oil: there is but a very ſmall quantity of Oil in mother of thyme, neither is there a large quantity of Oil afforded by rue: and, though this plant is of an acrid taſte, and penetrating ſmell, yet ten pounds of it yield only half an ounce, or two or three drachms, of Oil. Hence it is certain, that, in this ſimple, the ſaline is ſuperior to the oleous principle.

The flowers of the common and Roman chamomile yield but a very ſmall quantity of Oil; for which reaſon it muſt, when genuine, be ſold at a pretty dear rate; for the Oils of that kind, as commonly ſold, are almoſt all adulterated: the calamus aromaticus, alſo, though of a pretty acrid taſte, affords but little Oil.

The four carminative ſeeds, which are, aniſe, dill, caraway, and fennel, yield a large quantity of Oil; but thoſe commonly ſold are generally adulterated.

We are, alſo, to advert to the ſpecific and diſtinguiſhing taſte and ſmell of ſome Oils. Thus, the Oils of thyme and ſavory are ſo acrid as to corrode the noſtrils. The Oil of wormwood, which is highly bitter, fills the head with a fœtid vapour; and it is to be obſerved, that this oil, when diſtilled from green wormwood, is green; but of a browniſh-yellow colour, when obtained from old wormwood. The Oil of chervil, in taſte, reſembles that of fennel; Oil of tanſey, in ſmell, greatly reſembles the herb from which it is obtained.

It is in a particular manner to be obſerved, that plants, and their various parts, whether ſeeds, flowers, or leaves, do not in all ſeaſons, and at every age, yield equal quantities of Oil; for, if mint, thyme, rue, balm, or marjoram, when recent, tender, and young, are ſubjected to diſtillation, they yield little or no Oil; but they muſt be arrived at a juſt degree of vigour and perfection; when, for inſtance, they begin to riſe into ſmall heads or flowers: and, as, in old animals, the ſtrength is much impaired and diminiſhed, ſo, alſo, old plants loſe a great deal of their virtues, and yield but little Oil. Hence, it is obvious, that the perfect ſtrength and maturity of plants conſiſts in the abundance of the Oil they contain, and which is either large or ſmall, according to the period of their age.

It is, alſo, to be obſerved, that the ſeaſons and conſtitutions of the year contribute greatly to the obtaining a larger or ſmaller quantity of Oil; for I have often obſerved, that, if the ſpring or ſummer are too moiſt or rainy, herbs, and their flowers, ſpike, for inſtance, or lavender, do not yield ſo large a quantity of Oil, as when the ſeaſons are moderately warm and dry: hence we learn, that a due temperature, purity, and drineſs of the air and weather, contribute greatly to bring vegetables to their due maturity and perfection.

Adulteration of diſtilled **Oils.**—It is a ſhameful, though true, aſſertion, that the true and genuine Oils of plants are rarely to be had in the ſhops; ſince, in order to increaſe their weight and price, it is cuſtomary, in diſtilling them, to mix with them ſome pinguious or other ſubſtances of little value. As for the dear aromatic Oils exported from Holland, it is certain from experience, that they are almoſt all adulterated, as is obvious in the Oils of cinnamon, cloves, nutmegs, and mace. But in theſe the fraud is eaſily detected, by pouring alcohol of wine, or highly rectified ſpirit of wine, upon them; for this liquor immediately reſolves and imbibes the particles of the purer Oil, leaving, in the bottom, a large quantity of expreſſed Oil, either of almonds, or ben-nuts. But the more ſkilful of the chemiſts have an artful method of concealing this piece of fraud; for they adulterate pure Oil of cinnamon, or cloves, by adding an equal quantity of highly rectified ſpirit of wine, which may be ſo prepared, that one part of the ſpirit may abſorb one part of the Oil, whilſt the taſte remains, and the ſmell continues ſufficiently ſtrong and penetrating, ſo that the impoſition is with difficultly diſcovered. But this piece of fraud is, alſo, quickly diſcovered, if theſe Oils are poured into common water; for, then, the water immediately becomes milky, which effect is not produced by pure oil, when put into cold water, and left to itſelf. There is ſtill another method of adulterating Oils of plants, by mixing Oil of turpentine, or pine, with the herbs to be diſtilled; and this piece of fraud is moſt commonly committed in preparing cephalic Oils from plants, which abound with a balſamic reſin, ſuch as mint, origanum, ſage, roſemary, marjoram, ſavory, thyme, mother of thyme, the flowers of ſpike and lavender, and baſilicon; from which, by the addition of theſe Oils, they obtain a large quantity of Oil, though of a bad kind, and inconſiderable virtues; but ſuch Oils, if the plants are recent, retain their ſpecific and diſtinguiſhing taſte and ſmell. But this piece of fraud is eaſily detected; for, if ſuch Oils are kept ſome time, they loſe their grateful ſmell, and the diſagreeable odour of the turpentine remains. But there is ſtill a more expeditious method of diſcovering this fraud; for, if a piece of cloth macerated in ſuch Oil is put into a warm place, or expoſed to an hot furnace, the ſubtile fragrance is immediately exhaled, and the ſmell of turpentine diſcovers itſelf.

Beſides, the cephalic Oils, adulterated with turpentine, or Oil of pines, are more limpid than the genuine Oils, which are of a deeper colour. There is, alſo, another method of detecting this fraud; which is, when the letters of the ſignature put upon the mouth of the glaſs become ſucceſſively pale, which does not happen with the genuine Oils; for the effluvia of the turpentine contain a ſubtile acid, which, in proceſs of time, deſtroys the colour of the ink. Some, in the diſtillation of theſe Oils, inſtead of turpentine, add ſeeds which contain a large quantity of pinguious juice, ſuch as thoſe of poppies; and, by this means, that thick Oil, which at other times is generally expreſſed, with difficulty paſſes the helm, is raiſed and diſtilled in conjunction with a portion of ſubtile and ethereal Oil: and this is the uſual method of adulterating the Oil of rue; for, though rue is of a ſtrong taſte, and penetrating ſmell, yet there is hardly any plant, which affords a ſmaller quantity of oil: but pure Oil of rue is eaſily diſtinguiſhed from that which is adulterated, ſince, when genuine, it does not become thick and coagulated, when expoſed to the cold; but is inſpiſſated, when it is adulterated with any expreſſed oil.

The Oils of chamomile and the tops of yarrow, when pure and recent, are of a beautiful bluiſh colour, which is afterwards changed into that of brown; for, if this bluiſh colour of the Oil of chamomile flowers remain above a year, it is a ſure ſign that it is adulterated; for it is cuſtomary to mix with it Oil of turpentine, which is of a deep bluiſh colour, on account of the tincture it receives from the copper of the veſſel.

It is of great importance to the phyſician to be able to diſtinguiſh genuine from adulterated Oils; for theſe balſamic and cephalic Oils not only loſe much of their efficacy, but, alſo, acquire a foreign quality, by being adulterated; and it is ſufficiently known, that all terebinthinaceous ſubſtances violently exagitate the maſs of blood and humours, and create an intenſe heat in the body.

Oil *of ſtone.* In the manufacture of the Chineſe porcelain, they uſe a liquid matter of a white colour, which they call by this name, on which the great myſtery of finiſhing their work depends; yet, this has been leſs enquired into by the imitators of that ware in Europe, than many other articles of leſs conſequence. The ſtone of which this Oil is made, is of the ſame degree of hardneſs with that which the petunſe is prepared of. They procure it from quarries, and chuſe ſuch as is of a good white colour, and has many dark green ſpots in it.

Theſe ſpots are of the colour of the leaves of cypreſs. Sometimes a ſtone is choſen which has a brown ground, variegated with ſpots and blotches of a reddiſh colour. They firſt carefully waſh this ſtone; then, laying it in a clean place, they break it to pieces with iron inſtruments, and afterwards grind theſe to a perfectly fine and impalpable powder, by rubbing them in large mortars, with peſtles of ſtone faced with iron, and turned either by the labourers, or by water. When the whole is thus reduced to a fine powder, they throw it into a veſſel of water, and ſtirring it briſkly about, they let the coarſer part ſubſide to the bottom, and there ſwims a fine thick matter like cream, for two or three inches depth, on the ſurface. This they carefully ſcum off, and putting it into another veſſel of clear water, they let it throw down any coarſe matter it may yet contain; and, finally, taking off the thick ſurface again, they mix this with ſome freſh water in another veſſel, and leave it to ſubſide; then pouring off the clear water, they take out the remainder at the bottom of the veſſel, which is perfectly fine, and reſembles a thick cream. To every hundred pounds of this they add one pound of a ſubſtance of the nature of which we are not yet perfectly informed. It is ſaid to be a mineral reſembling alum. They calcine this firſt, and then beat it to a fine powder, and this, being added to the cream, or oil, as it is called, ſerves to keep it always in the ſame liquid ſtate. This ſubſtance, when finiſhed in this manner, has very little title to the name of an Oil; it is rather a varniſh, and is always uſed in mixture with another varniſh, which is called at this time fern Oil, and uſed to be called lime Oil; it is prepared in the ſame manner with the other after burning. See Fern *Oil.*

Animal **Oil**, *oleum animale*, in medicine, the name of an eſſential Oil diſtilled by a retort from blood, and recommended as a powerful remedy in epilepſies, the gout, and other obſtinate diſeaſes.

Oil *of camphor*, a name given by the chemiſts to a ſolution of camphor in ſpirit of nitre. It is uſed to exfoliate carious bones, and on other the like occaſions. It is obſervable, that camphor, which is ſoluble in this acid, in the proportion of one half its quantity, is not at all ſoluble in ſpirit of vitriol, ſpirit of alum, or diſtilled vinegar; and that it is the only known vegetable reſin that is ſoluble in this menſtruum.

Connecting OIL, in chemiſtry, a term uſed by Boerhaave, and his followers, to expreſs a certain Oil, found in all vegetable ſubſtances, but wholly differing from, and independent of, their eſſential Oil. This is not poſſeſſed of any of their virtues, or qualities, but ſeems the ſame in all plants, and is the means of their conſiſtence and ſolidity, giving tenacity to their earth, which, without it, falls to duſt, and the plant exiſts no more.

Red OIL, in the porcelain manufacture, a name given to a peculiar colour uſed on the China ware, or to thoſe pieces of the ware which are coloured with it. It is a very elegant ornament, and would be worth our attempting to imitate in England, on our better ſorts of wares. They who have viſited the Chineſe works affirm that it is done in the following manner: they mix the red colour called tam-tan-hum, or the copperas red, with Oil of ſtone (ſee OIL *of ſtone*) and with another Oil, as they expreſs it, of the ſame kind, made of a whitiſh ſort of pebble, or agate, found on the ſhores of their rivers, and the place of which might probably be ſupplied, with us, by common cryſtal. The powder is to be thoroughly mixed with theſe liquors, and the veſſel dipped carefully into the mixture, or ſome parts of it only covered with it in figures: after this, it is to be ſet by to dry, and, when thoroughly dried, it is to be baked in the common way. The general method is that of covering the veſſel all over, both inſide and out, with this red; and it comes out of the moſt bright and brilliant colour imaginable, but it will not ring when ſtruck upon, as our common China ware does. We ſeldom ſee this in any degree of perfection, but it is very elegant when fine. *Obſerv. ſur les Cout. de l'Aſie.*

OIL *of earth*, *oleum terræ*.— This Oil is of two kinds, the red and the black; the red is brought from the Eaſt-Indies, and is of a pellucid red colour, and has a ſtrong ſmell like petroleum, but more grateful, as Schroder ſays; but, as to what we know of this Oil, it is either the ſame with petroleum, or elſe is unknown in our ſhops.

The Indian Oil of earth, deſcribed by Neuhovius, is ſcarcely ever brought over to us, but ingroſſed by the Aſian potentates; but, whether it be a ſpecies of petroleum, or naphtha, I cannot certainly determine. What is brought to us from the Indies, and ſold for Oil of earth, is prepared of expreſſed Oil of the cocoa nut, mixed with medicated earths, as I have been informed by a perſon very ſkilful in theſe matters, and therefore wholly belongs to the claſs of vegetables. *Boerhaave.*

Theſe kinds of bitumen differ only in degree, as ſome think, ſo as that the more ſpirituous and ſubtile part of it is the naphtha, the next to it the petroleum, and the groſſer and more feculent part aſphaltum; juſt as we ſee in amber, from which, by diſtillation, there is obtained, firſt, a ſpirituous and limpid Oil, repreſenting naphtha; ſoon after, comes off a yellow and thicker Oil, reſembling petroleum; and, laſt of all, a black feculent matter, which might paſs for aſphaltum. *Dale.*

OLIGAE'DRA, in natural hiſtory, the name of a genus of cryſtals.

The word is derived from the Greek ολιγὸς, a few, and ἕδρα, a plane, or ſide; and expreſſes a cryſtal which is compoſed of only a few planes.

The bodies of this claſs are cryſtals of the imperfect kind, being compoſed of columns affixed irregularly to ſome ſolid body at one end, and, at the other, terminated by a pyramid, being both pentangular; the whole conſiſts only of ten planes, not, as the common kind, of twelve.

OLIVE-*tree*, *olea*, in botany, a genus of trees, whoſe characters are:

The leaves are, for the moſt part, oblong and ever green: the flower conſiſts of one leaf; the lower part of which is hollowed, but the upper part is divided into four ſegments: the ovary, which is fixed to the center of the flower-cup, becomes an oval, ſoft, pulpy fruit, abounding with a fat liquor, incloſing an hard rough ſtone.

There are five ſorts of Olive-trees preſerved in the gardens of the curious, where they are planted either in pots or caſes, and removed into the green-houſe in the winters, with oranges, myrtles, &c. but they are moſt of them hardy enough to endure the cold of our ordinary winters in the open air, provided they are planted upon a dry ſoil, and in a warm ſituation, though in ſevere winters they are demoliſhed, or at leaſt loſe their heads, or are killed to the ſurface; but this is what they are liable to in the ſouth parts of France, in which country theſe trees abound; and yet in very ſharp winters are moſt of them deſtroyed. There was a parcel of theſe trees growing in the gardens of Camden-houſe, near Kenſington, a few years ſince, which were ſeven or eight feet high; and in ſome good ſeaſons produced very good fruit: theſe were planted againſt a ſouth wall, but were permitted to grow up rude without pruning, or faſtening to the wall, (which they do by no means care for; and, during the time they were below the top of the wall, they throve very well; but, after their heads were gotten above the wall, the north winds uſually greatly prejudiced them every winter; and I believe the hard winter, 1739, intirely demoliſhed them.

Theſe plants may be propagated by laying down of their tender branches (in the manner practiſed for other trees) which ſhould remain undiſturbed two years; in which time they will have taken root, and may be taken off from the old plants, and tranſplanted either into pots filled with freſh light earth, or into the open ground in a warm ſituation. The beſt ſeaſon for tranſplanting them is the beginning of April, when you ſhould, if poſſible, take the opportunity of a moiſt ſeaſon; and thoſe which are planted in pots, ſhould be placed in a ſhady part of the green-houſe until they have taken root; but thoſe planted in the ground ſhould have mulch laid about their roots, to prevent the earth from drying too faſt, and be now-and then refreſhed with water; but you muſt by no means let them have too much moiſture, which will rot the tender fibres of their roots, and deſtroy the trees.

When the plants have taken freſh root, thoſe in the pots may be expoſed to the open air, with other hardy exotics; with which they ſhould be houſed in winter, and treated as myrtles, and other leſs tender trees and ſhrubs; but thoſe in the open air will require no farther care until the winter following, when you ſhould mulch the ground about their roots, to prevent the froſt from penetrating deep into them: and, if the froſt ſhould prove very ſevere, you ſhould cover them with mats, which will defend them from being injured thereby; but you muſt be cautious not to let the mats continue over them after the froſt is paſt, leſt, by keeping them too cloſe, their leaves and tender branches ſhould prove mouldy for want of free air, which will be of as bad conſequence to the trees, as if they had been expoſed to the froſt, and many times worſe; for it ſeldom happens, if they have taken much of this mould, or have been long covered, ſo that it has entered the bark, that they are ever recoverable again; whereas it often happens, that the froſt only deſtroys the tender ſhoots; but the body and larger branches, remaining unhurt, put out again the ſucceeding ſpring.

Theſe trees are generally brought over from Italy every ſpring, by the perſons who bring over the oranges, jaſmines, &c. from whom they may be procured pretty reaſonably; which is a better method than to raiſe them from layers in this country, that being too tedious; and thoſe which are thus brought over, have many times very large ſtems, to which ſize young plants in this country would not arrive in ten or twelve years growth. When you firſt procure theſe ſtems, you ſhould (after having ſoaked their roots twenty-four hours in water and cleaned them from the filth they have contracted in their paſſage) plant them in pots filled with freſh light ſandy earth, and plunge them into a moderate hot-bed; obſerving to ſkreen them from the violence of the ſun in the heat of the day, and alſo to refreſh them with water, as you ſhall find the earth in the pots dry. In this ſituation they will begin to ſhoot in a month or ſix weeks after, when you ſhould let them have air in proportion to the warmth of the ſeaſon; and, after they have made pretty good ſhoots, you ſhould inure them to the open air by degrees; into which they ſhould be removed, placing them in a ſituation where they may be defended from ſtrong winds: in this place they ſhould remain till October following, when they muſt be removed into the green-houſe, as was before directed. Having thus managed theſe plants until they have acquired ſtrong roots, and made tolerable good heads, you may draw them out of the pots, preſerving the earth to their roots, and plant them in the open air in a warm ſituation, where you muſt manage them as was before directed for the young ones, and theſe will in two or three years produce fruit, provided they do well. The Lucca and box-leaved Olives are the hardieſt, for which reaſon they ſhould be preferred to plant in the open air; but the firſt ſort will grow to be the largeſt trees.

OMBRO'METER *, a machine to meaſure the quantity of rain that falls.

* The word is formed from the Greek ὄμβρος, rain, and μετρεώ, to meaſure.

The following Ombrometer is that lately uſed by Mr Pickering.

This machine conſiſts of a tin funnel, whoſe ſurface is an inch ſquare, a flat board and glaſs tube let into the middle of it in a groove (the length and breadth of both board and tube being ad libitum) and an index. My board is about three feet long, to anſwer the height of the rails that go round the top of my houſe, to one of which it is hung, clear of any obſtacle to prevent the free fall of the rain, with four little ſtaples that ſlide over as many tenter-hooks. The bore of my tube is about half an inch; which, at a medium, is the beſt ſize, a larger bore obliging you to make your graduations the more contracted, and, conſequently, the leſs plain and accurate; and a leſſer not permitting you to return the water out of the tube when full, without the adheſion of a great deal to its ſides; which, when you have placed the tube in its perpendicular ſituation, ſubſides, and ſometimes fills up $\frac{2}{32}$ of an inch; which, without care, muſt neceſſarily make great miſtakes in the diary. The method of graduating the board is this:

I had a veſſel of tin made, whoſe contents were exactly a cubic inch. With this veſſel, filled with water exactly to its ſurface, I frequently gauged the tube, till, by repeated trials, I had found the height to which a cubic inch of water would riſe in it. The ſpace anſwering to this on the board I had graduated into 32 equal parts, and took the ſame method with the reſt of the tube, till in the ſame manner I had graduated four ſuch inches. Now, the ſurface of the funnel being, as has been ſaid, exactly a ſquare inch, no rain can by it get into the tube, but ſuch as falls within the ſquare of one inch, which, as the ſhower is more or leſs, has its exact quantity ſhewn upon the board, on which a moveable index is placed. This machine has highly anſwered my expectation; its form being very ſimple, and eaſily repaired, if any accident happen; for, ſhould the tube be broke, it is only rubbing out the graduation, which is marked with a black-lead pencil upon the board painted white, and gauging you a new tube with the cubic meaſure for a new graduation, and your machine is again complete. In winter it will be neceſſary to let no depth of water remain in the tube; for, ſhould there be a froſt, the expanſion of the ice will certainly break it. The machine will equally ſerve for diſſolved hail and ſnow. Its figure may be ſeen *Plate* XXXI. *fig.* 17. where *a a* is the board, *b b* the tube, *d* the funnel fixed, *e* a larger view of the funnel. *Philoſophical Tranſ.* N°. 473.

OME'NTUM, (*Dict.*) — As the Omentum is a ſoft and pinguious part in conſequence of its laxity, highly ſubject to receive the humours conveyed to it from other parts, it is for this reaſon, as well as the Omentum and pancreas, ſubject to various diſorders; which, however, are not deſcribed by authors, becauſe they can hardly, if at all, be diſcovered in live perſons; and are only to be inveſtigated by laying open their carcaſes, as is obvious from the caſes recorded by various authors. Thus Veſalius informs us, that in a certain carcaſe, when laid open, he ſaw the Omentum ſo preternaturally tumid, that it weighed about five pounds; whereas, in its natural ſtate, it hardly exceeds half a pound. Rouſſet, in his treatiſe de Partu Cæſareo, tells us that, upon laying open a carcaſe at Paris, there was a very conſiderable abſceſs found on the Omentum. Riolanus, alſo, in his Anthropographia, informs us, that, upon laying the body of a young gentleman of nineteen years of age, he ſaw the Omentum full of a large number of glands, from which a conſiderable quantity of ſordid humours had been conveyed to it; whilſt, at the ſame time, the meſentery and pancreas were, by means of the abſceſs, putrified; and the ſpleen ſo greatly diminiſhed, as to be almoſt entirely conſumed. And I myſelf, upon laying open the body of a canon of Montpelier, ſaw the Omentum ſcirrhous, poſſeſſing the whole epigaſtric region, and about four fingers breadth in thickneſs. The colour of this tumor of the Omentum reſembled that of the ſpleen: ſo that it is highly probable that the melancholic humour was tranſlated from the ſpleen, and accumulated in that part, ſince the patient was of an highly melancholic conſtitution, and ſince, through the ſplenic ramifications, there is a ſufficiently potent conveyance from the ſpleen to the Omentum. According to Hippocrates, in a dropſy, the waters are alſo frequently conveyed from the ſpleen to the Omentum, from which they gradually drop into the cavity of the abdomen.

But as the tumors of the Omentum are not, by all the efforts of art, to be diſtinguiſhed from thoſe of the meſentery, ſo their diagnoſtic or diſtinguiſhing ſigns cannot poſſibly be aſcertained. It is true, indeed, tumors of the Omentum are more eaſily perceived by the firſt touch, becauſe that part lies immediately under the peritonæum, whereas the meſentery is ſituated deeper: but the larger tumors of the meſentery riſe to the peritonæum, and even the epigaſtric muſcles are, ſometimes, ſo united with it, that, a ſuppuration happening, theſe tumors diſcharge their ſordid contents through the navel, or ſome other part.

But this difficulty of aſcertaining the diagnoſtic ſigns of theſe diſorders, by no means produces any perplexity in the method of cure; ſince, in all tumors of the ſame ſpecies poſſeſſing the inferior parts of the abdomen, the ſame meaſures are to be taken; which, however, are not ſo ſucceſsful in the Omentum which is not furniſhed with ſo commodious outlets for the matter of theſe tumors, as the other parts are. *River. Prax. Med. Lib.* 13. *Cap.* 5.

O'NION, *cepa*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the liliaceous kind, and compoſed of ſix leaves; in the center of it there ſtand a piſtil which finally becomes a roundiſh fruit, divided into three cells, and containing roundiſh ſeeds. To this it is to be added, that the flowers are placed in ſpherical heads, and that the leaves, as well as ſtalks, are tubular.

Onions are much eaten, and it would be well if they were yet more ſo; they attenuate tough humors, cleanſe the ſtomach, and excite appetite, aud in ſome degree promote the menſes. but they are apt to breed flatulences, and, if eaten too largely, to affect the head and diſturb the ſleep afterwards. An Onion, boiled to perfect ſoftneſs, is recommended by many as a cataplaſm for ripening peſtilential buboes. A freſh cut Onion, rubbed on the part till it becomes red and itch, is ſaid to be a cure for baldneſs. A mixture of equal parts of juice of Onions and ſpirit of wine is eſteemed a cure for deafneſs, a few drops being put at times into the ears: an Onion cut in two, and macerated an hour in the ſame ſpirit, is a good application for the head ach. A cataplaſm of roaſted Onions and butter is an excellent application for the piles.

The three ſorts of Onions, propagated for the ſake of their roots for winter uſe, are the Straſburgh Onion, the red Spaniſh Onion, and the white. Theſe are to be propagated by ſowing their ſeeds in the latter end of February, in a dry and ſomewhat ſandy ſoil, yet rich; in about a month's time the plants will appear, and, in a fortnight after that, they will be forward enough for hoeing, which muſt be done with a very ſmall hoe, cutting up all the weeds, and leaving the Onions two inches aſunder; this ſhould be done in a dry ſeaſon, and the ground will then be clear from weeds for a month: at the end of this time, they muſt be hoed again, and cut to three inches a-part; and, a month after this, to four inches; at which diſtance they will thrive well, and grow very large. Toward the latter end of July, the Onions will have arrived at their full growth, which is known by their leaves hanging down and ſhrivelling; and they muſt at this time be pulled up, and ſpread on a dry place, and turned every day, to prevent their ſtriking freſh roots; in a fortnight's time they will be dry enough to houſe, and ſhould be wiped clean, and ſpread thin in an upper loft, or garret.

The differences between theſe ſpecies are not eſſential, they often degenerating into one another; and even the large Portugal Onion, after a few years, with us, will loſe itſelf ſo far, that no one would imagine it came of that race. *Miller's Gard. Dict.*

Welſh **ONIONS**, a ſort of Onions propagated by gardeners, for the uſe of the table in ſpring; they never make any bulb, and are therefore only to be eaten green with ſallads. They are propagated by ſowing their ſeeds towards the end of July in beds of a dry but rich ſoil; and, in three weeks after ſowing, they will appear above ground: they muſt be kept carefully cleared from weeds. About October all their leaves die away which has occaſioned ſome to think all the plantation loſt, and to dig up the ground for ſome other uſe; but, if they are ſuffered to ſtand, they will ſhoot up again very ſtrong in January, and from that time will grow very vigorouſly, and reſiſt all weathers, and will be fit to draw for young Onions in March, and are extremely green and fine, and more valued at market at that ſeaſon than any other kind; but they are much ſtronger than any other Onions, and have very much of the taſte of garlic.

Counterfeit **OPAL**. To imitate this gem in natural cryſtal, uſe the following method: take yellow orpiment and white arſenic, of each two ounces; crude antimony and ſal armoniac, of each one ounce; powder all theſe, and mix them well together; put this powder into a large crucible, and lay upon it ſmall fragments of cryſtal, and, upon theſe, other larger pieces of cryſtal; fill up the crucible with theſe, and lute on to it another crucible inverted, with a hole at the bottom as big as a ſmall pea; when the lute is dry, ſet the veſſel in a quantity of charcoal in a large chimney, covering them up with coals, to the middle of the upper crucible; ſo long as the materials fume out at the hole, keep up a ſtrong fire; when that is over, let the fire go out of itſelf, and then unlute the crucible; the greateſt part of the cryſtal will be found tinged to the colours of various gems; not only the Opal, which will be very fair and beautiful, but the topaz and ruby colour will be ſeen in others. *Neri's Art of Glaſs.*

OOST, in huſbandry, a name given by the people who manure hops, for the kiln in which they dry them after they are picked from the ſtalks. This is a ſquare room, built up of brick, or ſtone, ten feet wide, more or leſs, and having a door on one ſide. In the midſt of this room is a fire-place, about thirteen inches wide, and as much high; and in length, reaching from the mouth ſo nearly to the back part of the kiln, that a man has juſt room to go round it. This fire place is called a herſe, and the fire is let out into the room by ſeveral holes in the ſides, in the ſame manner as in malt kilns. Five feet above this, is laid the floor on which the hops are to be laid to dry, and this muſt have a wall round it, at four feet high, to keep the hops from falling out. At one ſide of the upper bed muſt be made a window by which to puſh out the hops, as they are dried, into a room prepared for them. The beds muſt be made of laths an inch ſquare, placed at a quarter of an inch diſtance from one another, and ſupported by beams underneath. The hops are to be poured on this bed with a baſket, till the whole is covered half a yard thick with them; when this is done, lay them even with a rake, and let a fire be made in the fire-place below. Some recommend a wood fire, but experience ſhews nothing does ſo well as charcoal; let the fire be kept at the mouth of the furnace, for the air will be carried all the way through; and thus let the hops lie, never ſtirring them till they are thoroughly dry; when they rattle under the rake, and the inner ſtalks are brittle, they are ſufficiently dried, and are to be puſhed out, and a freſh parcel laid in the Ooſt in their place. Some people dry their hops in a common malt kiln, ſpreading them on a hair cloth about ſix inches thick, and now and then turning them till they are all thoroughly dried, then laying them in a heap, till they are to be put in the bags. But both theſe ways are liable to ſome inconveniencies; the Ooſt generally overdries the under ones, by the time that the upper ones are dry enough; and the hair cloth, and the turning in the other way, breaks and ſhatters them, and ſpills many of the ſeeds.

OPHIO'GLOSSUM, *adder's-tongue*, in botany, a genus of plants, no part of the fructification of which is viſible, except the fruit. This is an oblong, double, or diſtichous capſule, divided by a great number of tranſverſe articulations into many cells, each of which, when mature, opens tranſverſly, and is found to contain a great number of ſmall ſeeds of a ſubovate figure.

This is a ſpring plant, and is only to be found in April and May. It is not uncommon in wet meadows, and is eaſily diſtinguiſhed among the other ſpring plants by its ſpike, or tongue.

It is eſteemed one of the beſt vulnerary herbs this nation produces, but it is more in uſe among the common people than in the ſhops. They give its juice internally, and uſe the herb bruiſed, or an ointment prepared from it, with lard, or May butter, externally at the ſame time. *Dale's Pharmac.*

OPODE'LDOC, the name of a plaiſter ſaid to be invented by Mindererus, though often mentioned by Paracelſus.

There is a famous popular ointment, which goes by the name of Opodeldoc, which is ſaid to be thus prepared:

Take of the roots of marſh-mallows, comfrey, gentian, long-birthwort, angelica, of each one ounce and an half; of the herbs ſanicle, ladies-mantle, mouſe-ear, colts foot, ſnakewood, periwinkle, bruiſed, of each half an handful; of the leaves of roſemary, ſage, and lavender, of each one handful and a half; flower of roſemary, ſage, and lavender, of each one handful; juniper-berries, two ounces; cumin-ſeeds, one ounce; camphire and caſtor powdered, of each one ounce and an half; and, of ſpirit of wine, three pints and an half.

Put all into a glaſs cucurbit, well luted, and digeſt for ten hours in balneo mariæ, that is, in hot water, but not to boil; then ſtrain; and, the ſpirit of wine being ſufficiently impregnated with the ingredients, then add one pound of Caſtile ſoap ſhaved thin; then digeſt in the ſame manner as before, until the ſoap is diſſolved.

In order to ſucceed in this proceſs, the juncture muſt be carefully luted with two or three doubles of paper, daubed over with the whites of eggs, and tied about with thread; when the luting is dried, digeſt in balneo mariæ for ten hours, the matraſs being fixed in the middle of the kettle, with a layer of ſtraw under it to keep it at the diſtance of two inches from the bottom: for the firſt eight hours, the water muſt be kept ſo hot about it, that you can ſcarce hold your finger therein; and the two other hours augment the heat, but not ſo much as to make the water boil.

After the ſpirit of wine is thoroughly impregnated with the tincture of the roots, herbs, leaves, and powders, cool it gently; and, ſtraining it through a linen cloth, pour it again into the matraſs, with one pound of Caſtile ſoap ſhaved thin; then fit the veſſel of rencounter to the matraſs; lute the junctures, and digeſt as before, till the ſoap is intirely mixed with the ſpirit, and the whole reduced to an ointment; then take out the matraſs, and ſuffer it to cool.

If the doſes and other directions are duly obſerved, it will be the conſiſtence of an unguent, neither too thick nor thin; and the method of trying, if it is truly prepared, is, to rub ſome of it on your hand, which it will immediately penetrate, leaving only a greeniſh ſtain; though the natural colour of the ointment is brown.

It is excellent in ſtrains, relaxations of the ſinews in horſes, as well as human kind; alſo, in all pains, numbneſs, weakneſs in the joints, or other parts, being well rubbed in.

A ſuccedaneum for this celebrated preparation may be made in the following manner:

Take, of Caſtile ſoap, two ounces; of rectified ſpirits of wine, four ounces; and, of camphire, two drachms: and mix them well together.

OPO'SSUM, or POSSUM, in zoology, the name of a very remarkable American animal, deſcribed by various authors, under the names of maritacaca, carigoi, ropoza, caregueya, jupatuma, tlaquatzin, ſarigoi, and ſemivulpa.

It is a creature of the ſize of a large cat. Its head is ſhaped like that of the fox; its noſe ſharp, and its upper jaw longer than the under; its teeth are ſmall, but like thoſe of the fox, and it has two long ones, like the hare, in the front of the mouth; its eyes are very beautiful, ſmall, round, and vivid; its ears long, ſmooth, and very ſoft, placed erect, like thoſe of the fox, and very thin and tranſparent. It has black whiſkers, like thoſe of a cat; and has other hairs of the ſame kind on the other parts of its face, and over its eyes; its tail is round, and a foot long, and is of great ſervice to it, as it uſes it to twiſt round the branches of trees, hanging itſelf to them by that means. The tail is hairy near the inſertion, but naked all the other parts, and is partly black, and partly of a browniſh white; the hinder feet are conſiderably longer than the fore ones, and each has five toes; they much reſemble hands, and the nails are white and crooked, the hinder one being, as in the monkey kind, the longeſt. Its head, and legs, as Hernandez obſerves, ſomething reſemble thoſe of the badger. It has a broad, longitudinal black ſtreak, on the face; it is of a blackiſh colour, with a mixture of a brown and grey on the back and ſides, and has ſomewhat of a faint yellowiſh caſt on the belly. *Ray's Syn. Quad.*

ORA'NGE-*dew*, a ſort of dew which falls, in the ſpring time, from the leaves of Orange and lemon trees, and is extremely fine and ſubtile. Mr. De la Hire, obſerving this, placed ſome pieces of glaſs under the leaves to receive it, and, having thus procured ſome large drops of it, was deſirous of finding out what it was. He ſoon found that it was not a merely aqueous fluid, becauſe it did not evaporate in the air; and that it was not a reſin, becauſe it readily and perfectly mixed with water: it was natural here to ſuppoſe it a liquid gum, but neither did this, on examination, prove to be the caſe; for, being laid on paper, it did not dry as the other liquid gums do. Its anſwering to none of theſe characters, and its being of the conſiſtence of honey, and of a ſweet ſugar-like-taſte, gave a ſuſpicion of its being a kind of manna; and whatever in the other trials had proved it not a reſin, a gum, &c. all equally tends to prove that it is this ſubſtance.

O'RCHARD (*Dict.*) — In planting of an Orchard, great care ſhould be had to the nature of the ſoil, that ſuch trees as are adapted to grow upon the ground intended to be planted, may be choſen, otherwiſe there can be little hopes of their ſucceeding; and it is for want of rightly obſerving this method, that we ſee, in many countries, Orchards planted which never arrive to any tolerable degree of perfection, their trees ſtarving; and their bodies either covered with moſs, or the bark cracks and divides; both which are evident ſigns of the weakneſs of the trees; whereas, if inſtead of apples the Orchard had been planted with pears, cherries, or any other ſort of fruit to which the ſoil had been adapted, the trees might have grown very well, and produced great quantities of fruit.

As to the poſition of the Orchard (if you are at full liberty to chuſe) a riſing ground, open to the ſouth-eaſt, is to be preferred; but I would by no means adviſe to plant upon the ſide of an hill, where the declivity is very great; for in ſuch places the great rains commonly waſh down the better part of the ground, whereby the trees would be deprived of proper nouriſhment: but, where the riſe is gentle, it is of great advantage to the trees, by admitting the ſun and air between them, better than it can upon an intire level; which is an exceeding benefit to the fruit, by diſſipating fogs, and drying up the damps, which, when detained amongſt the trees, mix with the air, and render it rancid: if it be defended from the weſt, north, and eaſt-winds, it will alſo render this ſituation ſtill more advantageous; for it is chiefly from theſe quarters that fruit-trees receive the greateſt injury: therefore, if the place be not naturally defended from theſe by riſing hills (which is always to be preferred) then you ſhould plant large growing timber-trees at ſome diſtance from the Orchard, to anſwer this purpoſe.

You ſhould alſo have a great regard to the diſtance of planting the trees, which is what few people have rightly conſidered; for, if you plant them too cloſe, they will be liable to blights; and the air, being hereby pent in amongſt them, will cauſe the fruit to be ill-taſted, having a great quantity of damp vapours from the perſpiration of the trees, and the exhalations from the earth mixed with it, which will be imbibed by the fruit, and render their juices crude and unwholeſome.

Wherefore, I cannot but recommend the method which has been lately practiſed by ſome particular gentlemen with very great ſucceſs; and that is, to plant the trees fourſcore feet aſunder, but not in regular rows. The ground between the trees they plough and ſow with wheat and other crops, in the ſame manner as if it were clear from trees; and they obſerve their crops to be full as good as thoſe quite expoſed, except juſt under each tree, when they are grown large, and afford a great ſhade; and, by thus ploughing and tilling the ground, the trees are rendered more vigorous and healthy, ſcarcely ever having any moſs, or other marks of poverty, and will abide much longer, and produce better fruit.

If the ground in which you intend to plant an Orchard has been paſture for ſome years, then you ſhould plough in the green ſward the ſpring before you plant the trees: and, if you will permit it to lie a ſummer fallow, it will greatly mend it, provided you ſtir it two or three times, to rot the ſward of graſs, and prevent weeds growing thereon.

At Michaelmas you ſhould plough it pretty deep, in order to make it looſe for the roots of the trees, which ſhould be planted thereon in October, provided the ſoil be dry; but, if it be moiſt, the beginning of March will be a better ſeaſon.

When you have finiſhed planting the trees, you ſhould provide ſome ſtakes to ſupport them, otherwiſe the wind will blow them out of the ground; which will do them much injury, eſpecially if they have been planted ſome time; for, the ground at that ſeaſon being warm, and for the moſt part moiſt, the trees will very ſoon puſh out a great number of young fibres; which, if broken off by their being diſplaced, will greatly retard the growth of them.

In the ſpring following, if the ſeaſon ſhould prove dry, you ſhould cut a quantity of green turf, which muſt be laid upon the ſurface of the ground about their roots, turning the graſs downward; which will prevent the ſun and wind from drying the ground, whereby a great expence of watering will be ſaved: and, after the firſt year, they will be out of danger, provided they have taken well.

Whenever you plough the ground between theſe trees, you muſt be careful not to go too deep among their roots, leſt you ſhould cut them off, which would greatly damage the trees: but, if you do it cautiouſly, the ſtirring of the ſurface of the ground will be of great benefit to them; though you ſhould obſerve never to ſow too near the trees, nor ſuffer any great rooting weeds to grow about them, which would exhauſt the goodneſs of the ſoil, and ſtarve them.

If, after the turf which was laid round the trees be rooted, you dig it in gently about the roots, it will greatly encourage them.

There are ſome perſons who plant many ſorts of fruit together in the ſame Orchard, mixing the trees alternately: but this is a method which ſhould always be avoided; for hereby there will be a very great difference in the growth of the trees, which will not only render them unſightly, but alſo the fruit upon the lower trees ill taſted, by the tall ones overſhadowing them; ſo that, if you are determined to plant ſeveral ſorts of fruit on the ſame ſpot, you ſhould obſerve to place the largeſt-growing trees backwards, and ſo proceed to thoſe of leſs growth, continuing the ſame method quite through the whole plantation; whereby it will appear at a diſtance in a regular ſlope, and the ſun and air will more equally paſs through the whole Orchard, that every tree may have an equal benefit therefrom.

The ſoil of your Orchard ſhould alſo be mended once in two or three years with dung, or other manure, which will alſo be abſolutely neceſſary for the crops ſown between: ſo that where perſons are not inclinable to help their Orchard, where the expence of manure is pretty great; yet, as there is a crop expected from the ground beſides the fruit, they will the more readily be at the charge upon that account.

In making choice of trees for an Orchard, you ſhould always obſerve to procure them from a ſoil nearly a kin to that where they are to be planted, or rather poorer; for, if you have them from a very rich ſoil, and that wherein you plant them is but indifferent, they will not thrive well, eſpecially for four or five years after planting; ſo that it is a very wrong practice to make the nurſery, where young trees are raiſed, very rich, when the trees are deſigned for a middling or poor ſoil. The trees ſhould alſo be young and thriving; for, whatever ſome perſons may adviſe to the contrary, yet it has always been obſerved, that though large trees may grow, and produce fruit, after being removed, they never make ſo good trees, nor are ſo long-lived, as thoſe which are planted while young.

Theſe trees, after they are planted out, will require no other pruning but only to cut out dead branches, or ſuch as croſs each other, ſo as to render their heads confuſed and unſightly: the too often pruning them, or ſhortening their branches, is very injurious; eſpecially to cherries and ſtone fruit, which will gum prodigiouſly, and decay in ſuch places where they are cut: and the apples and pears, which are not of ſo nice a nature, will produce a greater quantity of lateral branches, which will fill the heads of the trees with weak ſhoots, whenever their branches are thus ſhortened; and many times the fruit is hereby cut off, which, on many ſorts of fruit-trees, is firſt produced at the extremity of their ſhoot.

It may, perhaps, ſeem ſtrange to ſome perſons, that I ſhould recommend the allowing ſo much diſtance to the trees in an Orchard, becauſe a ſmall piece of ground will admit of very few trees, when planted in this method: but they will pleaſe to obſerve, that, when the trees are grown up, they will produce a great deal more fruit, than twice the number, when planted cloſe, and will be vaſtly better taſted; the trees, when placed at a large diſtance, being never ſo much in danger of blighting as in cloſe plantations, as hath been obſerved in Herefordſhire, the great county for Orchards, where they find, that when Orchards are ſo planted or ſituated, that the air is pent up amongſt the trees, the vapours which ariſe from the damp of the ground, and the perſpiration of the trees, collect the heat of the ſun, and reflect it in ſteams ſo as to cauſe what they call a fire blaſt, which is the moſt hurtful to their fruit; and this is moſt frequent where the Orchards are open to the ſouth ſun.

But, as Orchards ſhould never be planted, unleſs where large quantities of fruit are deſired, ſo it will be the ſame thing to allow twice or three times the quantity of ground; ſince there may be a crop of grain of any ſort upon the ſame place (as was before ſaid) ſo that there is no loſs of ground: and, for a family only, it is hardly worth while to plant an Orchard; ſince a kitchen garden well planted with eſpaliers will afford more fruit than can be eaten while good, eſpecially if the kitchen garden be proportioned to the largeneſs of the family: and, if cyder be required, there may be a large avenue of apple-trees extended croſs a neighbouring field, which will render it pleaſant, and produce a great quantity of fruit; or there may be ſome ſingle rows of trees planted to ſurround the fields, &c. which will fully anſwer the ſame purpoſe, and be leſs liable to the fire blaſts before-mentioned. *Miller's Gard. Dict.*

O'RCHIS, *male ſatyrion.* — This Orchis which is the common ſatyrion of the ſhops, has two oval roots, about as big as a ſmall olive, of a whitiſh colour, full of a ſlimy juice, which, contrary to moſt other plants, have ſeveral white fibres growing above them; from theſe ſprings a ſingle ſucculent ſtalk, encompaſſed with three ſhining, ſmooth, lily-like leaves ſpotted with black. The flowers grow on the tops of the ſtalks in a long ſpike or thyrſus, of a purple colour; each flower being of an irregular form, conſiſting of ſix leaves, ſomewhat reſembling a galea, with a ſmall piece of ear ſtanding erect on each ſide, and a broad labella ſpotted with deeper ſpots. The ſeeds are very ſmall, included in a triangular long capſula; it grows in moiſt meadows, and flowers in April. The roots only are uſed.

They are accounted a provocative and a ſtimulus to venery, and a ſtrengthener of the genital parts, and help conception, and for theſe purpoſes are a chief ingredient in the electuarium diaſatyrium: outwardly applied in form of a cataplaſm, they diſſolve hard tumors and ſwellings.

The only officinal preparation is the aforeſaid electuary. *Miller's Bot. Off.*

ORCHIS, *female ſatyrion.*— This is a lower and ſomewhat leſſer plant than the former, having no ſpots on the leaves; the ſpike of the flowers is leſs, and not ſo beautiful, of a purpliſh colour, having the labella ſtriped with green ſtripes; it grows in the like places with the former, and flowers ſomewhat later. The root is much alike, and is ſuppoſed to have the ſame virtues.

Though theſe plants are uſed in the ſhops for the ſatyrion, yet they are not the ſatyrion of Dioſcorides and the ancients; that being, as is plainly proved by Parkinſon, and other ſkilful botaniſts, our common tulip, which much better anſwers the deſcription of Dioſcorides, than any of the Orchiſes. *Miller's Bot. Off.*

ORE (*Dict.*)—The Ores of the richer metals, as gold and ſilver, uſually contain a conſiderable portion of ſulphur, and Alonſo Barba tells us, that the moſt expert mineraliſts in Peru always eſteem abundance of ſulphur a ſign of a rich Ore in the neighbourhood. Among the richeſt Ores of the mountain of Potoſi, there are ſuch quantities of native brimſtone, that the cavities in the mines are often filled with a blue flame, on only bringing a lighted candle into them ſo as to touch their ſides. It has been wondered at, that, where there is abundance of ſulphur in theſe mines, there ſhould be no vitriol found, that being only a metal diſſolved by means of ſulphur; but this objection ceaſes, when we conſider the denſe and compact nature of theſe two metals, which renders them not ſoluble by means of ſulphur, as the others are. Wherever there is ſtore of ſulphur, or of pyrites, or other ſtones which contain ſulphur in the mines of copper and iron, great ſtore of vitriols are always found there alſo, being formed by the corroſion of the Ores of thoſe metals by ſulphur, which renders them ſoluble in water, from which they again concrete in form of ſalts. Chemiſtry is able to imitate the operations of nature on this occaſion ſeveral ways; for copper, or iron, being formed in thin plates, and either rubbed over with the acid ſpirit of ſulphur, or calcined with powder of common ſulphur, become ſoluble in water, and afford cryſtals of true vitriol, wholly analogous to the natural ones; and either blue or green, as iron, or copper, are the metals employed; but, theſe proceſſes not being able to produce cryſtals of ſalt, or vitriol, from either ſilver, or gold, it is not wonderful that nature is not able to form them by the ſame means.

The general formation of ſulphur from the Ores of metals, yet lying in the bowels of the earth, is, probably, after this manner: an acid, ſaline, ſulphureous, ſteam, or vapour, ſuch as common ſulphur is eaſily reduced to, by heat not greater than that within the bowels of the earth, inſinuating itſelf either through the pores of ſtones, or through their cracks, which are always frequent about the veins of metals, penetrates into the bed of Ore, ſuppoſe of copper. The vapour is continually ſupplied with freſh quantities from below; and, as it blends itſelf with the metal, corrodes it, as the fume of brimſtone will do the ſame copper in plates. The metal, thus corroded, being ſoluble in water, as we find by experience, it is neceſſary, that the Ore muſt, under the ſame management, be ſo too; and, in this caſe, the water, which is continually pervading all the ſtrata of the earth, waſhes off the diſſolved metal; and wherever it happens to be ſtayed in ſmall quantities afterwards, whether within the vein of the metal, or at a diſtance from it, it cryſtalliſes the ſalt it contains, and common blue vitriol is produced, if the metal in the vein be iron. The ſame proceſs is obſerved, and the event is the ſame in all reſpects, when copper is the metal corroded, except that the vitriol, inſtead of blue, is green; this plainly accounts for the obſervation of the workers in copper mines, that vitriol and brimſtone are uſually found together, the one being a natural conſequence of the other. Sulphur is, indeed, often found where there is no vitriol, but vitriol is very ſeldom found without ſulphur; it being not a diſtinct principle, but a genuine production of ſulphur. *Philoſ. Tranſ.* N°. 104.

OREOSELI'NUM, *mountain parſley,* in botany, a genus of plants, whoſe characters are:

It hath a roſe-ſhaped unbellated flower, conſiſting of ſeveral leaves, placed in a circular order, reſting on the empalement, which afterwards becomes as fruit, compoſed of two ſeeds, which are oval, plain, large-ſtreaked and bordered, and ſometimes caſt off their cover: to theſe notes muſt be added, that the leaves are like parſley.

Theſe plants are propagated by ſeeds, which ſhould be ſown in autumn, as ſoon as poſſible after they are ripe; for, if they are kept out of the ground until the ſpring, they ſeldom grow. Theſe ſeeds ſhould be ſown in the places where they are deſigned to remain; for, as they have downright carroty roots, they do not well bear tranſplanting. They require a moiſt light ſoil, and they are beſt in a ſhady ſituation. The beſt method is, to ſow the ſeeds in drills, which ſhould be made about eighteen inches aſunder, and about half an inch deep. In the ſpring, when the plants come up, they ſhould be carefully cleared of weeds; and, where the plants are too cloſe, they ſhould be thinned, leaving them about ſix or ſeven inches a-part, that they may have room to grow.

In two years after the ſeeds are ſown, the plants (if they have thriven well) will be ſtrong enough to produce their flower ſtems, when they will begin to ſhoot up in April, and their flowers appear in June; but their ſeeds will not ripen till the end of Auguſt or September. Theſe plants will continue ſome years, and will annually produce ſeeds; ſo that the ground ſhould be carefully dug between the plants every ſpring, and conſtantly kept clean from weeds, which is all the culture the plants will require.

O'RGANO, in the Italian muſic, is uſed to ſignify the thorough baſs. It is uſually ſcored with figures over the notes, for the harpſichord, baſs viol, and lute.

O'RGUES (*Dict.*)—Orgues are preferable to herſes, or portculliſes, becauſe theſe may be either broke by a petard, or they may be ſtopped in their falling down; but a petard is uſeleſs againſt an Orgue; for, if it break one or two of the pieces, they immediately fall down again, and fill up the vacancy; or, if they ſtop one or two of the pieces from falling, it is no hindrance to the reſt; for, being all ſeparate, they have no dependence upon one another.

ORI'GANUM, *wild marjoram*, in botany, a genus of plants, whoſe characters are:

The calyx is long, ſimple, tubulous, and cloſely ſeated among foliaceous ſcales; in this is ſituated the flower, having an erect, roundiſh, bifid galea, or creſt, and a beard divided into three parts, the middle one being hollow like a ſpoon. The flowers are collected into ſquamous ſpikes, reſembling thoſe of the muſcari; and ſometimes form a ſort of umbella, ſhooting forth one on each ſide of the ſcales.

This Origanum, or wild marjoram, is a foot, or more, high, having many hairy, brown, brittle ſtalks, with two broad, round-pointed leaves, bigger than marjoram, ſet at a joint on very ſhort foot-ſtalks, and of a browniſh green colour. The flowers grow on the tops of the ſtalks, being ſmall, labiated, and galeated, of a purple colour, among long heads, compoſed of a great number of green ſcales. The roots are woody and fibrous. It grows in hedges and thickets, and flowers in July. The tops and leaves are uſed.

This Origanum, though not ſo ſtrong as the Origanum Creticum, yet is very good for obſtructions of the breaſt, liver, and womb; helps the jaundice, ſhortneſs of breath, and ſtoppage of the menſes; comforts the head and nerves. The diſtilled oil helps the tooth-ach, being put upon lint into the aching tooth. *Miller's Bot. Off.*

The wild marjoram is acrid, aromatic, deterſive, and gives a very faint tincture of red to the blue paper; which makes us conjecture, that this plant is filled with a volatile, aromatic, and oily ſalt, not entirely deſtitute of acid; whereas, in the artificial volatile ſalt, the acid of the ſal ammoniac has been detained by the ſalt of tartar.

Beſides, the wild marjoram contains abundance of terreſtrial parts. It is diuretic, diaphoretic, good to make one ſpit, and provoke the terms. A tea of it may be uſed in an aſthma, violent coughs, indigeſtion, and pleuriſy. It is uſed in the waſhings for the feet, and ſemicuhiums for the vapours, green-ſickneſs, and palſy. Take wild marjoram dried at the fire, and wrap it warm in a linen cloth, and cover the head well with it, for a rheum and rheumatiſm in the neck, commonly called torticolis. *Martyn's Tournefort.*

ORNI'THIÆ, a name given by the ancients to certain winds, which uſually blow in ſpring, at the time when the birds of paſſage came over to them. Pliny ſays, that theſe winds blew from the weſt, and that, by ſome, the Eteſian winds are called by this name. Others ſuppoſe that they blew from the north, or north-weſt.

ORNITHOGA'LUM, *ſtar of Bethlehem*, in botany, a genus of plants, whoſe characters are:

It hath a lily flower, compoſed of ſix petals, or leaves, ranged circularly, whoſe center is poſſeſſed by the pointal, which afwards turns to a roundiſh fruit, which is divided into three cells, and filled with roundiſh ſeeds; to which muſt be added, it hath a bulbous or tuberoſe root, in which it differs from ſpiderwort.

Theſe plants are propagated by off-ſets, which their roots do commonly produce in great plenty. The beſt time to tranſplant their roots is in July or Auguſt, when their leaves are decayed; for, if they are removed late in autumn, their fibres will be ſhot out, when they will be very apt to ſuffer, if diſturbed. They ſhould have a light ſandy ſoil; but it muſt not be overdunged, which would cauſe their roots to decay. They may be intermixed with other bulbous-rooted flowers in the borders of the pleaſure garden, where they will afford an agreeable variety, and continue in flower a long time. Their roots need not be tranſplanted oftener than every other year; for, if they are taken up every year, they will not increaſe ſo faſt; but, when they are ſuffered to remain too long unremoved, they will have ſo many off-ſets about them as to weaken their blowing roots. Theſe may alſo be propagated from ſeeds, which ſhould be ſown and managed as moſt other bulbous-rooted flowers, and will produce their flowers in three or four years after ſowing.

ORNITHOPO'DIUM, *bird's foot*, in botany, a genus of plants, whoſe characters are theſe:

The leaves are conjugated, in a ſeries of ſeveral pairs, and end in an odd one. The pod is hooked, jointed, and undulated, or waved; containing, within each joint, one round ſeed. The pods grow many together from the ſame origin, in ſuch a manner as to reſemble a bird's-foot.

It grows in ſandy and gravelly places, and flowers in ſummer. The herb, which is of uſe in medicine, breaks and expels the ſtone in the kidnies and bladder, and is effectual in an hernia.

OROBA'NCHE, *broom-rape*, in botany, a genus of plants, whoſe characters are:

The root is ſquamous, and the plant appears as if it were bare of leaves. The end of the pedicle opens into a multifid calyx; the flower is monopetalous, anomalous, bilabiated (the galea being hollow, and the beard trifid) collected into ſpikes, and embracing an oblong ovary, furniſhed with a long tube unicapſular, bivalve, opening, when ripe, into two valves, and pregnant with very minute ſeeds.

It frequently grows to the roots of geniſta, or broom; whence it is called rapum-geniſtæ, or broom-rape; it is found alſo among corn. The herb preſerved, or its ſyrup, is of an excellent uſe in ſplenetic and hypochondriac diſorders; and an ointment prepared of the ſame, with ſwine's fat, is good for hard and ſcirrhous tumors.

It grows in gravelly and dry places, and flowers in June and July. The herb, dried and pulveriſed, is a preſent remedy for the cholic. *Dale.*

OROBOI'DES, a name given by Hippocrates, and other authors, to a furfuraceous ſediment in the urine of perſons who have the jaundice: it is uſually of a reddiſh brown colour; and is not peculiar to that diſeaſe, but is found in ſome others

ORO'BUS, *bitter vetch*, in botany, a genus of plants, whoſe characters are:

It hath a papilionaceous flower, conſiſting of the ſtandard, the keil, and the wings; out of whoſe empalement riſes the pointal wrapped up in the membrane, which afterwards becomes a round pod, full of oval-ſhaped ſeeds: to which muſt be added, that two leaves joined together grow upon a rib that ends in a point.

OROBUS, is alſo the name of a plant, called wood peaſe.

This plant grows in woody and bluſhy places, flowers in April, and the ſeed is ripe in May. The tubera of the root taſte much like liquorice, and the Scottiſh Highlanders make uſe of them in the ſame diſorders of the thorax, for which liquorice is proper. They call the plant karemyle, and uſe thoſe tubera, tempered with water, to enable them to ſupport hunger and thirſt the longer; for which purpoſe, they find them very ſerviceable, for, by their ſweet and viſcid ſubſtance, they correct and mitigate, and even fix and reſtrain, the acid and acrimonious humour in the ſtomach; and, by that means, are a remedy againſt hunger and thirſt. If this plant, therefore, be not the ſame with what Theophraſtus calls ſythica (which is generally thought by the learned to be liquorice) it is certainly very much like it, being leguminous, ſiliquous, and of the ſame qualities. And it ſeems very probable, that the tubera of this plant were the food with which the Britons ſuſtained themſelves for ſome days, when they were preſſed by the enemy; as it is related by Dion, in the life of the emperor Severus. For this plant, ſays Dr. Sibbald in his introduction to the Natural Hiſtory of Scotland, has the virtues of liquorice; and its tubera by our Highlanders, who, to this very day, retain the manners, and way of living, of the ancient Scots, are ſtill applied to the ſame uſes; but, as for liquorice, I know not, that it grows any where in the whole Iſland without cultivation. *Raii Hiſt. Plant.*

ORPE'LLO, a preparation of braſs uſed in the glaſs trade, and prepared in this manner: cut plates of braſs into ſmall pieces, and place them in a luted crucible, in a ſtrong fire, but not ſo violent as to melt it. Let it ſtand in this manner for four days, in which time it will be well calcined; when cold, powder and ſift it, and finally grind it on a porphyry. This will be a black powder; ſpread this on tiles, which place on burning coals in the leer, near the hole, for four days; take off the aſhes that may fall into it, and finally powder and ſift it fine for uſe. It is known to be nicely prepared, when, on mixing with the melted metal in the glaſs furnace, it makes it ſwell and boil.

The colour it gives is a very elegant ſky colour, and a ſea-green, or a mixed colour between them, according to the quantity and degree of calcination. *Neri's Art of Glaſs.*

ORVIETA'NUM (*Dict.*) — The antidotum Orvietanum is thus prepared:

Take of old theriaca, and dried vipers, with their hearts and livers, each four ounces; of the root of viper's-graſs, carline-thiſtle, maſterwort, angelica, biſtort, the ſmaller birthwort, contrayèrva, white dittany, galangals, gentian, coſtus, and the true acorus; of the ſeeds of Macedonian parſley, of the leaves of ſage, roſemary, goats-rue, carduus benedictus, and dittany of Crete; of bay and juniper-berries, each one ounce; of cinnamon, cloves, and mace, each half an ounce; and, of the beſt honey deſpumated, eight pounds; make into an antidote. Reduce all the ingredients into a common powder; deſpumate the honey, and boil it to the conſiſtence of a thick ſyrup. Suffer it to become half-cold, and then, by means of a ſpatula, carefully mix with it the theriaca and the powder, in order to make an electuary, to be kept, for uſe, in a cloſe-ſtopped veſſel.

This electuary, or antidote, is highly eſteemed, as good againſt the plague, the ſmall-pox, and the bites of poiſonous animals. It alſo corroborates the brain, the heart, and the ſtomach. The doſe is, from one ſcruple, to a drachm and an half.

ORYCTO'GRAPHY, is that part of natural hiſtory wherein foſſils are deſcribed. *Wolfm. Diſc. Prælim. Logic.*

ORYCTO'LOGY, is that part of phyſics which treats of foſſils, or it is the ſcience of foſſils. Under this head comes the doctrine of ſalts, ſulphurs, ſtones, gems, and metals. *Wolfm. Diſc. Prælim. Logic.*

ORY'ZA. See RICE in the Dictionary.

OS *aureum*, *the golden mouth*, in natural hiſtory, a name given to a ſpecies of cochleæ of the lunar kind, or of that genus which have a round mouth. This, in the Os aureum, is of a fine yellow.

Os *calcis*, in anatomy, a bone of the foot; ſee the article FOOT, in the Dictionary.

Os *calcis luxated.* It ſometimes happens, that the Os calcis, and no other bone of the foot, is diſplaced or luxated by ſome external force; and this happens ſometimes toward the external, ſometimes toward the internal ſide of the foot. When this accident happens, it is eaſily diſcovered by the violent pain it occaſions; and by the inequality of the part, that is, there is a cavity plainly obſervable in one part, and a tumor in the other, on the place. The reduction of this diſlocation is very eaſy. The patient is to be placed on a bed, and, while two aſſiſtants extend the limb in the oppoſite directions, the ſurgeon replaces the diſlocated bone with his fingers, and the preſſure of the palm of his hand, and then there is no more than a proper bandage and reſt required to the cure. *Heiſter's Surg.*

Os *humeri*, in anatomy, a bone of the arm. See ARM in the Dictionary.

Os *humeri fractured.* Fractures of the Os humeri are leaſt dangerous when near its middle, and much worſe when near its upper or lower head. It ſometimes happens, that the fractured ends of theſe bones keep their places, but much more frequently they are found ſlipped one over another, by which means the fractured limb is made ſhorter than the ſound one: ſometimes alſo, though much more rarely, it happens, that the dividends of the bone recede from one another, by reaſon of the weight of the arm, and by that means the fractured limb becomes longer than the ſound one. In fractures of this bone, where the ends of the divided bone have ſlipped one over another, as is uſually the caſe, there is required both force and ſkill to reduce them, eſpecially if the patient has tenſe nerves and larger muſcles, as is uſually the caſe in ſtrong men. To extend the arm on this occaſion, the patient muſt be ſeated on a high ſtool, and an aſſiſtant muſt lay hold of his arm firmly above the fracture, keeping his elbow gently bent; then the lower part of the arm, beneath the fracture, is in like manner to be taken hold of, and the arm is to be gently extended forward, by endeavouring to remove eaſily each part from the other, in a right line. The ſurgeon is then to take hold of the fractured part of the arm, and with both his hands reduce the fractured bones into their proper places, while the arm is kept in a proper ſtate of extenſion by the aſſiſtants; and, when they are replaced, the limb is to be rolled up with the proper bandages. *Heiſter's Surg.*

Os *innominatum.* See INNOMINATA *Oſſa*, in the Dictionary.

Os *innominatum fractured.* A fracture of this bone very ſeldom happens, but, when it does, it is readily diſcovered by the injury and ſymptoms in the neighbouring parts, and is the more particularly dangerous, when the patient diſcharges a brown bloody matter. In reſtoring this bone, the patient muſt lie down on his ſound ſide; the bone muſt be replaced with the hands, covered with compreſſes, dipped in ſpirit of wine, and kept on by the ſpica bandage. Afterwards bleeding, with cooling and relaxing medicines, muſt be uſed and a thin diet obſerved. *Heiſter's Surg.*

Os *ſacrum.* See SACRUM *Os*, in the Dictionary.

Os *ſacrum fractured.* When this bone is found to be fractured, the fragments are to be reduced into their proper places with the fingers, and, if any part of it be depreſſed inwards, a finger dipped into oil or butter, and with the nail cloſe cut off, muſt be introduced up the anus in order to thruſt the depreſſed fragment into its proper place, to which it is to be directed externally by the other hand. This being performed, a ſticking plaiſter is to be applied, and compreſſes dipped in ſpirit of wine over it, to be kept on by the T bandage; or the plaiſters may be let alone, and only the compreſs and bandage applied. The patient muſt keep his bed a fortnight, lying on his ſides; or, if he will needs ſit up, it muſt be on a chair without a bottom, that the bones may not be diſplaced by touching the ſeat. *Heiſter's Surgery.*

OSMUNDA, *Oſmund royal*, in botany, a genus of plants, whoſe characters are:

It produces no flowers, but bears its fruit in cluſters.

This is the biggeſt of our Engliſh ferns, ſending forth ſeveral large-branched leaves, whoſe long broad pinnulæ are not at all indented about the edges, like the other ferns; they are of a light colour; among theſe ariſe ſeveral ſtalks, which have the like leaves growing on them on their lower parts, but towards the tops they are full of round, ſlender, ſeed-bearing, curled heads, an inch or more long when ripe, of a brown colour, covered with ſmall duſty ſeed. Theſe appear in June, and ripen in July. The root conſiſts of a great number of ſmall, long, round parts, matted together, blackiſh on the outſide, and green within, covered over with ſmall fibres. It grows in marſhy, boggy places, particularly in a bog, at the backſide of Woolwich, near the Warren.

The roots, the only part uſed, are accounted good for obſtructions of the liver and ſpleen, and particularly eſteemed for the rickets in children, as, alſo, for ruptures, wounds, and bruiſes. *Miller's Bot. Off.*

OSTEO'LOGY (*Dict.*) — There are properly two kinds of Oſteology, one of which is to be learned from bones dried and prepared by boiling, and the other from the bones of a dead ſubject, as they are naturally connected with each other. Both theſe methods are very neceſſary for the practice of phyſic, and for the exact knowledge of the human body. By examining dry bones, however, we can only learn their exterior forms, their ſituation, and the connection which they may have with one another; but, when we conſider them as joined together in a dead body, we are in a condition to obſerve many other things, in regard to them, very uſeful in phyſic; becauſe their connections with one another, by cartilages and ligaments, and by the diverſity of articulation, are ſometimes very different in the dry from what we ſee them in the freſh bones. There are, for inſtance, in dry bones, certain cavities which appear to be cotyloide; becauſe they are diveſted of their cartilages; but, in freſh bones, they are found to be glenoide, their cavities being filled with cartilages. And, on the other hand, ſome cavities appear to be glenoide in the ſkeleton, which are cotyloide in the body, their cavities being augmented by cartilaginous ſupercilia.

The exterior form and qualities of bones are much better demonſtrated alſo from freſh ſubjects, than from prepared bones; becauſe they loſe a great many things in boiling, ſuch as the cartilaginous bodies, the perioſteum, the mucilaginous ſubſtance found between them, and the marrow contained in their cavities; all which may be ſhewn in a freſh body, but cannot be ſeen in a ſkeleton. *Riolan. Encheiridion Anatomicum.*

OSTEOSPE'RMUM, *hard-ſeeded chryſanthemum*, in botany, a genus of plants whoſe characters are:

The flower hath an hemiſpherical empalement, which is ſingle, and cut into many ſegments; the flower is compoſed of ſeveral hermaphrodite flowers in the diſk, which are tubulous, and cut at the brim into five parts: theſe are ſurrounded by ſeveral female flowers, which are radiated, each having a long narrow tongue, which is quinquefid: the hermaphrodite flowers have each five ſlender ſhort ſtamina; theſe are barren: the female flowers have each a globular pointal, which afterwards becomes one ſingle hard ſeed.

Theſe plants are propagated by cuttings, which may be planted in any of the ſummer months, upon a bed of light earth, and ſhould be watered and ſhaded until they have taken root. Theſe may remain in the beds till they have gotten very good roots, when they muſt be taken up, and planted in pots: for, if they are ſuffered to ſtand long, they will make ſtrong vigorous ſhoots, and will be difficult to tranſplant afterwards; during the ſummer ſeaſon the pots ſhould be frequently removed, to prevent the plants from rooting through, the holes in the bottoms of the pots, into the ground, which they are very apt to do when they continue long undiſturbed, and then they ſhoot very luxuriantly, and, on their being removed, theſe ſhoots, and ſometimes the whole plants, will decay.

OS'TREA, *the oiſter*, in natural hiſtory, the name of a very large genus of ſhells, the characters of which are theſe:

It is a bivalve ſhell, of a coarſe external ſtructure, and dirty appearance; each ſhell being compoſed of a great number of laminæ not nicely cloſed down upon one another. It is in ſome ſpecies ſmooth, in others ſtriated, tuberoſe, or prickly; uſually flat, but ſometimes globoſe, plicated, and wrinkled into ſinuſes; the lower ſhell being always deeper than the other. Aldrovand ſuppoſes this genus of ſhell fiſh obtained the name Oſtreum, from the Greek ὀστέον, a bone, as they are of a bony hardneſs.

Moſt authors have confounded the two genera of oiſters and chamæ together, though there is an obvious and an invariable diſtinction. The oiſter is rough, and has a ſort of beak; and, notwithſtanding the roughneſs of both ſhells, it always ſhuts very evenly and firmly: add to this, that one of its ſhells is flat, the other convex; and is thus abſolutely diſtinguiſhed from the chamæ. *Hiſt. Nat. Eclair.*

Oiſters, in their growth, become faſtened to every ſolid ſubſtance which they happen to come into contact with; and rocks, ſmall ſtones, wood, ſea-plants, and a thouſand other things are found at times with Oiſters adhereing to them, whoſe ſhells have fitted themſelves to the form of the thing itſelf, and left their natural ſhape. The people who fiſh for, and trade in Oiſters, pretend to diſtinguiſh two kinds; one of which is fecund and will breed; the other which is barren. They ſay, they diſtinguiſh theſe by a little black fringe, which always ſurrounds the good breeding Oiſters.

The way to make Oiſters green is, to put them into ſmall pits where the water is about three feet deep, and where the ſun has great power; in theſe they become green in three or four days.

OSY'RIS, *poets caſia*, in botany, a genus of plants whoſe characters are:

It is male and female in different plants: the empalement of the flower is of one leaf, which is divided into three acute ſegments; the flower hath no petals; but thoſe on the male plants, have three ſhort ſtamina; and thoſe on the female have a roundiſh pointal, which afterwards changes to a globular berry, having a ſingle ſeed.

OTHO'NNA, *African ragwort*, in botany, a genus of plants whoſe characters are:

It hath a compound flower, conſiſting of many florets and half florets, incloſed in one common empalement: the florets are hermaphrodite; theſe are tubulous, and indented at the brim; the half florets are female; theſe are ſtretched out on one ſide with a narrow ſegment, like a tongue, beyond the empalement: the hermaphrodite flowers have each five ſmall ſtamina: the female flowers have an oblong pointal, which afterward turns to a ſingle oblong ſeed covered with a down.

O'TTER, in zoology, the name of an amphibious animal, ſmaller than the beaver, and has a longer and more ſlender body. Its tail is alſo longer than that of the beaver, and is all over covered with hair, and its legs are very ſhort in proportion to the ſize of its body. The feet have all five toes each, which are naturally expanded, and are connected by a membrane like the toes of web-footed fowl; and are all ſo equally diſtant, that there is no diſtinction of any in the place of the great toe in other animals. The head and face exactly reſemble the beaver, and the ears are ſmall, and placed under the eyes, near the upper jaw, as in the beaver. The hair is ſhort, and of a cheſnut brown, but paler under the belly. The tail has ſhorter hair than that of the body, but longer than that of the legs. *Ray's Syn. Quad.*

OV'EN, or *Aſſaying* OVEN; ſee *Aſſaying* FURNACE.

O'VIS, *the ſheep*. See the article SHEEP.

OU'TLICKER, or OUTLIGGER, in a ſhip, a ſmall piece of timber, three or four yards long, as occaſion ſerves, made faſt to the top of the poop, and ſtanding right out a-ſtern: at the outmoſt end of it is a hole, into which the ſtanding part of the ſheet is received, and made faſt through the block of the ſheet; and then again received through another block, which is ſeized to this Outlicker, hard by the end of it. This is ſeldom uſed in men of war, or in great ſhips; and, whenever it is made uſe of, it is becauſe the mizen maſt is placed ſo far aft, that there is not room enough within board to hale the ſheet flat.

OWL *Pigeon*, the name of a peculiar ſpecies of pigeon, called, by Moore, the columba bubo nominata. It is a ſmall and ſhort-bodied pigeon. It has a ſhort round head, and has a ſeries of feathers that ſeparate and open two ways upon the breaſt: but its moſt remarkable character is its beak, the upper chop of which is bent, and hooked over like an Owl's: this is the occaſion of its name: it is of various colours, as white, blue, or black, but is always of only one colour, never pied.

OU'ZELL, or *brook* OUZELL, in zoology, an Engliſh name for the rollus aquaticus, more uſually called the water rail.

OUZELL, or *ring* OUZELL, an Engliſh name for a bird of the merula or blackbird kind, remarkable for a white ring about its neck, and thence called by authors merula torquata; it is more commonly called, in Engliſh, the ring amzell. *Ray's Ornithology.*

OX, *bos*, a well known, and a very ſerviceable animal, in many reſpects; but his nature depends wholly on that of the bull and cow, from which he is bred. Derbyſhire and Lancaſhire are ſaid to have the beſt Oxen in England. Wales, and the iſland of Angleſea, afford a kind that are very valuable to the farmers, as they will fatten upon middling land; and the Scotch Oxen are yet hardier than theſe. The long-legged ſhort-horned cow, of the Dutch breed, is the beſt for milk; but then this kind needs to be very carefully kept. This ſort of cow will often yield two gallons of milk at a time.

When theſe creatures are intended to breed, the better the land is, the larger ſort of beaſts are to be choſen, and the greater will be the profit. But, of whatever ſort the breed is, the bull ſhould always be of the ſame country with the cow, otherwiſe it never ſucceeds ſo well. The bull ſhould be choſen of a ſharp quick countenance, his forehead broad and curled, his eyes black and large, his horns long, his neck fleſhy, his belly long and large, and his hair ſmooth and like velvet; his breaſt ſhould be large, his back ſtraight and flat, his buttocks ſquare, his thighs round, his legs ſtraight, and his joints ſhort. This ſort of bull is the beſt for breed, and makes the beſt Oxen for draught as well as for fattening.

The cow ought to have a broad forehead, black eyes, great clean horns, the neck long and thin, the belly large and deep, the thighs thick, the legs round, and the joints ſhort; a white large and deep udder with four teats, and large feet. The ſize muſt be proportioned to the goodneſs of the land. The largeſt cows, in general, give the greateſt quantity of milk; and it is always a good rule to take the cattle from a worſe ground than that on which they are to be kept; for, if from a better, they are apt to degenerate. The beſt time of a cow's life, for breeding of calves, is from three years old till twelve: the black cows are uſually choſen to breed out of.

The largeſt Oxen are to be choſen for work, and for feeding, but then it muſt be where there is land rich enough to maintain them. When they are to draw, care muſt be taken to match them well, both for height and ſtrength; for, if one be ſtronger than the other, the weakeſt will ſoon be deſtroyed. They muſt never be driven beyond their natural pace, for the beating them throws them into ſurfeits, and many other diſeaſes.

The time of putting Oxen to work is at three years old; they muſt be worked gently the firſt year, eſpecially in hot weather, and fed with a large quantity of hay: this will enable them to bear their labour better than graſs; and they ſhould be always kept in a middle ſtate, neither too fat nor too lean. They may be worked till they are ten or twelve years old, and then ſold.

It is obſerved, that meat and fair treatment ſucceed much better with this animal than blows. The beſt way to break a young one to the yoke, is to put him to it with an old tame Ox of about his own height and ſtrength. If he prove unruly after this, he muſt be kept hungry, and made to feed out of the driver's hand. Oxen are much more profitable to keep than horſes, there being no loſs in them; an old wrought Ox fattening as well as a young one, and being as good meat. Their keeping alſo is cheaper, for they eat no oats: their harneſs and their ſhoes alſo are conſiderably cheaper, and they are not ſo ſubject to diſeaſes. They muſt always indeed have good graſs and good hay, and they are not ſo ſerviceable as horſes, when there is much working in carts, and where the ways are good; but for winter plowing, where the ground is heavy, an Ox will do as much work as a horſe.

Every farmer who can keep two teams, would do well to have one of them of horſes, and the other of oxen; it is much better to yoke them together by the necks and breaſts, than by the horns as ſome do; and, where a man keeps an Ox team, he ſhould raiſe two Oxen and two cow calves every year to keep up his ſtock; for it is better for a farmer, in all neceſſary things, to be a ſeller than a buyer. Chalky land ſpoils the feet of Oxen more than any other. *Mortimer's Huſbandry.*

OX-*eye*, in the ſea language, a name given by the ſeamen to thoſe dreadful ſtorms that are ſometimes met with on the coaſt of Guinea; for at firſt it appears in the form of an Ox's eye, and not much bigger; but it deſcends with ſuch celerity, that in a very little ſpace of time, and often before they can prepare themſelves for it, it ſeems to them to overſpread the whole hemiſphere, and at the ſame time forces the air with ſo much violence, that the ſhips are ſometimes ſcattered ſeveral ways, ſome directly contrary, and ſometimes are ſunk downright.

OX-*fly*, in natural hiſtory, a ſpecies of two-winged fly, bred from a fly-worm, hatched under the ſkin of Oxen, from the egg of the parent fly lodged there.

This fly, cloſely examined, appears to be of the ſecond claſs, and to have a mouth without teeth or lips, and its mouth very ſmall. The antennæ are very ſhort, rounded at their ends, and of a gloſſy hue. The reticular eyes are of a deep cheſnut colour.

The female, has, in the under and hinder part of his body, a cylindric tube, which ſhe can thruſt out at pleaſure, and which is the inſtrument with which ſhe pierces the ſkin of the animal, to depoſit her egg. *Reaumur, Hiſt. Inſ.*

OX-*gang*, or OXENGATE, (*Dict.*)— In Scotland this term ſignifies a portion of arable land, containing 13 acres.

O'XYS, *wood ſorrel*, in botany, a genus of plants, whoſe characters are:

It hath a bell-ſhaped flower, conſiſting of one leaf, having its brim wide expanded, and cut into ſeveral diviſions: the pointal, which riſes from the flower cup, becomes an oblong, membranaceous fruit, divided into five ſeminal cells, opening outward from the baſe to the top, and incloſing ſeeds which ſtart from their lodges, by reaſon of the elaſtic force of the membrane which involves them.

OY'STER. See OSTREA.

OYSTER-*worm*, in natural hiſtory, a name given by writers to a kind of ſmall worm found in Oyſters, which ſhines in the dark, in the manner of the glow-worm; but with an univerſal light, and not in a peculiar part only, like this animal.

P.

PACHODECARHO'MBIS *, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ.

* The word is derived from the Greek παχὺς, thick, δέκα, ten, and ῥόμβος, a rhombus, and expreſſes a thick rhomboidal body, compoſed of ten planes.

The characters of this genus are, that the ſelenitæ of it conſiſt of ten planes; but as the top and bottom in the leptodecarhombes, or moſt common kind of the ſelenitæ, are broader and larger planes than any of the reſt, the great thickneſs of this genus, on the contrary, makes it four longer in all the bodies of it, meeting in an obtuſe angle from its ſides, its largeſt planes. *Hill's Hiſt. of Foſſ.*

PA'DDLE, in glaſs-making, the name of an inſtrument with which the workman ſtirs about the ſand and aſhes in the calcar. *Neri's Art of Glaſs.*

PÆDARTHRO'CACES, in ſurgery, is a diſeaſe of the bones, raiſing them into tumors near the joints, and differing from the ſpina ventoſa, in that it is not attended either with violent pains, or eroſions of the bone and adjacent parts. The word is derived from the Greek παῖς, a child, ἄρθρον a joint, and κακὸν, an evil, ſignifying, that it is a diſorder of the joints, to which children are principally ſubject; which is the caſe, becauſe the bones of children, being ſofter than thoſe of adults, are therefore the more eaſily diſtended by humours, and more frequently raiſed into tumors: theſe are hard in this caſe, and the adjacent ſoft parts are not inflated, and are free from redneſs, inflammation, and pain. It is, however, to be obſerved, that this diſorder, though at firſt very different from the ſpina ventoſa, is ſometimes known to degenerate into that diſorder. *Heiſter's Surgery.*

PÆO'NIA, *the peony*, in botany, the name of a genus of plants, whoſe characters are:

It hath a flower compoſed of ſeveral leaves, which are placed orbicularly, and expand in form of a roſe; out of whoſe empalement riſes the pointal, which afterwards becomes a fruit, in which ſeveral little horns, bent downward, are gathered, as it were, into a little head, covered with down, opening lengthwiſe, containing many globulous ſeeds.

They are propagated by parting their roots, which multiply very faſt. The beſt ſeaſon for tranſplanting them, is, towards the latter end of Auguſt, or the beginning of September; for, if they are removed after their roots have ſhot out new fibres, they ſeldom flower ſtrong the ſucceeding ſummer.

In parting of theſe roots, you ſhould always obſerve to preſerve a bud upon the crown of each off-ſet, otherwiſe they will come to nothing; nor ſhould you divide the roots too ſmall, eſpecially if you have regard to their blowing the following year; for, when their off-ſets are weak, they many times do not flower the ſucceeding ſummer, or, at leaſt, produce but one flower upon each root: but, where you would multiply them in quantities, you may divide them as ſmall as you pleaſe, provided there be a bud to each off-ſet; but then they ſhould be planted in a nurſery bed, for a ſeaſon or two, to get ſtrength, before they are placed in the flower garden.

The ſingle ſorts may be propagated from ſeeds, which they generally produce in large quantities, where the flowers are permitted to remain; which ſhould be ſown in the middle of Auguſt upon a bed of light freſh earth, covering them over about half an inch thick with the ſame light earth; the ſpring following the plants will come up, when they ſhould be carefully cleared from weeds, and, in very dry weather, refreſhed with water, which will greatly forward their growth. In this bed they ſhould remain two years before they are tranſplanted, obſerving in autumn, when the leaves are decayed, to ſpread ſome freſh rich earth over the beds about an inch thick, and conſtantly to keep them clear from weeds. *Miller's Gard. Dict.*

The roots, flowers, and ſeeds, are cephalic, and counted good againſt the epilepſy, apoplexy, and all kinds of convulſions, and nervous affections, both in young and old; as alſo in hyſteric caſes, the obſtructions of the menſes, and the retention of the lochia. The root and ſeed are hung about children's necks, to prevent convulſions in breeding their teeth. *Miller's Bot. Off.*

PAINTING *in oil.*— The art of Painting in oil was unknown to the ancients; and it was a Flemiſh Painter, one John van Eyck, or John de Bruges, who firſt diſcovered, and put it in practice, in the beginning of the fourteenth century: till him, all painters wrought in freſco, or in water-colours.

This was an invention of the utmoſt advantage to the art; ſince, by means hereof, the colours of a Painting are preſerved much longer and better, and receive a luſtre and ſweetneſs which the antients could never attain to, what varniſh ſoever they made uſe of to cover their pieces.

The whole ſecret only conſiſts in grinding the colours with nut oil or linſeed-oil: but it muſt be owned, the manner of working is very different from that in freſco, or in water; by reaſon the oil does not dry near ſo faſt; which gives the painter an opportunity of touching and retouching all the parts of his figures, as often as he pleaſes: which, in the other kinds, is a thing impracticable.

The figures too are here capable of more force and boldneſs, inaſmuch as the black becomes blacker, when ground with oil than with water; beſides that, all the colours, mixing better together, make the colouring ſweeter, more delicate and agreeable, and give an union and tenderneſs to the whole work, inimitable in any of the other manners.

Painting in oil is performed on walls, on wood, canvas, ſtones, and all ſorts of metals.

To paint on a wall.— When well dry, they give it two or three waſhes with boiling oil, till the plaiſter remain quite greaſy, and will imbibe no more. Over this they apply deſiccative or drying colours, viz. white chalk, red oker, or other chalks beaten pretty ſtiff. This layer being well dry, they ſketch out, and deſign their ſubject; and at laſt paint it over; mixing a little varniſh with their colours, to ſave the varniſhing afterwards.

Others, to fortify their wall better againſt moiſture, cover it with a plaiſter of lime, marble-duſt, or a cement made of beaten tiles ſoaked with linſeed-oil; and at laſt prepare a compoſition of Greek pitch, maſtich, and thick varniſh boiled together, which they apply hot over the former plaiſter: when dry, they lay on the colours as before.

Others, in fine, make their plaiſter with lime-mortar, tile-cement, and ſand; and, this dry, apply another of lime, cement, and iron ſcum; which, being well beaten and incorporated with whites of eggs and linſeed oil, makes an excellent plaiſter. When dry, the colours are applied as before.

To paint on wood.— They uſually give their ground a layer of white tempered with ſize, or they apply the oil abovementioned; the reſt as in Painting on walls.

To paint on cloth, or canvas.—The canvas being ſtretched on a frame, they give it a layer of ſize, or paſte-water. When dry, they go over it with a pumice-ſtone, to ſmooth off the knots. By means of the ſize the little threads and hairs are all laid cloſe on the cloth, and the little holes ſtopped up, ſo as no colour can paſs through.

When the cloth is dry, they lay on oker; which is a natural earth, and bears a body; ſometimes mixing with it a little white lead, to make it dry the ſooner. When dry, they go over it with the pumice-ſtone, to make it ſmooth.

After this, they ſometimes add a ſecond layer compoſed of white lead, and a little charcoal black, to render the ground of an aſh-colour; obſerving in each manner to lay on as little colour as poſſible; that the cloth may not break, and that the colours, when they come to be painted over, may preſerve the better.

In ſome Paintings of Titian and Paolo Veroneſe, we find they made their ground with water, and painted over it with oil; which contributed much to the vivacity and freſhneſs of their works: for the water ground, by imbibing the oil of the colours, leaves them the more beautiful; the oil itſelf taking away a deal of their vivacity.

As little oil therefore is to be uſed as poſſible, if it be deſired to have the colours keep freſh: for this reaſon ſome mix them with oil of aſpic, which evaporates immediately, yet ſerves to make them manageable with the pencil.

To paint on ſtones or metals, it is not neceſſary to apply ſize, as on cloth; it ſuffices to add a ſlight layer or colours, before you draw your deſign; nor even is this done, on ſtones, where it is deſired the ground ſhould appear, as on certain marbles of extraordinary colours.

PA'LATE (*Dict.*)— The Palate is that arch and cavity of the mouth ſurrounded anteriorly by the alveolary edge and teeth of the upper jaw, and reaching from thence to the great opening of the pharynx. This arch is partly ſolid and immoveable, and partly ſoft and moveable. The ſolid portion is that which is bounded by the teeth, being formed by the two oſſa maxillaria, and two oſſa palati. The ſoft portion lies behind the other, and runs backward like a veil fixed to the edge of the oſſa palati, being formed partly by the common membrane of the whole arch, and partly by ſeveral muſcular faſciculi, &c.

The membrane that covers all this cavity, is like that which lines the ſuperior and middle portions of the pharynx. It is very thick ſet with ſmall glands, the orifices of which are not ſo ſenſible as in the pharynx, and eſpecially in the rugæ of the ſuperior portion thereof, where Heiſter obſerved a conſiderable orifice, and a canal proportioned to that orifice, which he could eaſily inflate with air. This is certainly the beſt way of beginning theſe kinds of inquiries, eſpecially if the pipe be held at firſt only very near the part, without endeavouring to force it in. To immerge the parts in clear water, is likewiſe a very good way to diſcover ſmall orifices by the help of a microſcope. Small ducts, of the ſame kind with what I have now mentioned, may be ſuppoſed to lie along the middle line, or raphe, of the arch of the Palate, and along the alveolary edge, becauſe of ſome ſmall tubercles, or points, which appear there.

This membrane, together with that of the poſterior nares, forms, by an uninterrupted continuation, the anterior and poſterior ſurfaces of the ſoft portion, or ſeptum palati; ſo that the muſcular faſciculi of this portion lie in the duplicature of a glandulous membrane. The muſcles compoſed of theſe faſciculi ſhall be preſently deſcribed.

The ſeptum, which may likewiſe be called velum, or valvula palati, terminates below by a looſe floating edge, repreſenting an arch, ſituated tranſverſly above the baſis or root of the tongue. The higheſt portion, or top of this arch, ſuſtains a ſmall, ſoft, and irregularly conical glandulous body, fixed by its baſis to the arch, and its apex hanging down without adhering to any thing, which is called uvula.

On each ſide of the uvula, there are two muſcular half arches, called columnæ ſepti palati. They are all joined to the uvula by their upper extremities, and diſpoſed in ſuch a manner, as that the lower extremities of the two, which lie on the ſame ſide, are at a little diſtance from each other, and ſo, as that one half arch is anterior, the other poſterior, an oblong triangular ſpace being left between them, the apex of which is turned toward the baſis of the uvula.

The two half arches on one ſide, by joining the like half arches on the other ſide, form the entire arch of the edge of the ſeptum. The poſterior half arches run by their upper extremities, more directly towards the uvula than the anterior. The anterior half arches have a continuation with the ſides of the baſis of the tongue, and the poſterior with the ſides of the pharynx. At the lower part of the ſpace left between the lateral half arches on the ſame ſide, two glands are ſituated, termed amygdalæ.

The half arches are principally made up of ſeveral flat fleſhy portions, almoſt in the ſame manner with the body of the ſeptum. The membrane which covers them is thinner than the other parts of it towards the Palate, pharynx, and tongue. Each portion is a diſtinct muſcle, the greateſt part of which terminates in one extremity, in the ſubſtance of the ſeptum, and of the half arches; and, by the other extremity, in parts different from theſe.

Ulcers of the PALATE.— Theſe ulcers are of ſo malignant a nature, that, ſometimes, they not only conſume the ſoft parts, but corrode the bones, and extend themſelves even to the noſe. The voice of the patient becomes not only altered and broken, but whatever he drinks is immediately diſcharged by the noſe with very great uneaſineſs. Theſe ulcers proceed from a ſcorbutic acrimony, or a venereal infection in the blood; and, if the cauſe is not ſpeedily removed, not only the Palate, but, likewiſe, the noſe, will be in a miſerable manner deſtroyed.

The firſt intention of cure, therefore, muſt be either to alleviate, or entirely remove, the acrimony of the blood, or the venereal malignity, by proper internal medicines. If the Palate is not yet perforated or conſumed by the caries, let it be cleanſed with frequent gargariſms, ointments, and injections. For this purpoſe, firſt, make a decoction of agrimony, St. John's-wort, ladies-mantle, and the like vulnerary herbs; then mix it with honey of roſes, or, if more powerful detergents are neceſſary, with ungentum Ægyptiacum, or fuſcum. The honey that ſwims a-top of the Ægyptiacum, and, alſo, Fallopius's alum-water, are excellent detergents, even when the caries has affected the bones. As often as the ulcer is thus cleanſed, it will not be improper, ſoon after, to apply to the ulcerated part with lint, or a pencil, honey of roſes, oil of myrrh, per deliquium, elixir proprietatis, or Peruvian balſam.

If the caries has already ſeized the bones, the morbid part may be ſeparated from the ſound, by the remedies already recommended, eſpecially if the part be carefully anointed with the oil of cloves, or with honey of roſes acidulated with ſpirit of vitriol, the internal medicines being conſtantly continued. But, when theſe do not ſucceed, the actual cautery ought to be gently applied to the morbid bone, after having carefully cleanſed the ulcer with dry lint, and ſecured the tongue from injury, by covering it with wet linen cloths, and applying the ſpeculum oris. After the cauterization is completed, continue the application of balſamic remedies, till the bone is again covered with fleſh, and the ulcer entirely cured. But thoſe perforations, which penetrate through the Palate to the noſe, can never again be naturally cloſed.

PALE, in heraldry (*Dict.*)— *Plate* XLIV. *fig.* 8, in the Dictionary, repreſents one of the honourable ordinaries called Pale.

PALLI'SADOES, or PALISADOES, in fortification.— *Plate* XXXI. *fig.* 11, in the Dictionary, repreſents a row of Palliſadoes. See PALISADE, in the Dictionary.

PALIU'RUS, *Chriſt's thorn*, in botany, a genus of plants, whoſe characters are:

It has long and very ſharp ſpines, diſpoſed in regular order. The calyx is monophyllous and pentaphylloidal; the flower roſaceous, pentapetalous, and furniſhed with five ſtamina. The ovary in the bottom of the calyx becomes a fruit, reſembling a bonnet, or target, and ſurrounding another almoſt globular and tricapſular fruit, containing, in each capſula or cell, one round ſeed.

The leaves and root of the Paliurus are aſtringent, ſtop a looſeneſs, and digeſt and cure tubercles; and the fruit is ſo powerfully inciding, as to diminiſh the ſtone in the bladder, and promote excretions from the breaſt and lungs. The ſeeds bruiſed are commended againſt the cough, and the phyſicians of Montpelier preſcribe their uſe in diſorders from ſand and gravel. *Raii, Hiſt. Plant.*

PA'LMA, the *palm-tree*, in botany, a genus of plants, whoſe characters are:

It hath a ſingle unbranched ſtalk: the leaves are diſpoſed in a circular form on the top, which, when they wither, or fall off with age, new ones always ariſe out of the middle of the remaining ones; among which, certain ſheaths or plain twigs break forth, opening from the bottom to the top, very full of flowers, and cluſters of embryo's.

Theſe plants may be eaſily produced from the ſeeds, provided they are freſh; which ſhould be ſown in pots filled with light rich earth, and plunged into an hot-bed of tanner's bark; which ſhould be kept in a moderate temper, and the earth frequently refreſhed with water.

When the plants are come up, they ſhould be each planted into a ſeparate ſmall pot filled with the ſame light rich earth, and plunged into an hot bed again, obſerving to refreſh them with water, as alſo to let them have air in proportion to the warmth of the ſeaſon, and the bed in which they are placed. During the ſummer time they ſhould remain in the ſame hot bed; but in Auguſt you ſhould let them have a great ſhare of air to harden them againſt the approach of winter; for, if they are too much forced, they will be ſo tender as not to be preſerved through the winter without much difficulty, eſpecially if you have not the conveniency of a bark ſtove to keep them in.

The beginning of October you muſt remove the plants into the ſtove, placing them where they may have a great ſhare of heat, theſe being ſomewhat tenderer, while young, than after they have acquired ſome ſtrength: though indeed they may be ſometimes preſerved alive in a cooler ſituation, yet their progreſs would be ſo much retarded, as not to recover their vigour the ſucceeding ſummer. Nor is it worth the trouble of raiſing theſe plants from ſeeds, where a perſon has not the conveniency of a good ſtove to forward their growth; for, where this is wanting, they will not grow to any tolerable ſize in eight or ten years.

Whenever theſe plants are removed, which ſhould be done once a year, you muſt be very careful not to cut or injure their large roots, which is very hurtful to them; but you ſhould clear off all the ſmall fibres which are inclinable to mouldineſs; for, if theſe are left on, they will in time decay, and hinder the freſh fibres from coming out, which will greatly retard the growth of the plants.

The ſoil in which theſe plants ſhould be placed, muſt be compoſed in the following manner, viz. a third part of light freſh earth taken from a paſture ground; a third part ſea ſand; and the other part rotten dung, or tanner's bark: theſe ſhould be carefully mixed, and laid in an heap three or four months at leaſt before it is uſed; but ſhould be often turned over, to prevent the growth of weeds, and to ſweeten the earth.

You ſhould alſo obſerve to allow them pots proportionable to the ſizes of the plants; but you muſt never let them be too large, which is of worſe conſequence than if they are too ſmall. During the ſummer ſeaſon they ſhould be frequently refreſhed with water; but you muſt be careful not to give it in too great quantities; and in winter they muſt be now and then refreſhed, eſpecially if they are placed in a warm ſtove; otherwiſe they will require very little water at that ſeaſon.

Theſe plants are moſt of them very ſlow growers, even in their native countries, notwithſtanding they arrive to a great magnitude; for it has been often obſerved by ſeveral of the old inhabitants of thoſe countries, that the plants of ſome of theſe kinds have not advanced two feet in height in twenty years; ſo that, when they are brought into theſe countries, it cannot be expected they ſhould advance very faſt, eſpecially where there is not due care taken to preſerve them warm in winter: but, however ſlow of growth theſe plants are in their native countries, yet they may be with us greatly forwarded, by placing the pots into an hot-bed of tanner's bark; which ſhould be renewed as often as neceſſary, and the plants always preſerved therein both winter and ſummer, obſerving to ſhift them into larger pots as they advance in growth, as alſo to ſupply them with water: in which management I have had ſeveral of them come on very faſt; for I obſerve the roots of theſe plants are very apt to root into the bark, if theſe pots remain a conſiderable time without ſhifting, where they meet with a gentle warmth; and the moiſture ariſing from the fermentation of the bark doth preſerve their fibres plump and vigorous. *Miller's Gard. Dict.*

PA'NCREAS (*Dict.*)— The Pancreas, by means of its glandular ſtructure, ſecretes from the cœliac arteries an humour into one common duct, which terminates in the duodenum, into which it diſcharges all the quantity of lymph ſecreted.

This pancreatic juice is almoſt inſipid, or but gently ſaline, limpid, continually ſecreted in large quantities, by the motion, preſſure, warmth, and contiguity of the heart; but it is moſt copiouſly diſcharged, when, during digeſtion, the ſtomach is turgid. It is neither acid nor alcaline, but bears a great reſemblance to the ſaliva, not only with reſpect to its origin, but alſo with reſpect to its qualities, and the veſſels ſubſervient to its generation. In thoſe who are alive, this juice is mixed and incorporated with the bile; and, being lodged in the ſame common duct, produces no marks of any inteſtine motion, but is equally mixed with it, or is diſcharged alone, and by itſelf, into the empty inteſtines. Hence, the uſes of the pancreatic juice, when mixed and incorporated with the chyle, the fæces, the bile, and the mucus, are to dilute the thick parts of the fluids, to produce a due mixture of them, to render the chyle capable of mixing with the blood, to fit it for its paſſage through the lacteals, to correct the acrimonious parts of the fluids, to correct the viſcidity and bitterneſs, and to change the colour of the bile, and to mix it intimately with the blood to ſerve as a proper menſtruum or vehicle, ſo to change the taſtes, ſmells, and qualities of aliments, as that they aſſume nearly the ſame nature; and, laſtly, to go and return, and conſequently anſwer all theſe ends, with the utmoſt expedition. *Boerhaav. Inſtit.*

Practical authors furniſh us with ſome inſtances of abſceſſes in the Pancreas, which, however, were not diſcovered till after the death of the patients: but ſuch abſceſſes may be, in a great meaſure, gueſſed at, from the ſymptoms of the patients, ſome of which are the ſame with thoſe accompanying a ſcirrhus of the Pancreas; but to theſe ſigns may be added a ſlow fever, the almoſt inſeparable concomitant of internal abſceſſes, long-protracted watchings, ſhort ſleeps, and, after them, wearineſs, faintings, and cold ſweats.

If the patient has a tumor under the region of the ſtomach, that is indolent, and it is attended with an obſtinate coſtiveneſs, we may be ſure there is a ſcirrhus of the Pancreas; eſpecially if any of the cauſes of a ſcirrhus have preceded. The pancreatic juice dilutes the fæces, and perhaps ſtimulates the inteſtines, in ſome meaſure, to an expulſion of their contents; therefore, when there is a defect of this, the patient muſt be coſtive.

When a perſon has a cancer in the Pancreas, when faſting, he will feel a great weight under the ſtomach; after eating he is in extreme pain, but more ſo, if he vomits; he will have a diarrhœa, and then fall into an atrophy, and die.

A copious uſe of cherries, perfectly ripe, is very much recommended in a ſcirrhus of the Pancreas; and they are preferable to currants, which, have ſomething acrimonious in them, and are prejudicial to hyſterical women.

PANGO'NIA †, in natural hiſtory, the name of a genus of cryſtal.

† The word is derived from the Greek πᾶς, numerous, and γόνυ, an angle or bending, and expreſſes a cryſtal, compoſed of many angles.

The bodies of this genus are ſingle-pointed, or imperfect cryſtals, compoſed of dodecangular or twelve planed columns, terminated by twelve planed pyramids, and the whole body, therefore, made up of twenty-four planes.

PANIO'NIA, Πανιωνια, in antiquity, a feſtival in honour of Neptune, celebrated by a concourſe of people from all the cities of Ionia.

One thing is remarkable in this feſtival, that if the bull offered in ſacrifice happened to bellow, it was accounted an omen of the divine favour; becauſe that ſound was thought to be acceptable to Neptune. *Potter, Archæol. Græc.*

PA'RALLAX (*Dict.*)— Parallax *of declination*, is an arch of a circle of declination S I, *Plate* XXXIII. *fig.* 5, whereby the Parallax of altitude increaſes or diminiſhes the declination of a ſtar.

Parallax *of right aſcenſion and declenſion*, is an arch of the equator D *d*, *Plate* XXXIII. *fig.* 5, whereby the Parallax of altitude increaſes the aſcenſion, and diminiſhes the deſcenſion.

Parallax *of longitude*, is an arch of the ecliptic T *t*, *Plate* XXXIII. *fig.* 5, whereby the Parallax of altitude increaſes or diminiſhes the longitude.

Parallax *of latitude*, is an arch of a circle of latitude S *l*, *Plate* XXXIII. *fig.* 5, whereby the Parallax of altitude increaſes or diminiſhes the latitude.

PARIETA'RIA, *pellitory of the wall*, in botany, a genus of plants, whoſe characters are:

The flower is male, tetrapetaloidal, ſtellated, furniſhed with four ſtamina, and with teſticuli, having a ſmall apex in the center, without an ovary. The flower is female, conſiſting of a foliaceous, trifoliated calyx, in whoſe center is a conoidal ovary, furniſhed with a fimbriated tube in another place of the plant. The floſcules and ovaries are cloſely collected in thick nodes to the ſtalks.

It is cooling, opening, and cleanſing, abounding in nitro-ſulphureous ſalt, and is accounted very good for the ſtone, gravel, ſtoppage and heat of urine; and for theſe purpoſes the juice, or decoction, is given in draughts, or in clyſters; ſome commend the ſame for coughs. *Miller's Bot. Off.*

By the chemical analyſis, pellitory yields a great deal of oil, a great deal of fixed ſalt and earth, and ſeveral liquors, of which ſome are acrid, and the reſt acid: as for the volatile ſalt, one obtains none that is concrete from this plant, but it yields an urinous ſpirit.

PARKINSO'NIA, in botany, a genus of plants, whoſe characters are:

It hath a polypetalous, anomalous flower, conſiſting of five diſſimilar leaves, from whoſe cup ariſes the pointal, which afterwards becomes a rough-jointed point; each knot or joint containing one kidney-ſhaped ſeed.

This plant was diſcovered by father Plumier, in America, who gave it this name, in honour to the name of Mr. John Parkinſon, who publiſhed an Univerſal Hiſtory of Plants, in England, in the year 1640.

It is very common in the Spaniſh Weſt-Indies; but, of late years, it has been introduced into the Engliſh ſettlements in America, for the beauty and ſweetneſs of its flowers. This, in the countries where it grows, naturally riſes to be a tree of twenty feet high, or more; and bears long ſlender branches of yellow flowers, which hang down after the ſame manner as the laburnum. *Miller's Gard. Dict.*

PARNA'SSIA, *graſs of Parnaſſus*, in botany, a genus of plants, whoſe characters are:

The leaves are roundiſh, and diſpoſed in a circle; the calyx pentaphylloidal; the flower roſaceous, one on a ſtalk, conſiſting of greater and ſmaller fimbriated petals. The ovary becomes a ſmall conoidal fruit, opening into three or four keel-ſhaped cells, full of minute ſeeds.

It grows in putrid and marſhy places, and flowers in Auguſt: the parts uſed in medicine are the root, herb, and ſeed.

The juice of the leaves, and decoction of the root, are moſt approved medicines for the eyes. The ſeed is a powerful provocative of urine, and ſtops a looſeneſs and vomiting. Dioſcorides. It ſtrengthens the liver, and frees it from obſtructions. Chab. It is vulnerary and aſtringent, and is ſaid to be effectual in ſtopping hæmorrhages. *Hiſt. Plant. adſcript. Boerhaav.*

PA'RROT, the Engliſh name for a well known genus of birds.

PA'RSNEP, *paſtinacha*, in botany, the name of a well known root.

The Parſnep is to be propagated by ſowing their ſeeds in February or March, in a rich mellow ſoil, which muſt be deep dug, that the roots may be able to run deep without hindrance.

It is a common practice to ſow carrots, at the ſame time, upon the ſame ground with the Parſneps; and, if the carrots are deſigned to be drawn young, there is no harm in it. The Parſneps, when they are grown up a little, muſt be thinned to a foot diſtance, and carefully kept clear of weeds. They are fineſt taſted, juſt at the ſeaſon when the leaves are decayed; and ſuch as are deſirous to eat them in ſpring ſhould have them taken up in autumn, and preſerved in ſand. When the ſeeds are to be ſaved, ſome very ſtrong and fine plants ſhould be left for it at four feet diſtance; and towards the end of Auguſt, or in the beginning of September, the ſeeds will be ripe: they muſt then be carefully gathered, and dried on a coarſe cloth. They ſhould always be ſown the ſpring following, for they do not keep well. *Miller's Gard. Dict.*

The common wild Parſnep is frequent by road ſides, and in dry paſtures; it flowers in autumn, and ripens its ſeed ſoon after. The ſeeds deſerve to be brought into uſe in medicine, much more than they are at preſent. They are warm and carminative, though not ſo violently hot as the caraway ſeeds and others which we commonly uſe on theſe occaſions. They diſpel flatuſes, and are in great eſteem among the country people, for curing the cholic. They alſo are diuretic and aperient, and gently promote the menſes.

PARTI'TION, in huſbandry. The Partitions in land ſown with wheat by the drill, for the horſe-hoeing huſbandry, are different, according as the wheat is ſown, in double, treble, or quadruple rows. The double row has but one Partition, and this is beſt to be uſed in caſes where the land is ſuſpected to be full of the ſeed of weeds, which muſt be taken out with the hand-hoe. This Partition ſhould be twelve or fourteen inches wide. Whole fields drilled in theſe rows may be hand-hoed at the expence of four ſhillings an acre; and, when there is but one foot in ſix, the price of that work ought to be proportionable.

The common width of the two Partitions, when the wheat is ſown in treble rows, is ſix or eight inches. Care is to be taken in this particular; for, if they are planted cloſer, they will ſtarve one another before the intervals are hoed to give them a freſh ſupply of nouriſhment; and, if they are planted too far aſunder, the two outer rows will thrive well, but the middle row will be ſtarved, and look worſe and weaker, becauſe of its being alſo a greater diſtance from the hoed intervals. In quadruple rows the Partitions are beſt to be ſeven inches wide each; at this diſtance the plants will thrive ſufficiently, and, if they are ſet nearer, the whole will be worſe; and, if farther off, the outer rows will thrive, but the two inner ones will be ſtarved, by reaſon of their diſtance from their plowed intervals.

PA'RTRIDGE, *perdix*, in ornithology.— The Partridge is a timorous and ſimple bird, and is ſo valuable at the table, that there are a great many ways of taking it invented by the ſportſmen, all of which ſucceed from the folly and fear of the animal.

The places that Partridges moſt delight in, are corn fields, eſpecially while the corn grows; for that is a ſafe retreat, where they remain undiſturbed, and under which they uſually breed. They frequent the ſame fields after the corn is cut down, and that with another intent; for they then feed on the corn that has fallen from the ears, and find a ſufficient ſhelter for them under covert of the ſtalks, eſpecially thoſe of wheat ſtubble. When the wheat ſtubble is much trodden by men or beaſts, they retire to the barley ſtubble, and will there hide themſelves in coveys of twenty or thirty. When the winter comes on, and the ſtubble fields are trodden down or plowed up, they then retire to the upland meadows, where they lodge in the high graſs, and among the ruſhes; ſometimes they reſort to the low coppice woods, eſpecially if there be corn lands near them.

Red-legged **PARTRIDGE**, a very delicate and valuable bird, called cutumo by the Italians.

It is diſtinguiſhed from the common Partridge by the redneſs of its beak and legs. It is of a greyiſh aſh-colour on the back; its throat is white near the head, but has a ſmall black ſpot on each ſide at the angle of the bill, and this white ſpace is ſurrounded by a black line; its breaſt is of a yellowiſh brown, and its wings are variegated with black, yellowiſh, and white. It is not found in England, but is ſometimes ſhot in the iſlands of Guernſey and Jerſey. *Ray's Ornithology.*

PA'RTY-*china*, a name given by the Engliſh merchants and others to a ſort of porcelain or China ware, which is elegantly painted on the outſide with ſome bright colour, and blotted or variegated with round or ſquare ſpots of a different tinge. The manner in which the Chineſe do this is a very ſimple and eaſy one, and may be imitated in our own potteries with great eaſe. They prepare as many pieces of paper as they intend to have ſpots on the veſſel, and cut them exactly into the ſhape of thoſe ſpots: they wet theſe, and then ſpread them ſmoothly on the places where the ſpots are to be. When this is done, they cover the veſſel with the brown and gold, or any other varniſh, and then take off the papers: in the places which they covered no varniſh has come, ſo that they are ſo many regular white ſpaces. Theſe they cover with ſome other colour, laying it on carefully with a pencil: when this is done, they varniſh over the whole veſſel with the common varniſh, and bake it. In ſome veſſels they lay on only plain blue, or plain black, in the ſpaces deſigned for ſpots; and, after the firſt baking, they cover theſe with gold, and make them ſo many figures of ſquares, triangles, or globes in pure gold. *Obſerv. ſur les Coutumes de l'Aſie.*

PA'SSION (*Dict.*)— Dr. Cheyne conſiders the Paſſions as either ſpiritual or animal:— ſpiritual Paſſions he defines to be thoſe ſentiments produced in the ſoul by external objects, either ſpiritual ones immediately, or material ones by the meditation of the organs of the body.

Animal Paſſions he defines to be thoſe effects produced by ſpirits or bodies, immediately on the body.

Hence, as outward objects may be conſidered either as goods or evils; the moſt natural diviſion of the Paſſions, whether ſpiritual or animal, as they regard thoſe objects, is into pleaſurable and painful.

And, in this ſenſe, all the Paſſions may be reduced to love and hatred; of which joy and ſorrow, hope and fear, are only ſo many modifications or complexions, according to the various appearances, poſitions, &c. of the object.

In effect, all the Paſſions may not only be reduced to two, viz. love and hatred; but, perhaps, to one, love; and even that may be all reſolved into ſelf-love; and this into a principle of ſelf-preſervation, or neceſſary invincible deſire of pleaſure, or happineſs.— The reſt are only rivulets from this ſource, or ſpecial applications of this principle to particular occaſions. Thus, the deſire of any thing, under the appearance of its goodneſs, ſuitableneſs, or neceſſity to our happineſs, conſtitutes the Paſſion of love: the deſire of eſchewing or avoiding any thing, apprehended to be miſchievous, hurtful, or deſtructive, conſtitutes hatred or averſion: the deſire of a good, which appears at the ſame time probable, and in our power, conſtitutes hope; but, if the good appear improbable, difficult, or impoſſible, it conſtitutes fear or deſpair: the unexpected gratification of deſire is joy: the deſire of happineſs to another under pain, or ſuffering, is compaſſion; and the deſire of another's puniſhment, revenge, or malice, &c.

The ſingle deſire of happineſs, then, is the ſpring or motive of all our Paſſions; as thoſe are of all our actions. Some wiſe and reaſonable motive, or end of action, ſays Dr. Morgan, is certainly neceſſary to all wiſe and reaſonable action; to act without a motive would be the ſame thing as not to act at all, that is, ſuch an action could anſwer no farther or better end than not acting; and conſequently the action, as well as the agent, would be ſo far inſignificant and uſeleſs. He who ſhould have no object at all of his love or averſion, hope or fear, joy or grief, muſt be ſimply and purely indifferent to all action; and conſequently muſt either be in a ſtate of perfect reſt and inaction, or in a ſtate equivalent thereto; wherein the action of ſuch a being could be of no more ſignificancy, than the uncertain fluctuation of an atom, or the quivering of a feather in the air.

The natural, or occaſional cauſe of all the Paſſions, Malebranche makes to be the motion of the animal ſpirits, which are diffuſed through the body to produce and preſerve a diſpoſition therein ſuitable to the object perceived; to the end, that the body and mind may mutually aſſiſt each other on this occaſion; it being the order of the Creator, that our wills be followed by motions of the body proper to execute them; and that the motions of the body mechanically excited in us by the view of external objects, be accompanied with a Paſſion of the ſoul which inclines to will or nill what appears ſerviceable or noxious to the body.

It is a continual impreſſion of the will of the Creator, that unites us thus intimately to a piece of matter, and occaſions this reciprocation of motions and ſenſations; were this impreſſion of the Creator's will ſuſpended a moment, we ſhould be delivered from all dependence, all Paſſions, &c. For what people uſually imagine of a neceſſary connection between the motions of the ſpirits and blood, and the emotions of the ſoul, is inconceivable.

Certain little parts of the bile, ſay they, move with ſome violence among the fibres of the brain: therefore the ſoul muſt neceſſarily be agitated with ſome Paſſion, and this Paſſion muſt be anger, rather than love. What relation can we conceive between the faults of an enemy, a Paſſion of contempt or hatred, and a bodily motion of the parts of the blood ſtriking againſt certain parts of the brain? How can the union or alliance of two things ſo different as ſpirit and matter be effected, but by the omnipotent will of the author of nature?

It is a point, about which, the divines and philoſophers can never agree, whether this relation and connection of thoughts of the mind and motions of the body be the gift of nature, or the puniſhment of the firſt ſin; and whether the Paſſions be the inſtitution of nature, or the corruption thereof? Indeed, conſidering the good and wiſe purpoſes the Paſſions ſerve, and that abſolute neceſſity they are of, it is ſurpriſing it ſhould ever be doubted, that they are eſſential to human nature.

PASTES, in the glaſs-trade, a ſort of compoſitions of the glaſs kind, made from calcined cryſtal, lead, and metallic preparations, to imitate the ſeveral natural gems. Theſe are no way inferior to the native ſtones, when carefully made and well poliſhed, in brightneſs or tranſparency, but want their hardneſs.

The general rules to be obſerved in the making them are theſe: 1. That all the veſſels in which they are made are firmly luted, and the lute left to dry before they are put into the fire. 2. That ſuch veſſels are choſen for the work as will bear the fire well. 3. That the powders be prepared on the porphyry ſtone, not in a metal mortar, which would communicate a tinge to them. 4. That the juſt proportion in the quantities of the ſeveral ingredients be nicely obſerved. 5. That the materials be well mixed; and, if not ſufficiently baked the firſt time, to be committed to the fire again, without breaking the pot; for, if this be not obſerved, they will be full of bliſters and air bladders. 6. That a ſmall vacuity be always left at the top of the pot, to give room to the ſwelling of the ingredients. *Neri's Art of Glaſs.*

To make a Paſte of extreme hardneſs, and capable of all the colours of the gems, with great luſtre and beauty, take, of prepared cryſtal, ten pounds; ſalt of polverine, ſix pounds; ſulphur of lead, two pounds; mix all theſe well together into a fine powder, make the whole, with common water, into a hard Paſte, and make of this Paſte ſmall cakes, of about three ounces weight each, within them, in their middle; dry theſe in the ſun, and afterwards calcine them in the ſtraighteſt part of a potter's furnace; after this, powder them, and levigate them to a perfect fineneſs on a porphyry, and ſet this powder in pots in a glaſs furnace to purify for three days; then caſt the whole into water, and afterwards return it into the furnace, where let it ſtand fifteen days; in which time all foulneſs and bliſters will diſappear, and the Paſte will greatly reſemble the natural jewels. To give this the colour of the emerald, add to it braſs, thrice calcined: for a ſea green, braſs ſimply calcined to a redneſs: for a ſapphire, add zaffer, with manganeſe: and, for a topaz, manganeſe and tartar. All the gems are thus imitated in this, by the ſame way of working as the making the coloured glaſſes; and this is ſo hard, that they very much approach to the natural gems. *Neri's Art of Glaſs.*

The colours, in all the counterfeit gems made of the ſeveral Paſtes, may be made deeper or lighter, according to the works for which the ſtones are deſigned; and it is a neceſſary general rule, that ſmall ſtones for rings, &c. require a deeper colour, and large ones a paler. Beſides the colours made from manganeſe, verdigreaſe, and zaffer, which are the ingredients commonly uſed, there are other very fine ones, which care and ſkill may prepare: very fine red may be made from gold, and not much inferior to that from iron; a very fine green from braſs or copper, and a ſky colour from ſilver; and a much finer one from the common ſmall garnets of Bohemia, which are of little value. The gems alſo afford glorious colours, like their own. *Neri's Art of Glaſs.*

The fine blue from ſilver is, probably, only from the ſmall quantity of copper uſed in the alloy.

A very ſingular and excellent way of making the Paſte to imitate the coloured gems, is this: take a quantity of ſaccharum ſaturni, or ſugar of lead, made with vinegar, in the common way; ſet it in ſand, in a glaſs body well luted from the neck downwards; leave the mouth of the glaſs open, and continue the fire twenty-four hours; then take out the ſalt, and, if it be not red, but yellowiſh, powder it fine and return it into the veſſel, and keep it in the ſand-heat twenty-four hours more, till it becomes as red as cinnabar. The fire muſt not be made ſo ſtrong as to melt it, for, then, all the proceſs is ſpoiled. Pour diſtilled vinegar on this calcined ſalt, and ſeparate the ſolution from the dregs; let the decanted liquor ſtand ſix days in an earthen veſſel, to give time to the finer ſediment to ſubſide; filtre this liquor, and evaporate it in a glaſs body, and there will remain a moſt pure ſalt of lead; dry this well, then diſſolve it in fair water; let the ſolution ſtand ſix days in a glazed pan; let it ſubſide; then filtre the clear ſolution, and evaporate to a yet more pure white and ſweet ſalt; repeat this operation three times; put the now perfectly pure ſalt into a glaſs veſſel, ſet it in a ſand heat for ſeveral days, and it will be calcined to a fine impalpable powder, of a lively red. This is called the ſulphur of lead. *Neri's Art of Glaſs.*

Take all the ingredients as in the common compoſition of the Paſtes of the ſeveral colours, only, inſtead of red-lead, uſe this powder, and the produce will well reward the trouble of the operation, as experience has often proved.

PASTURE.—Paſture ground is of two ſorts: the one is low meadow land, which is often overflowed; and the other is upland, which lies high and dry. The firſt of theſe will produce a much greater quantity of hay than the latter, and will not require manuring or dreſſing ſo often: but then the hay produced on the upland is much preferable to the other; as is alſo the meat which is fed in the upland more valued than that which is fatted in rich meadows: though the latter will make the fatter and larger cattle, as is ſeen by thoſe which are brought from the low rich lands in Lincolnſhire. But where people are nice in their meat, they will give a much larger price for ſuch as hath been fed on the downs, or in ſhort upland Paſture, than for the other, which is much larger. Beſides this, dry Paſtures have an advantage over the meadows, that they may be fed all the winter, and are not ſo ſubject to poach in wet weather; nor will there be ſo many bad weeds produced; which are great advantages, and do, in a great meaſure, recompenſe for the ſmallneſs of the crop.

I have already mentioned the advantages of meadow land, or ſuch as is capable of being overflowed with water, and given directions for draining and improving low Paſture land, under the article LAND; therefore ſhall not repeat that here, but juſt mention ſome methods for improving of upland Paſture.

The firſt improvement of upland Paſture is, by fencing it, and dividing it into ſmall fields of four, five, ſix, eight, or ten acres each, planting timber trees in the hedge-rows, which will ſcreen the graſs from the drying pinching winds of March, which prevent the graſs from growing in large open lands; ſo that, if April proves a dry month, the land produces very little hay; whereas in the ſheltered fields the graſs will begin to grow early in March, and will cover the ground, and prevent the ſun from parching the roots of the graſs, whereby it will keep growing, ſo as to afford a tolerable crop, if the ſpring ſhould prove dry. But, in fencing of land, it muſt be obſerved, as was before directed, not to make the incloſures too ſmall, eſpecially where the hedge-rows are planted with trees; becauſe, when the trees are advanced to a conſiderable height, they will ſpread over the land; and, where they are cloſe, will render the graſs ſour; ſo that, inſtead of being an advantage, it will greatly injure the Paſture.

The next improvement of upland Paſture is, to make the turf good, where, either from the badneſs of the ſoil, or for want of proper care, the graſs hath been deſtroyed by ruſhes, buſhes, or mole-hills. Where the ſurface of the land is clayey and cold, it may be improved by paring it off, and burning it in the manner before directed: but, if it is an hot ſandy land, then chalk, lime, marl, or clay, are very proper manures to lay upon it: but this ſhould be laid in pretty good quantities otherwiſe it will be of little ſervice to the land.

If the ground is over-run with buſhes or ruſhes, it will be a great advantage to the land to grub them up towards the latter part of the ſummer; and after they are dried, to burn them, and ſpread the aſhes over the ground juſt before the autumnal rains; at which time the ſurface of the land ſhould be levelled, and ſown with graſs ſeed, which will come up in a ſhort time, and make good graſs the following ſpring. So, alſo, when the land is full of mole-hills, theſe ſhould be pared off, and either burnt for the aſhes, or ſpread immediately on the ground, when they are pared off, obſerving to ſow the bare patches with graſs ſeed, juſt as the autumnal rains begin.

Where the land has been thus managed, it will be of great ſervice to roll the turf, in the months of February and March, with an heavy wood roller; always obſerving to do it in moiſt weather, that the roll may make an impreſſion: this will render the ſurface level, and make it much eaſier to mow the graſs, than when the ground lies in hills; and will alſo cauſe the turf to thicken, ſo as to have what the people uſually term a good bottom. The graſs, likewiſe, will be the ſweeter for this huſbandry, and it will be a great help to deſtroy bad weeds.

Another improvement of upland Paſtures is, the feeding of them: for, where this is not practiſed, the land muſt be manured at leaſt every third year; and where a farmer hath much arable land in his poſſeſſion, he will not care to part with his manure to the Paſture. Therefore every farmer ſhould endeavour to proportion his Paſture to his arable land, eſpecially where manure is ſcarce, otherwiſe he will ſoon find his error; for the Paſture is the foundation of all the profit which may ariſe from the arable land.

Whenever the upland Paſtures are mended by manure, there ſhould be a regard had to the nature of the ſoil, and a proper ſort of manure applied: as, for inſtance, all hot ſandy land ſhould have a cold manure; neat's dung and ſwine's dung are very proper for ſuch lands; but, for cold lands, horſe dung, aſhes, and other warm manures, are proper. And, when theſe are applied, it ſhould be done in autumn, before the rains have ſoaked the ground, and rendered it too ſoft to cart on; and it ſhould be carefully ſpread, breaking all the clods as ſmall as poſſible, and then harrowed with buſhes, to let it down to the roots of the graſs. When the manure is laid on at this ſeaſon, the rains in winter will waſh down the ſalts, ſo that the following ſpring the graſs will receive the advantage of it.

There ſhould alſo be great care had to the deſtroying of weeds in the Paſture every ſpring and autumn: for, where this is not practiſed, the weeds will ripen their ſeeds, which will ſpread over the ground, and thereby fill it with ſuch a crop of weeds as will ſoon overbear the graſs, and deſtroy it; and it will be very difficult to root them out, after they have gotten ſuch poſſeſſion; eſpecially ragwort, and ſuch other weeds as have down adhering to their ſeeds.

Theſe upland Paſtures ſeldom degenerate the graſs which is ſown on them, if the land is tolerably good: whereas the low meadows, which are overflowed in winter, in a few years turn to an harſh ruſhy graſs, though the upland will continue a fine ſweet graſs for many years without renewing.

There is no part of huſbandry, of which the farmers are in general more ignorant than that of the Paſture: moſt of them ſuppoſe, that when old Paſture is plowed up, it can never be brought to have a good ſward again: ſo, their common method of managing their land, after plowing, is, to ſow, with their crop of barley, ſome graſs ſeeds, as they call them; that is, either the red clover, which they intend to ſtand two years after the corn is taken off the ground, or rye graſs, mixed with trefoil: but as all theſe are, at moſt, but biennial plants, whoſe roots decay ſoon after their ſeeds are perfected; ſo, the ground, having no crop upon it, is again plowed for corn: and this is the conſtant round which the lands are employed in, by the better ſort of farmers; for I never have met with one of them, who had the leaſt notion of laying down their land to graſs for any longer continuance; therefore, the ſeeds which they uſually ſow, are the beſt adapted for this purpoſe.

But, whatever may have been the practice of theſe people, I hope to prove, that it is poſſible to lay down land, which has been in tillage, with graſs, in ſuch a manner, as that the ſward ſhall be as good, if not better, than any natural graſs, and of as long duration. But this is never to be expected, in the common method of ſowing a crop of corn with the graſs ſeeds: for, wherever this has been practiſed, if the corn has ſucceeded well, the graſs has been very poor and weak; ſo that, if the land has not been very good, the graſs has ſcarcely been worth ſaving: for the following year it has produced but little hay, and the year after the crop is worth little, either to mow or feed. Nor can it be expected to be otherwiſe; for the ground cannot nouriſh two crops: and, if there were no deficiency in the land, yet the corn, being the firſt, and moſt vigorous of growth, will keep the graſs from making any conſiderable progreſs; ſo that the plants will be extremely weak, and but very thin, many of them, which came up in the ſpring, being deſtroyed by the corn; for, whenever there are roots of corn, it cannot be expected there ſhould be any graſs. Therefore, the graſs muſt be thin, and, if the land is not in good heart, to ſupply the graſs with nouriſhment, that the roots may branch out after the corn is gone, there cannot be any conſiderable crop of clover: and, as their roots are biennial, many of the ſtrongeſt plants will periſh ſoon after they are cut; and the weak plants, which had made but little progreſs before, will be the principal part of the crop for the ſucceeding year: which is many times not worth ſtanding.

Therefore, when ground is laid down for graſs, there ſhould be no crop of any kind ſown with the ſeeds; and the land ſhould be well plowed, and cleaned from weeds; otherwiſe the weeds will come up the firſt, and grow ſo ſtrong, as to overbear the graſs, and, if they are not pulled up, will intirely ſpoil it. The beſt ſeaſon to ſow the graſs ſeeds upon dry land is, about the middle of September, or ſooner, if there is an appearance of rain: for, the ground being then warm, if there happen ſome good ſhowers of rain after the ſeed is ſown, the graſs will ſoon make its appearance, and get ſufficient rooting in the ground before winter; ſo will not be in danger of having the roots turned out of the ground by the froſt, eſpecially if the ground is well rolled before the froſt comes on, which will preſs it down, and fix the earth cloſe to the roots. Where this hath not been practiſed, the froſt has often looſened the ground ſo much, as to let in the air to the roots of the graſs, and done it great damage; and this has been brought as an objection to the autumnal ſowing of graſs: but it will be found to have no weight, if the above direction is practiſed: nor is there any hazard of ſowing the graſs at this ſeaſon, but that of dry weather, after the ſeeds are ſown; for, if the graſs comes up well, and the ground is well rolled in the end of October, or the beginning of November, and repeated again the beginning of March, the ſward will be cloſely joined at bottom, and a good crop of hay may be expected the ſame ſummer. But, where the ground cannot be prepared for ſowing at that ſeaſon, it may be performed the middle or latter end of March, according to the ſeaſon's being early or late; for, in backward ſprings, and in cold land, I have often ſowed the graſs in the middle of April, with ſucceſs: but there is danger, in ſowing late, of dry weather, and eſpecially if the land is light and dry; for I have ſeen, many times, the whole ſurface of the ground removed by ſtrong winds at that ſeaſon; ſo that the ſeeds have been driven in heaps to one ſide of the field. Therefore, whenever the ſeeds are ſown late in the ſpring, it will be proper to roll the ground well ſoon after the ſeeds are ſown, to ſettle the ſurface, and prevent its being removed.

The ſorts of ſeeds which are the beſt for this purpoſe, are, the beſt ſort of upland hay ſeeds, taken from the cleaneſt Paſtures, where there are no bad weeds: if this ſeed is ſifted to clean it from rubbiſh, three buſhels will be ſufficient to ſow an acre of land. The other ſort is the trifolium pratenſe album, which is commonly known by the names of white Dutch clover, or white honey-ſuckle graſs. Eight pounds of this ſeed will be enough for one acre of land. The graſs ſeed ſhould be ſown firſt, and then the Dutch clover ſeed may be afterwards ſown: but they ſhould not be mixed together; becauſe the clover ſeeds, being the heavieſt, will fall to the bottom, and conſequently the ground will be unequally ſown.

When the ſeeds are come up, if the land ſhould produce many weeds, theſe ſhould be drawn out before they grow ſo tall as to overbear the graſs: for, where this has been neglected, the weeds have taken ſuch poſſeſſion of the ground, as to keep down the graſs, and ſtarve it; and, when theſe weeds have been ſuffered to remain until they have ſhed their ſeeds, the land has been ſo plentifully ſtocked with them, as intirely to deſtroy the graſs: therefore it is one of the principal parts of huſbandry, never to ſuffer weeds to grow on the land.

If the ground is rolled two or three times, at proper diſtances after the graſs is up, it will preſs down the graſs, and cauſe it to make a thicker bottom: for, as the Dutch clover will put out roots from every joint of the branches which are near the ground, ſo, by preſſing down of the ſtalks, the roots will mat ſo cloſely together, as to form a ſward ſo thick as to cover the whole ſurface of the ground, and form a green carpet; and will better reſiſt the drought. For, if we do but examine the common Paſtures in ſummer, in moſt of which there are patches of this white honey-ſuckle graſs growing naturally, we ſhall find theſe patches to be the only verdure remaining in the fields. And this, the farmers in general acknowledge, is the ſweeteſt feed for all ſorts of cattle; yet never had any notion of propagating it by ſeeds: nor has this been long practiſed in England; for, till within a few years, that ſome curious perſons imported the ſeed from Brabant, where it had been long cultivated, there was not any of the ſeeds ſaved in England; though now there are ſeveral perſons who ſave the ſeeds here, which ſucceed full as well as any of the foreign ſeeds which are imported.

As the white clover is an abiding plant, ſo it is certainly the very beſt ſort to ſow, where Paſtures are laid down to remain: for as the hay ſeeds which are taken from the beſt Paſtures, will be compoſed of various ſorts of graſs; ſome of which may be but annual, and others biennial; ſo, when thoſe go off, there will be many and large patches of ground left bare and naked, if there is not a ſufficient quantity of the white clover, to ſpread over and cover the land. Therefore, a good ſward can never be expected, where this is not ſown: for, in moſt of the natural Paſtures, we find this plant makes no ſmall ſhare of the ſward; and it is equally good for wet and dry land, growing naturally upon gravel and clay, in moſt parts of England: which is a plain indication how eaſily this plant may be cultivated, to great advantage, in moſt ſorts of land throughout this kingdom.

Therefore, the true cauſe why the land which has been in tillage, is not brought to a good turf again, in the uſual method of huſbandry, is, from the farmers not diſtinguiſhing which graſſes are annual from thoſe which are perennial: for, if annual or biennial graſſes are ſown, theſe will of courſe ſoon decay; ſo that, unleſs where ſome of their ſeeds may have ripened and fallen, nothing can be expected on the land but what will naturally come up. Therefore this, with the covetous method of laying down the ground with a crop of corn, has occaſioned the general failure of increaſing the Paſture in many parts of England, where it is now much more valuable than any arable land.

After the ground has been ſown in the manner before directed, and brought to a good ſward, the way to preſerve it good is, by conſtantly rolling the ground with an heavy roller, every ſpring and autumn, as hath been before directed. This piece of huſbandry is rarely practiſed by farmers: but thoſe who do, find their account in it; for it is of great benefit to the graſs. Another thing ſhould alſo be carefully performed; which is, to cut up docks, dandelion, knapweed, and all ſuch bad weeds, by their roots every ſpring and autumn: this will increaſe the quantity of good graſs, and preſerve the Paſtures in beauty. Dreſſing of theſe Paſtures every third year is alſo a good piece of huſbandry; for otherwiſe it cannot be expected the ground ſhould continue to produce good crops. Beſides this, it will be neceſſary to change the ſeaſons of mowing, and not to mow the ſame ground every year; but to mow one ſeaſon, and feed the next: for, where the ground is every year mown, it muſt be conſtantly dreſſed, as are moſt of the graſs grounds near London, otherwiſe the ground will be ſoon exhauſted. *Miller's Gard. Dict.*

PASTURE *of plants.* See the article FOOD *of plants.*

PATELLA (*Dict.*)—*Fracture of the* PATELLA. The Patella, or knee pan, is much more ſubject to a tranſverſe fracture than to one in any other direction. The longitudinal fracture of this bone happens more rarely, but, when it does, is much more eaſily cured; becauſe the fragments of the bone, in this caſe, generally keep in their right places, but, when the bone is broken, not only tranſverſly, but into ſeveral pieces, the caſe is yet more difficult and dangerous. The cure of this fracture muſt be attempted in this manner: in a longitudinal or perpendicular fracture, the patient muſt be laid upon his back, and, extending the foot, the ſurgeon muſt replace the fragments on both ſides with the preſſure of his hands, binding them up carefully with the uniting bandage; which muſt be applied in this caſe in the ſame manner with that uſed in large wounds in the belly or forehead. But when the Patella is broken tranſverſely, or into ſeveral pieces, the patient being laid in the ſame poſture, and extending his foot as before, the ſurgeon is with great care to endeavour, with the palms of both hands, aſſiſted by his fingers and thumbs, to bring together and replace the fragments in their natural ſituation; and, when that is done, they muſt be retained firmly together, by means of a plaiſter made in form of a half-moon, or properly perforated, and then the foot and leg are to be bound up, and placed ſo that they cannot be eaſily moved: but, to prevent the bone from being diſplaced again, the patient muſt not uſe his leg, till after the ninth or tenth week. *Heiſter's Surgery.*

PATELLA *luxated.* The Patella is moſt uſually luxated either on the internal or external ſide of the joint, though phyſicians give accounts of its being ſometimes luxated both above and below it. Whenever the knee itſelf is perfectly luxated, the Patella can ſcarce avoid being diſplaced at the ſame time, becauſe of its ſtrong connection to the thigh and to the tibia.

The reduction of a luxated Patella is uſually no great difficulty.

The patient is to be laid flat on his back on a table or bed, or upon an even floor, ſo that his leg may be pulled out ſtraight by an aſſiſtant; when this is ſufficiently extended, the ſurgeon muſt graſp the Patella with his fingers, and afterwards, by the aſſiſtance of his hand, preſs it ſtrongly into its proper place. This may be alſo poſſibly affected, while the patient ſtands upright: when this is done, there remains nothing but carefully to bind up the part, and let the patient reſt for ſome days; ſometimes gently bending and extending his leg in the mean while, that it may not become ſtiff. *Heiſter's Surgery.*

PATELLA, *the limpit*, in natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe: it is an univalve ſhell, of a gibboſe ſhape, always fixed in its natural ſtate to a rock or to ſome other hard body, and having its apex or ſummit ſometimes ſharp-pointed, ſometimes obtuſe, ſometimes ſtraight, ſometimes crooked, ſometimes whole, and ſometimes perforated. There are ſeveral ſpecies of each of theſe kinds.

PATELLA, in the hiſtory of inſects, a name given by Liſter, and ſome others, to a certain little huſk or ſhell found on the bark of the cherry, plum, and roſe-trees, and ſome others, containing an animal within, and uſeful in colouring. Theſe Patella are of a globular form, except when they adhere to the tree, and are of a ſhining cheſnut colour in moſt kinds. The huſk itſelf ſtrikes a very fine crimſon colour on paper, and within it is found a white maggot of no value: this, in time, hatches into a very ſmall but beautiful bee. The whole ſize of this bee is not more than that of half the body of an ant. They have the ſting of bees, and the three ſpots placed in a triangle on the forehead, which are ſuppoſed to be eyes. They are black, and have a large round whitiſh or pale yellow ſpot upon the back. The upper pair of wings are ſhaded and ſpotted, but the under pair are clear.

The ſhells or huſks deſerve a trial, to find whether the colour they yield might not be brought to uſe; it is to be obſerved, that the deepeſt-coloured huſks afford the fineſt and deepeſt purple: they muſt be alſo uſed, while the creature contained in them is in the maggot form; for, when it is changed into the bee ſtate, the ſhell is dry and colourleſs. Dr. Liſter, who firſt obſerved theſe Patella, went ſo far on the comparing them with the common kermes, as to declare that they were of the ſame nature with that production; but his hiſtory of their being the workmanſhip of a bee, to preſerve her young maggot in, is not agreeable to the true hiſtory of the kermes; for that is an inſect of a very peculiar kind. This author has been too juſtly cenſured for his precipitancy in judging of things, and perhaps has fallen into an error by means of it here.

It is very poſſible that theſe Patella may be the ſame ſort of animal with the kermes, but then it produces its young within this ſhell or huſk, which is no other than the ſkin of the body of the mother animal; but as there are many flies, whoſe worms or maggots are lodged in the bodies of other animals, it may be, that this little bee here deſcribed may love to lay its egg in the body of the proper inſect here deſcribed, and the maggot hatched from that egg may eat up the proper progeny, and, undergoing its own natural changes there, iſſue at length in form of the bee. This may have been the caſe in ſome few which Dr. Liſter examined, and he may have been miſled by this to ſuppoſe it the natural change of the inſect. *Philoſ. Tranſact.* N°. 72.

PA'TER *patratus*, among the Romans, the firſt and principal perſon of the college of heralds, which formed a kind of board or council to examine the differences that aroſe between neighbouring ſtates, and endeavour amicably to accommodate the ſame. *Danet in voc.*

PA'VIA, *the ſcarlet-flowering horſe-cheſnut*, in botany, a genus of plants, whoſe characters are:

The leaves are like thoſe of the horſe-cheſnut, and conjugated; but ſo diſpoſed, as to have every conſequent order croſs the preceding. The end of the pedicle becomes a long tubulous red calyx, of the ſame colour with the flower, with a margin divided into ſix ſegments. Within the calyx grows an anomalous pentapetalous flower, ſo diſpoſed, as, with its five petals, to reſemble a monopetalous bilabiated flower; for the two upper petals, in conjunction, form a kind of galea; the two lateral ones, the jaws, and the under one, the beard. The flower incloſes eight ſtamina, each furniſhed with its apex, and the flowers are diſpoſed in ſpikes. The ovary in the bottom of the calyx, ſhooting forth a long, cylindrical, red tube, becomes a tricapſular, tricoccous fruit, containing globular ſeed.

PEACH, *perſica*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of many petals, arranged in a circular form. The piſtil ariſes from the cup, and finally becomes a fleſhy fruit of a roundiſh figure, ſulcated lengthwiſe, and containing a ſtone rough and full of irregular holes, containing an oblong kernel.

The curious in fruits account twenty-eight ſorts of Peaches, but many of them ſeem very trifling diſtinctions. The fineneſs of this fruit, in general, depends on the firmneſs of the pulp, the delicacy of the flavour, and the thinneſs of the ſkin. A fine Peach ſhould be of a fine deep red next the ſun, and of a pale whitiſh hue next the wall; and the pulp ſhould be of a yellowiſh caſt, and very juicy; and the ſtone ſhould be ſmall, though the fruit in general be large.

The varieties of the Peach are produced, like thoſe of the fine flowers, by ſowing the ſeeds; and, though many raiſed this way will be of little value, as is alſo the caſe in flowers, yet probably among a parcel of ſtones, ſaved from the finer kinds of Peaches, there would be ſome new kinds produced; which, as they were raiſed here, would be eaſily kept up in their perfection; which is not to be expected of thoſe brought from other countries.

The beſt method of ſaving the ſtones is, to let ſome of the fineſt Peaches of the beſt kinds hang till they drop of themſelves from the tree, and, then, the ſtones ſhould be immediately planted on a bed of light rich earth, planting them four inches deep in the earth, and at about ſix inches aſunder. The beds ſhould be covered, to preſerve them in winter; and in ſpring, when the trees come up, they muſt be cleared of weeds, and well watered. The next ſpring they ſhould be carefully taken up, and planted in the nurſery at greater diſtances; and, after two or three years ſtanding here, they may be removed to the places where they are to remain; or they may at that time, when the condition of their fruit is known, be grafted on other ſtocks, which is the common way now uſed to propagate theſe trees.

The common method of propagating the Peach is, by grafting. In order to this, ſome good ſtocks ſhould be provided, which ſhould be of the muſcle, or a white pear plum. When theſe ſtocks are two or three years old, they will be ſtrong enough to bud; and the common ſeaſon for doing this is about Midſummer. The buds ſhoulds be choſen from a healthy tree, which produces a great deal of fruit: they muſt be taken from the trees either in a cloudy day, or elſe in the morning or evening, when the ſun has not much power: they ſhould then be inoculated on the ſtalks as ſoon as poſſible, and the ſtalks treated with the uſual care afterwards. See INOCULATION.

When theſe are to be tranſplanted where they are to remain, the moſt proper ſoil for them is a light rich paſture land, taken up with the turf, and rotted together, before it is to be uſed; and the borders to be made with this cannot be too wide, and ought to be raiſed five or ſix inches above the level of the ground; or, if the ſoil be moiſt, more than that. They muſt be tranſplanted in autumn, as ſoon as the leaves are fallen off; and ſhould never be ſet at leſs than fourteen feet diſtance from one another. The heads of the trees are then to be raiſed up againſt the walls, to keep the roots from being moved by the winds; and they ſhould be watered at times, with a noſe on the watering pot, and the water ſprinkled all over them. In the middle of May the new ſhoots are to be nailed to the wall, training them horizontally; and the foreright ſhoots are to be rubbed off: in October, the new branches ſhould be pruned, ſhortening them according to the ſtrength of the tree; if ſtrong, they may be left eight inches long; if weak, they ſhould only be left five; and the ſame care is to be taken of them for the ſucceeding years.

There are two general rules always to be obſerved in the pruning of Peach and nectarine trees, which are, 1. Always to have enough bearing wood. 2. Not to lay in the branches too cloſe to one another. All Peach-trees produce their fruit from the young wood, either of the ſame, or, at the moſt, of the former year's ſhoot; for this reaſon the branches are to be ſo pruned, as to encourage them to throw out new ſhoots in every part of the tree: and this is to be done in May, when, by pinching, or ſtopping the ſtrong ſhoots, there may be new wood forced out in any part of the tree. This is the method of the ſummer pruning; the winter pruning is uſually done in February or March, but is much better done at Michaelmas, as ſoon as their leaves begin to fall; and the wounds will then have time to heal before the ſevere froſts come on.

In pruning of theſe trees it muſt always be obſerved alſo, that it is beſt done under a wood bud, not a bloſſom bud; which may be diſtinguiſhed by the wood buds being leſs turgid, and longer, and narrower than the bloſſom bud; for, if the ſhoot have not a leading bud where it is cut, it will commonly die down to the leading bud. In nailing the ſhoots to the wall, they ſhould be placed at as equal diſtances as poſſible, and ſo far apart that the leaves may have room; and they muſt always be trained as horizontally as poſſible, that the lower part of the tree may be well wooded, which it will not be, if the branches are ſuffered to run upright. *Miller's Gard. Dict.*

PEACH-*colour*, the pale red colour of the bloſſoms of the Peach-tree.

To give this beautiful colour to glaſs, add, at different times, and in ſmall quantities, the powder of prepared manganeſe to the maſs, for the making of lattimo, or milk-white glaſs, while in fuſion. This alone gives the Peach colour; but the metal muſt be immediately worked when of a right tinge, for the colour is very apt to go off. *Neri's Art of Glaſs.* See the article LATTIMO.

PEAR, *pyrus*, in botany. All the ſorts of Pears, propagated in gardens, are produced by budding, or grafting them upon ſtocks of their own kind, which are commonly called tree-ſtocks, or elſe upon the quince or white-thorn ſtocks; but the laſt are now generally diſuſed, the fruit produced this way being apt to be dry and mealy. The quince ſtocks are, however, in great eſteem for the trees deſigned for dwarfs or for walls; becauſe they do not let the ſhoots grow ſo faſt and luxuriant. But there are objections againſt even theſe, which are of ſome conſequence; for there are many kinds of Pear which will not do upon them, but will die, or become weak and good for nothing after three or four years; and the hard-breaking Pears are rendered very unpleaſant by being grafted on theſe ſtocks, while the buttery or melting ones are meliorated by them. And it is to be added, that no ſort of Pear will thrive upon a quince ſtock in a poor or gravelly ſoil.

PEAR-*trees* planted either againſt walls, or in eſpaliers, muſt not be placed nearer to one another than twenty feet. Pear-trees commonly produce their bloſſom buds firſt, at the extremity of their laſt year's ſhoots; the common way of pruning is very prejudicial, therefore, as it takes off the part which ſhould bear the fruit, and occaſions new ſhoots from the ſame branch, which will over-fill the tree with wood, the trees ſhould always be carefully looked over in ſummer, and all the foreright ſhoots taken off, by which means the fruit will not be overſhaded, and the trees will need but little winter pruning. The ſeveral ſorts of ſummer Pears all ripen beſt in eſpaliers, but the winter Pears require a ſouth-eaſt or ſouth-weſt, or elſe an eaſt wall. *Miller's Gard. Dict.*

It is ſaid that crabs and wild Pears, ſuch as grow in the wildeſt and moſt barren clefts, and on hills, may make the richeſt, ſtrongeſt, moſt pleaſant and laſting wines that England yields. See *Phil. Tranſ.* N°. 477.

PEARCH. See PERCA.

PEARCH-*glue*, in mechanics, the name of a kind of glue, of a remarkable ſtrength and purity, for the manufacture of which we are beholden to the Laplanders, from whom Scheffer has deſcribed it. They take a number of large Pearches, and, ſlitting them open, they carefully pick away the fleſh with a knife, ſo as to leave the ſkin pure. They put a number of theſe ſkins into a veſſel of warm water, which they expoſe to the ſun, and by that means keep it in a continual moderate heat for ſeveral days; when the ſcales become looſe by this maceration, they take out the ſkins and rub them clean off. The ſoft and clean ſkin remains then alone, and feels as ſoft as a wetted bladder. Theſe clean ſkins they throw into a ſmall quantity of freſh water, and boil them gently over the fire, ſtirring the whole together, and towards the end beating it forcibly with little ſticks. The ſkins by this means at length wholly diſſolve in the water, and the whole becomes a thick tranſparent liquor; which, when boiled as long as the thickneſs of it will permit, without burning, they pour it out on a flat ſtone, and, as it cools, they cut it into cakes exactly reſembling our glue, but that they want the coarſe reddiſh colour it has, and have no diſagreeable ſmell. When they would uſe this, they diſſolve it in more water, exactly as we do our glue. The bows of this people give us a very great proof of the ſtrength of this ſort of glue; they are made of two pieces faſtened together with it, and though put to the moſt forcible trials, as theſe people are very ſtrong, and uſe them in ſhooting bears, rain-deer, &c. yet the glue part is never known to ſtart. *Scheff. Hiſt. Lap.*

PEARL *colour*, in glaſs. This beautiful colour is given to glaſs in the following manner: put tartar calcined to a whiteneſs into putrified cryſtal, while in fuſion, at ſeveral times, in ſmall quantities, mixing it well every time, till the glaſs is become of the deſired colour, and, when it is, work it quick as can be, for it is a colour that is quickly gone. *Neri's Art of Glaſs.*

PEASE, *piſa*, in botany.—We have ſeveral ſorts of Peaſe cultivated for uſe in the gardens about London and elſewhere; and, as many people are deſirous of having them very early, it is a common practice to raiſe them on hot-beds. The method of doing this is, to ſow the Peaſe under warm hedges or walls. In the middle of October, when the plants are come up, their ſtalks are to be kept earthed up, and thus they are to remain till the beginning of January, or even till February, covering them againſt the ſevere froſts with Peaſe haulm, or other light covering. In January or February, there muſt be made a moderate hot-bed; the dung muſt be laid about two feet thick, and carefully beat down, and covered about ſix inches deep with light freſh earth; and, when the frames have been ſet on about four days, the plants muſt be planted in the earth, at a about a foot diſtance, in rows, and placed in each row at about two inches one from another. They muſt be watered and ſhaded till they have taken root, and then they muſt have as much air as may be; and, when they begin to fruit, they ſhould be watered more frequently than before, which will occaſion their producing a larger quantity of fruit.

The common dwarf-Pea is the ſort always uſed on this occaſion, as all the reſt ramble too much in their ſtalks.

The firſt ſort of Pea to be ſown to ſucceed thoſe on the hot-beds is the hot ſpur; of which the gardeners reckon three or four ſorts, which differ very little from each other; but that called the maſter's hot-ſpur is uſually preferred to the reſt. Theſe are to be ſown in October, as thoſe intended for the hot-bed, and treated every way in the ſame manner; but in ſpring theſe are ſubject to be deſtroyed by ſlugs and other vermin; the beſt method of deſtroying which is, to ſlake a little lime, and throw over the earth among the plants. For fear of this crop miſcarrying by the ſeverity of the weather, it is always proper to ſow two others after this, at the diſtance of a fortnight each; and after this there ſhould be no others ſowed till the end of January; and after theſe there ſhould be others at the beginning and end of February. To ſucceed theſe, which will ſupply the table with early Peaſe, the Spaniſh morotto, which is a large Pea, and a very plentiful bearer, ſhould be ſowed in rows on a clear plat of ground; the rows ſhould be two feet and a half diſtant, and the Peaſe dropped at an inch or two aſunder: theſe muſt be all very carefully covered two inches deep with earth, and the rooks, mice, &c. prevented from getting at them. A fortnight after this another ſpot ſhould be ſowed with this or ſome other large Pea, and this continued every fortnight till the latter end of May. *Miller's Gard. Dict.*

Field PEASE. The common white Pea ſucceeds beſt in a light land, ſomewhat rich: the time of ſowing them is in the middle of April. Three buſhels are the common allowance for an acre; and they kill the weeds the land is ſubject to, better than any other crop. In Staffordſhire they ſow the garden rouncivals in fields, and they grow and yield very well, though they are left trailing upon the ground without any ſupport of ſticks.

The white and rouncival Peaſe are only to be ſown with a broad caſt, and harrowed in; but the common grey Pea, which is more frequently ſown in fields than either of them, muſt be ſown under furrow, and delights moſt in a cold wet clay. Theſe are to be ſown in February; and the common quantity of ſeed is two buſhels to an acre. The blue Pea is the beſt kind for light ſandy land, and is to be early ſown; all Peaſe love land manured with lime or with marle. In Suffolk they plow up their lays in the beginning of March, and, turning the turf well, they have a croſs ſtick ſet with iron pegs, which they ſtrike down with their feet: theſe pegs make holes at equal diſtance; into which they have boys and girls following to put the Peaſe ſingly, till all the land is ſet. As ſoon as this crop is cut, they plow the land acroſs, and, harrowing it well, they plow it again, and ſow it about Michaelmas with wheat, and the next year with barley, then with oats; after which the land requires new improvement. *Mortimer's Huſbandry.*

PE'BBLES, *calculi*, in natural hiſtory, the name of a genus of foſſils, diſtinguiſhed from the flints and homochroa, by their having a variety of colours.

In all the ſtrata of pebbles there are conſtantly found ſome which are broken, and whoſe pieces lie very near one another; but, as bodies of ſuch hardneſs could not be broken without ſome conſiderable violence, their preſent ſituation ſeems to imply, that they have ſuffered that great violence in or near the places where they now lie. Beſides theſe, there are others alſo found which have as plainly had pieces broken off from them, though thoſe pieces are no where to be found; whence it ſeems equally plain, that, whatever has been the cauſe of their fracture, they have been brought broken, as we find them, from ſome other place, or elſe that the pieces broken from them muſt, at ſome time or other, have been carried from this place to ſome other diſtant one.

Several of theſe broken Pebbles have their edges and corners ſo ſharp and even, that it ſeems evident they never can have been toſſed about or removed ſince the breaking; and others have their ſides and corners ſo rounded, blunted, and worn away, that they ſeem to have been roughly moved and rolled about among other hard bodies, and that too either with great violence, or for a very long continuance; ſince ſuch hard bodies could not have been reduced to the condition we now ſee them in without long friction.

It may be ſuppoſed by ſome, that theſe ſtones never were broken, but have been naturally formed of this ſhape; but it will be eaſily ſeen by any one who accurately ſurveys their veins or coats that ſurround the nucleus, like the annual circles of a tree, that they muſt have been originally intire; and this will be the more plain, if they are compared with a ſtone broken by art. Such pebbles as are found in ſtrata, that lie near the ſurface of the earth, are much more brittle than thoſe which lie in deeper ſtrata.

The more clear and tranſparent the ſand is, which is found among Pebbles, the more beautiful the Pebbles are generally obſerved to be.

The uſe of theſe ſtones, and their diſpoſition in the earth, is a ſubject of great admiration; and may ſerve as one of the numerous proofs of an over-ruling providence in the diſpoſal of all natural bodies. The ſurface of the earth is compoſed of vegetable mould, made up of different earth mixed with the putrid remains of animal and vegetable bodies; and is of the proper texture and compages for conducting the moiſture to the roots of trees and plants: and under this are laid the ſands and Pebbles which are a ſort of drain to carry off the redundant moiſture deeper into the earth, where it may be ready to ſupply the place of what is conſtantly riſing in exhalations; and leſt the ſtrata of ſand ſhould be too thick, it is common to find thin ones of clay between, which ſerve to put ſome ſtop to the deſcent of the moiſture, and keep it from paſſing off too ſoon; and leſt theſe thin ſtrata of clay ſhould yield and give way, and by their ſoftneſs, when wetted, give leave to the particles of ſand to blend themſelves with, and even force their way through them, there are found in many places thin coats of a poor iron ore placed regularly above and below the clay; and by that means, no only ſtrengthening and ſupporting the clay, but effectually keeping the ſand from making its way into it. *Phil. Tranſ.* N°. 483.

PEC'TEN, in natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe:

It is a bivalve ſhell, ſhutting cloſe in all parts, of a flatted ſhape, ſtriated in the manner of a comb, and often auriculated, ſometimes only ſemi-auriculated, and in ſome ſpecies not auriculated at all. There are alſo ſome few ſpecies which are elate, not flat as the others.

This ſhell-fiſh is one of the ſpinners of the ſea, having a power of ſpinning or forming threads like the muſcle; but they are much ſhorter and coarſer, even than thoſe of that fiſh: ſo that they can never be wrought into any ſort of work, in the manner of the longer and finer threads of the pinna marina. The uſe of theſe threads which the Pecten or ſcallop ſpins, is to fix the creature to any other body that is near, whether it be a ſtone a piece of coral, or another ſhell. All theſe threads proceed, as in the muſcle, from one common trunk; they make their way out of the ſhells in thoſe Pectens which have only one ear, a little below that ear; in the others probably they iſſue out on both ſides. It is an evident proof, that the fiſh has a power of fixing itſelf at pleaſure to any ſolid body, by means of theſe threads, that after ſtorms the ſcallops are often found toſſed upon rocks, where there were none the day before; and yet theſe are fixed by their threads, as well as thoſe which had remained ever ſo long in their place. They form their threads in the very ſame manner with the muſcle, only their organ which ſerves for ſpinning is ſhorter, and has a wider hollow, whence the threads are neceſſarily thicker and ſhorter.

PEDILU′VIUM.—This word ſignifies no more than a bath for the feet, which may be prepared of the ſame ingredients with other baths; and, as it requires a leſs apparatus, is for that reaſon frequently uſed as a ſuccedaneum to them; for a bath for the feet may either conſiſt of pure light water alone, or, in order to correct the qualities of heavy and hard waters, a lixivium, or bran of wheat, or chamomile-flowers, may be added; or ſuch waters may be mixed with milk. But, though baths for the feet are only immediately applied to the inferior parts and extremities of the body, yet their virtues and efficacy diffuſe themſelves further, and alleviate violent diſorders in remote and diſtant parts of the body; for, whilſt the feet are cheriſhed with ſuch a warm liquor, the nervous, tendinous, and muſcular fibres, by the intertexture of which they are formed, are relaxed and unbended; the pores and ducts, before conſtricted, are enlarged; the blood has acceſs to the parts; and the return of the humours from them is rendered free and uninterrupted. By this means, the impetus of the blood on other parts is diverted; and, to the ſurpriſing relief of the patient, derived to the inferior parts. Beſides, baths for the feet, by their temperate heat, act upon the blood and humours, which, during their uſe, paſs through the veſſels of the feet, render them more thin and diluted, and by that means qualify them for paſſing more expeditiouſly through all the various ducts and parts of the body. Hence it is, that, if pretty hot baths for the feet are uſed, they increaſe the pulſe, and excite a ſweat over all the body. Beſides, the conſent of the feet, as being nervous and tendinous parts of an exquiſite ſenſation, is ſo great with all the other nervous parts of the body, eſpecially thoſe of the abdomen, that, if the feet are only rendered thoroughly cold, a cholic is forthwith produced, the patient becomes coſtive, the ſkin is rendered rough, perſpiration is intercepted, and the ſalutary evacuations from the uterus, and hæmorrhoidal veins, ſtopped. For this reaſon, it is not to be doubted, but when the feet are fomented, and their ſpaſmodic ſtricture removed by means of a tepid bath, the ſalutary effect muſt, alſo, be propagated to thoſe remote parts of the body, with which they have ſo near and immediate a conſent.

Baths for the feet are certainly highly expedient for the purpoſes of derivation, in thoſe diſeaſes which ariſe from congeſtions of the humours to the head and breaſt, produced by ſpaſms of the inferior parts, and eſpecially of the hypochondria. Among this kind, beſides lethargic diſeaſes, we may reckon almoſt all diſorders of the head, ſuch as madneſs, melancholy cephalæas, hemicranias, the clavus hyſtericus, vertigos, tooth-achs, pains of the ears, a gutta roſacea, inflammations, and defluxions of ſaline humours on the eyes, immoderate hæmorrhages from the noſe, and long watchings. Of this kind are, alſo, ſome diſorders which affect the breaſt, ſuch as convulſive aſthmas, dyſpnœas ariſing from a plethora, palpitations of the heart, dry coughs, and ſpittings of blood. Beſides, baths for the feet, in conſequence of their ſingular efficacy in relaxing ſpaſms, are highly beneficial in ſpaſmodic and convulſive diſorders, in pains, cardialgias, cholics, eſpecially of the hæmorrhoidal kind; gripes produced by the ſtone, and inflations of the ſtomach, accompanied with an uneaſineſs of the præcordia. Beſides, baths for the feet promote the ſalutary excretions by perſpiration, urine and ſtool, together with thoſe made from the uterus, and hæmorrhoidal veins, by procuring a free circulation of the blood, attenuating the humours, and ſolliciting them to the emunctories of the body. Baths for the feet, alſo, remove and prevent very terrible diſorders of the head and breaſt eſpecially thoſe which return at certain periods; and I myſelf, ſays Hoffman, have known the daily uſe of theſe baths for the feet remove the moſt terrible and obſtinate cephalalgias. Some, alſo, in intermittent fevers, adviſe the uſe of theſe baths, though not on the days of remiſſion. And this piece of practice is productive of very ſalutary effects, as is obvious from Obſ. 144. Decad. 2. An. 6. Miſcell. Nat. Curioſ. where we have an account of a quartan fever cured by means of foot-baths. And *Kozak de Salib. Sect.* 12. *cap.* 10.

But it is to be obſerved, that baths for the feet produce far more happy effects, if, before they are uſed, the quantity of blood is leſſened by veneſection in the feet; if they are uſed about bed-time, and the feet not expoſed to the cold after them, but kept duly warm, till the patient gets to bed; by which means the perſpiration, all over the body, is increaſed. But baths for the feet muſt not be uſed about the time the menſes are about to flow, or already preſent, becauſe, by diverting the courſe of the blood from the uterus and ſolliciting it to the inferior parts, this ſalutary diſcharge is either ſtopped or prevented. On the contrary, baths for the feet, uſed ſome days before the ſtated period for the menſtrual diſcharge, excellently promote it, eſpecially if, at the ſame time the pilulæ Becheri, or temperate emmenagogues, are uſed. We muſt, alſo, carefully abſtain from aſtringent, aluminous, and ſulphureous baths, in order to prevent a ſweating of the feet, diſcuſs oedematous tumors, cure ulcers, or remove arthritic pains, ſince, by means of ſuch aſtringent, aluminous, and ſulphureous baths, the virulent matter is repelled to the internal and more noble parts. And becauſe the common hot ſpring in the Caroline baths, commonly called Der Prudel, is poſſeſſed of an highly repellent quality; ſo bathing in it ought to be very cautiouſly uſed in all diſorders affecting the ſurface of the body, and more eſpecially in gouty and arthritic pains. *Hoffman.*

PE′LICAN, in the Linnæan ſyſtem of zoology, makes a diſtinct genus of birds of the order of the anſeres, or gooſe kind; the characteriſtic of which is to have a beak of a depreſſed form, with a hooked point, and furniſhed with a large bag or purſe beneath. *Linnæi Syſtem. Nat.*

PE′LLACK, the name of a young ſpout whale, often found in Zealand; where they run into creeks, and ſo entangle themſelves among the rocks, that they are caſt on ſhore, or eaſily taken. *Phil. Tranſ.* N°. 473.

PEN′DULUM (*Dict.*)—Soon after the invention of Pendulum-clocks (juſtly aſcribed to the celebrated Mr. Huygens) it was found, that they were liable to conſiderable inequalities in their motion; which were imagined to ariſe from the Pendulum, in its vibrations, deſcribing an arc of a circle; and, conſequently, that the larger vibrations muſt be ſlower than the ſhorter ones. In order to remedy this imperfection, the ſame Mr. Huygens wrote a treatiſe, called Horologium oſcillatorium (a piece of geometry, which does honour to the laſt century) in which he demonſtrates, from the properties of the cycloid, that the vibrations of a Pendulum, moving in a cycloid, would be performed in equal times, even though the vibrations were unequal. Pendulums therefore were made to vibrate in a cycloid; but great inequalities were ſtill obſerved in the motion of clocks.

We do not read of any attempts, after this, to regulate the motion of clocks, till the year 1726, when Mr. George Graham delivered into the Royal Society a paper, which is publiſhed in the Phil. Tranſ. N°. 392, in which he ſays, that, it having been apprehended, that the inequalities in the motion of clocks aroſe from a change of length in the Pendulum, by the influences of heat and cold, he, about the year 1715, made ſeveral trials, in order to diſcover, whether there was any conſiderable difference of expanſion between braſs, ſteel, iron, ſilver, &c. when expoſed to the ſame degrees of heat; conceiving, that it would not be very difficult, by making uſe of two ſorts of metals differing conſiderably in their degrees of expanſion and contraction, to remedy, in great meaſure, the irregularities, to which common Pendulums are ſubject. He ſays alſo, that, from the experiments he then made, he found their differences ſo ſmall, as gave him no hopes of ſucceeding that way, which made him leave off proſecuting this affair any more at that time: that, ſome time after, having obſerved an extraordinary degree of expanſion, by heat, in quickſilver, he thought of a proper manner of applying a column of it to the Pendulum of a clock, in order to prevent the inequalities ariſing from its different lengths by the effects of heat and cold; which ſucceeded accordingly, and is what is now called Mr. Graham's quickſilver Pendulum. Mr. Graham, in the ſame paper, takes notice, that, though the Pendulum of a clock was to remain invariable, yet there would ſtill be ſome irregularities in the motion of the clock, ariſing from the friction of the different parts of the clock-work, and from the different degrees of foulneſs.

In the year 1725, Mr. John Harriſon, of Barrow, in Lincolnſhire, made ſeveral experiments upon wires of different metals, in order to find their different degrees of expanſion and contraction: for he thought, that, by a proper combination of wires of two different metals, differing conſiderably in their expanſion and contraction, he might be enabled to keep the center of oſcillation of a Pendulum always at the ſame diſtance from the point of ſuſpenſion. In conſequence of theſe experiments, he made a Pendulum, conſiſting of one ſteel wire, at the end of which is the bob or weight, and, on each ſide of this wire, four wires alternately braſs and ſteel, ſo diſpoſed and contrived, as to raiſe the Pendulum the ſame quantity as it is lengthened by heat, and to let down the Pendulum in the ſame proportion as it is raiſed by cold. He made alſo a drawing of a clock, in which the wheels are diſpoſed in a different manner from thoſe then in uſe; which drawing I have ſeen, ſigned by himſelf in the year 1725. Two of theſe clocks with Pendulums, as deſcribed above, were finiſhed in the year 1726. In theſe clocks Mr. Harriſon has made a particular ſort of pallets, ſo as to be almoſt intirely free from friction; for, though he had thus happily ſucceeded in his contrivance to prevent the inequalities in the motion of the clock, ariſing from the different lengths of the Pendulum by the effects of heat and cold, yet he found there were conſiderable errors ſtill remaining, occaſioned by the friction of the pallets, as in the common way. He has alſo ſuſpended the Pendulum upon the wall of the houſe, intirely independent of the clock and clock-caſe: for he had obſerved conſiderable alterations in the going of the clock, when the Pendulum is ſuſpended as in the common manner. His Pendulum vibrates in an arc of about 15 degrees, with a bob of about three pounds, between cycloidal checks, which he himſelf found were neceſſary, though he had never heard of M. Huygens's book, till after he had made them. He has alſo diſpoſed the force of his Pendulum-wheel upon the Pendulum, by his ſort of pallets, in ſuch a manner, that the vibrations of the Pendulum will not be affected by the different reſiſtance of the air. Upon the whole, this clock is made in ſuch a manner, as to be almoſt intirely free from friction; in conſequence of which he uſes no oil, and therefore there is no neceſſity ever to clean the clock. When he ſettled in London, he ſent for one of theſe clocks from the country, and ſet it up in his houſe in Orange-ſtreet, in the year 1739, where it has ſtood ever ſince, and in all that time has never varied above one minute from the truth. He can depend upon it to a ſecond in a month.

About the year 1729, Mr. Harriſon made his firſt machine for meaſuring time at ſea, in which he has likewiſe applied this combination of wires of braſs and ſteel, to prevent any alterations by heat and cold. In the year 1726, he went on board one of his majeſty's ſhips of war with this machine to Liſbon, and returned, where this machine was ſeen by every curious and ingenious perſon, who were pleaſed to go to his houſe. Since that time, he has made two more of theſe machines or clocks for keeping time at ſea, in both which he has likewiſe this proviſion, to prevent the effects of heat and cold.

Mr. John Shelton, who was the principal perſon employed by Mr. Graham in the making of aſtronomical clocks, informs me, that Mr. Graham, in the year 1737, made a Pendulum conſiſting of three bars, viz. one of ſteel, between two of braſs; and that the ſteel bar acted upon a lever, ſo as to raiſe the Pendulum, when lengthened by heat, and to let it down, when ſhortened by cold. This lever, which is very ſtrong, reſts upon a roller; which roller is made moveable, ſo as to adjuſt the arms of the lever to their true proportion. The whole was made to be as free from friction, as poſſible, in ſuch a conſtruction. Mr. Graham made obſervations, by tranſits of the fixed ſtars, of the motion of the clock with this ſort of Pendulum, and from the experience of ſeveral years (during which the clock was kept conſtantly going) he found, that the clock was liable to ſudden ſtarts and jerks in its motion. Of this he informed Dr. Bradley, Mr. Bliſs, and ſeveral other gentlemen.

I have been informed, that one Mr. Frotheringham, a quaker, of Lincolnſhire, cauſed a Pendulum to be made, conſiſting of two bars, one of braſs, and the other of ſteel, faſtened together by ſcrews, with levers to raiſe or let down the bob; and that theſe levers were placed above the bob.

In the Hiſtory of the Royal Academy of Sciences at Paris, for the year 1741, there is a memoir of M. Caſſini, in which he deſcribes ſeveral ſorts of Pendulums for clocks, compounded of bars of braſs and ſteel, and applies a lever to raiſe or let down the bob of the Pendulum, by the expanſion or contraction of the bar of braſs. He has alſo given us, in the ſame memoir, a problem for finding the proportion, which the two arms of the lever ſhould have, to anſwer the intended purpoſe; and alſo a demonſtration of it.

In June, 1752, Mr. John Ellicott gave in to the Royal Society a paper, containing the deſcription of a Pendulum, conſiſting of two bars, one of braſs, and the other of iron, faſtened together by ſcrews, with two levers in the bob of the Pendulum, ſo contrived, as to raiſe and let down the bob, by the expanſion and contraction of the braſs bar; and alſo to adjuſt the arms of the levers to their true proportion. He ſays, that he firſt thought of theſe methods of applying bars of braſs and iron to prevent the irregularities of a clock, ariſing from the different lengths of the Pendulum, by the effects of heat and cold, in the year 1732; and that he put this his thought in execution in the year 1738.

He has alſo given us in the ſame paper another conſtruction of a Pendulum to prevent the effects of heat and cold, conſiſting of two bars, one of braſs, and the other of iron; the braſs bar acting upon a lever, at the end of which is faſtened the Pendulum; the whole ſo conſtructed and contrived, as to raiſe the Pendulum, when it is lengthened by heat, and to let it down, when ſhortened by cold. *Short, in the Philoſ. Tranſ. Vol.* 47.

Mr. Ellicott's contrivances for remedying theſe defects in clocks are given us by that ingenious gentleman himſelf in the following manner:

About the year 1732, an experiment, which I made, in order to ſatisfy ſome gentlemen, that the rod of a Pendulum was liable to be conſiderably influenced by moderate degrees of heat and cold, led me to conſider, that, as metals differ from each other in their denſity, it was highly probable they might likewiſe differ from each other in their expanſion; and that this difference of the expanſions of two metals might be ſo applied, as in a great meaſure to remove thoſe irregularities in the motion of a clock, which ariſe from the effect of heat and cold upon the length of a Pendulum. With this view, not long afterwards I contrived the Pendulum now deſcribed by *plate* XXXIII. *fig.* 6.

In which *a b* repreſents a bar of braſs, made quite faſt at the upper part by pins, and held contiguous, at ſeveral equal diſtances, by the ſcrews 1, 2, &c. to the rod of the Pendulum, which is a bar of iron; and, ſo far as the braſs bar reaches, is filed of the ſame ſize and ſhape, and conſequently does not appear in the figure; but, a little below the end of the braſs bar, the iron is left broader, as at *d d*, for the conveniency of fixing the work to it, and is made of a ſufficient length to paſs quite thro' the ball of the Pendulum to *c*. The holes, 1, 2, &c. in the braſs, through which the ſhanks of the ſcrews paſs into the iron rod of the Pendulum, are filed, as in the drawing, of a length ſufficient to ſuffer the braſs to contract and dilate freely by heat and cold under the heads of the ſcrews. *e e e c* Repreſents the ball of the Pendulum: *f f*, two ſtrong pieces of ſteel, or levers, whoſe inner centers, or pivots, turn in two holes drilled in the broad part of the Pendulum-rod, and their outer ones in a ſtrong bridge, or cock, ſcrewed upon the ſame part of the rod, but omitted in the draught; becauſe, when put on, it covers this mechaniſm. *g g*, are two ſcrews entering at the edge, and reaching into the cavity near the center of the ball. The ends of theſe ſcrews next the center are turned into the form repreſented in the drawing, which, preſſing with the weight of the ball againſt the longer arms of the levers, cauſe the ſhorter arms to preſs againſt the end of the braſs bar at 6. Things being in this ſituation, let us ſuppoſe, that the rod of the Pendulum, and the braſs annexed to it, grow longer by heat; and that the braſs lengthens more than the iron of the ſame length: then the braſs, by its exceſs of dilatation, will preſs the ſhort ends of the levers downwards at *b*, and at the ſame time neceſſarily lift up the ball, which reſts upon the long ends of the ſame levers at *f f*, to any proportion neceſſary: and, provided the ends of the ſcrews do preſs upon the levers at a proper diſtance from the centers, the ſaid ball will be always kept at the point of ſuſpenſion, notwithſtanding any alteration the rod of the Pendulum may be liable to from heat or cold. What this diſtance ought to be, may very nearly be determined, if the difference of the expanſion between the braſs and iron bars is known; for the proportion the ſhorter arms of the levers ought to bear to the longer ones will always be, as the exceſs of the expanſion of the braſs is to the whole expanſion of the iron, as may be thus eaſily demonſtrated. *Fig.* 7. Let the line *a b*, drawn perpendicular to the line *e f*, repreſent a bar of iron; the line *c d* a bar of braſs; the pricked line *b g*, the expanſion of the iron bar, and *d h* the expanſion of the braſs bar by the ſame degree of heat: let the line *g i* be parallel to *e f*, then will *i h* repreſent the difference of the expanſion of the two metals: through the points *h*, *g*, draw a right line cutting the line *e f*, as in *k*; to repreſent one of the levers turning upon its center at *g*, *h* the point where the braſs bar acts upon the ſhorter end of the lever, and *k* the point where the ſcrew acts upon the longer end of the lever, which being the place where it interſects the line *e f*, it is evident the ball of the Pendulum will be as much raiſed by the lever, as it would have been depreſſed by the expanſion of the iron; but the triangle *i h g* is ſimilar to the triangle *b g k*; and therefore, as *i h*, the exceſs of the expanſion of the braſs, is to *b g*, the whole expanſion of the iron, ſo will *h g*, the ſhorter arm of the lever, be to *g k*, the longer arm of the lever. *Q. e d.*

At *c*, *fig.* 6. is placed a ſtrong double ſpring, whoſe ends, preſſing againſt the under edge of the ball, hinder it from bending the braſs bar by its forcible action thereon at the point *b*, which, when the ball is of a conſiderable weight, it might otherwiſe be very liable to do.

The deſcription here given is exactly agreeable to the original contrivance; and the only alteration I have ſince made in it, conſiſts in placing the ſcrews *g g* within the ball of the Pendulum, as repreſented in *fig.* 9.

But, as the ſucceſs of this contrivance depended intirely upon the ſuppoſition, that metals were expanded differently by the ſame degree of heat, before I attempted to put it in execution, I thought proper to inquire what experiments had already been made upon this ſubject, when Mr. John Fames put into my hands Mr. Graham's account of his quickſilver Pendulum (as it is now commonly called) publiſhed in the Philoſophical Tranſactions, N°. 392, which account I found to be introduced by the following paragraph:

‘ Whereas ſeveral, who have been curious in meaſuring of time, have taken notice, that the vibrations of a Pendulum are ſlower in ſummer than in winter; and have very juſtly ſuppoſed this alteration has proceeded from a change of length in the Pendulum itſelf, by the influences of heat and cold upon it, in the different ſeaſons of the year; with a view therefore of correcting, in ſome degree, this defect of the Pendulum, I made ſeveral trials, about the year 1715, to diſcover whether there was any conſiderable difference of expanſion between braſs, ſteel, iron, copper, ſilver, &c. when expoſed to the ſame degrees of heat, as nearly as I could determine; conceiving it would not be very difficult, by making uſe of two ſort of metals differing conſiderably in their degrees of expanſion and contraction, to remedy, in great meaſure, the irregularities, to which common Pendulums are ſubject. But although it is eaſily diſcoverable, that all theſe metals ſuffer a ſenſible alteration of their dimenſions by heat and cold; yet I found their differences in quantity, from one another, were ſo ſmall, as gave me no hopes of ſucceeding this way, and made me leave off proſecuting this affair any farther at that time.'

The reading this paragraph proved at that time ſufficient to make me lay aſide all thoughts of ſucceeding in a contrivance founded upon principles, which a gentleman of ſo great abilities, and known accuracy in making experiments, had, after trial, judged to be inſufficient. And it was not till about the latter end of the year 1734, that I again reſumed them on the following occaſion. A gentleman, deſirous to make ſome experiments concerning the expanſion of metals, employed me to make him an inſtrument like one invented by Mr. Muſchenbroek for that purpoſe, which he calls a pyrometer. Upon looking over Mr. Muſchenbroek's experiments, I not only found the difference between the expanſion of ſome of the metals much greater than I expected, but, as I thought (if they were to be depended upon) ſufficient to anſwer my former purpoſe. This led me to conſider the ſtructure of the inſtrument, which Mr. Muſchenbroek made uſe of in his trials, and, upon examination, I thought it liable to ſome objections, which I imagined would make the reſult of experiments made by his inſtrument very uncertain. I therefore endeavoured to contrive one of a different conſtruction, that might be more to be depended upon. See PYROMETER. Having made a great variety of experiments with this inſtrument upon bars of different metals, as nearly of the ſame dimenſions as poſſible, I found, upon a medium, their ſeveral expanſions by the ſame degree of heat to be as follows:

Gold	ſilver	braſs	copper	iron	ſteel	lead
73	103	95	89	60	56	149.

And, as I found ſo great a difference between the expanſion of braſs and iron, I immediately determined to make a Pendulum after the manner above deſcribed, compoſed of thoſe two metals, and likewiſe ordered a clock to be made, with the utmoſt care and exactneſs; and, as I then apprehended, with ſome conſiderable improvements, with which I intended to make the experiments. Theſe were both finiſhed in the beginning of the year 1738; and, having no reaſon to doubt of ſucceſs, I ſhewed the Pendulum to the late Mr. Machin, and gave him a drawing and deſcription of it, in order to its being communicated to the Royal Society; but objections were made to it, of which the only one, that appeared to have any weight, was, that it had been found by experiment, that two bars of different metals, ſcrewed together, ſo as to be in contact with each other, would not expand regularly and ſmoothly, but by jerks. In order to examine into the force of this objection, I directed two bars of equal dimenſions to be made, one of braſs, the other of iron, of about two feet in length, faſtened together after the ſame manner, as the two rods of the Pendulum, which I intended to place ſo, that, by acting very near the center of an index of a conſiderable length, even the ſmalleſt alteration in the bars would be made ſenſible, and by the motion of the index I ſhould be able to form a judgment, whether the rods moved regularly and freely, or not: but, before this was put into execution, I contrived, by faſtening the two bars to the back plate of a clock, not only to make them anſwer the end above propoſed, but, at the ſame time, to lengthen or ſhorten a Pendulum of a common conſtruction, in ſuch a manner, as ſufficiently to correct the irregularities ariſing from the influence of cold or heat upon it. The manner of applying them is deſcribed by *fig.* 8.

In which, *a a a a* repreſents the back plate of the clock, *b b b*, a triangular piece of braſs, ſcrewed by two ſcrews, through the ſlits *c c*, to the plate, yet ſo that it may be drawn backwards or forwards by means of the ſcrew at *d*. *e f* Is a braſs bar, about two feet in length, made faſt at the bottom, by a ſcrew and two pins at *f*, to an iron one of equal dimenſions, to which it is likewiſe ſcrewed by the ſcrews 1, 2, 3, &c. after the ſame manner as the rod of the Pendulum already deſcribed. The iron bar is faſtened at the upper end to the triangular piece of braſs, nearly under that part of the braſs bar marked *e*. *g h* Is a ſtrong braſs or iron lever, moveable upon a center at *g*, and ſupported by the upper end of the braſs bar; *i i* is the cock, on which, in a common clock, the Pendulum is hung; *k k*, part of the rod of the Pendulum, whoſe ſpring, paſſing through a fine ſlit in the cock *i i*, is faſtened to a ſtud riveted into the lever at *l*. The ſlit in the cock muſt be made ſo cloſe, as to prevent the ſpring from having any lateral motion in it.

From this deſcription it is evident, that, if the braſs bar expands more than the iron one, it will raiſe up the lever, and, conſequently, the Pendulum, which is faſtened to it; and, as the length of the Pendulum is only from the center of oſcillation to the under part of the ſlit, through which the ſpring paſſes, the Pendulum will be thereby ſhortened; and, by making the point of the braſs bar to act upon a proper part of the lever (to which it is capable of being adjuſted by means of the ſcrew *d*) the Pendulum may be ſhortened to whatever degree ſhall be neceſſary.

To prevent the Pendulum from bending the bars, which it would be liable to do, if the ball of the Pendulum was of any conſiderable weight, the end of the lever, fartheſt from its center of motion, is hooked to the end of a chain, which is wound about and faſtened to a ſmall pulley at *m*. Upon the ſame arbor, to which this pulley is fixed, is faſtened another pulley, of a much larger diameter, to which is hung, by a ſilk line, the weight or counterpoiſe *n*. By means of this counterpoiſe, any part of the weight of the Pendulum, that ſhall be deſired, may be taken off from preſſing againſt the braſs bar. And if, upon the end of the arbor, to which the pullies are fixed, an index be placed, ſo as to point to a graduated circle, the leaſt motion of the lever will not only be eaſily perceived, but alſo whether that motion is uniform and regular, or not. And, upon having, ſome time after, made a clock with this contrivance added to it, I had the pleaſure to find the index not only to move very ſenſibly, but very regularly, and never, that I could perceive, by jerks. And I doubt not, but, when the point of bearing of the braſs bar upon the lever is once well adjuſted, it will be found to lengthen or ſhorten the Pendulum to as great a degree of exactneſs, as any other method whatſoever. But, as I have not as yet thought of any other method of adjuſting it, except from actual trial in different ſeaſons of the year, I muſt prefer the Pendulum to this method, which, from the great eaſe, as well as exactneſs, with which it is capable of being adjuſted, will, I think, appear to have much the advantage over any other contrivance yet made uſe of for this purpoſe.

The method I take for adjuſting the longer arms of the levers of the Pendulum to the ſhorter ones is deſcribed in *fig.* 9. To a ſtrong poſt, fixed to the wall, is faſtened a ſmall ſhelf, ſupported by two brackets *a b*. In the middle of this ſhelf is faſtened a wire, by the ſcrew *e*; to the end of which the Pendulum is to be hung. Below this ſhelf, at the diſtance of about forty inches, is placed the index *c d*, turning freely upon a center: the length of the index is fifty inches. At the diſtance of half an inch, upon a part of the index produced beyond the center, is placed a ſteel pin; and in the back of the Pendulum, as near the center of oſcillation as may be, is drilled an hole to receive this pin; when the Pendulum is hung upon the wire againſt the poſt, and the wire is ſcrewed higher or lower by the ſcrew *e*, till the pin reſting againſt the upper part of the hole (which is filed into a proper ſhape for that purpoſe) keeps the index nearly in an horizontal poſition. Below the bottom of the Pendulum is placed a ſecond index *f g*, exactly like the former, except that it is kept in an horizontal poſition, by the ſcrew *k* bearing againſt the end of the iron rod. When the experiment is to be made, the Pendulum is firſt put into a box, and gradually heated by a large fire, to a conſiderable degree, being often turned, that every part may be equally expoſed to the fire. And having continued ſhut up in the box for ſome time after it is removed from the fire, that the two rods may be heated as uniformly to the ſame degree as poſſible, the Pendulum is hung upon the wire, and the two indexes made to ſtand nearly in an horizontal poſition. The two graduated plates *h i* are then ſlid upon a wire, till the diviſions in each marked *o* are pointed to by the indexes. As the Pendulum cools, the lower index will be ſeen gradually to deſcend; but, if the ends of the two ſcrews, in the ball of the Pendulum, act upon proper parts of the levers, the upper index will continue in the ſame place. If the ends of the ſcrews are either too far off, or too near the centers of the levers, the index will either riſe or deſcend; and, by comparing the number of diviſions it has varied, with thoſe which the lower index has varied, a near eſtimate may be made, how much the ſcrews require to be altered; and, in a very few trials, they may be eaſily adjuſted to a very great exactneſs. In order to make an actual trial, how far this contrivance of the Pendulum will anſwer the end propoſed, it is neceſſary, that the clock, to which the Pendulum is fitted, be made with great exactneſs, and intirely to be depended on: for otherwiſe the experiments will be very uncertain, as I found in the clock I firſt made uſe of.

I have already obſerved, that, in order to render this clock as perfect as poſſible, I made it, in ſeveral reſpects, different from the common ones, in hopes of removing ſome imperfections I apprehended they were liable to. But as, in this attempt, I fell into an error, which it was a conſiderable time before I diſcovered, my making the trial was thereby greatly retarded. And, in order to prevent others from falling into the like miſtake, I ſhall beg leave to give ſome ſhort account of it.

In a common clock the Pendulum is uſually hung by a ſpring to a cock on the back plate of the clock, whilſt the wheel and pallets, by which the Pendulum is kept in motion, are placed in the middle of the frame; and the Pendulum is moved by a piece of ſteel (called the crutch) riveted to one end of the arbor, to which the pallets are faſtened. This diſpoſition of the pieces I apprehended liable to ſome conſiderable objections: to remedy which, I contrived to fix the pallets to the upper part of the Pendulum itſelf, above the center of motion; and, in order to make the Pendulum vibrate as freely as poſſible, it was made to turn upon two ſteel points, and was hung in the middle of the frame, exactly under the ſwing-wheel, and ſo as to vibrate in the ſame plane with it. By this means I was in hopes, that it would have moved with much greater freedom and regularity, than when hung after the common method; and, upon trial, it was found to move with ſo great freedom, that a Pendulum of above twenty pounds weight, when hung in its place without the clockwork, and made to vibrate thro' an arch of two degrees, was found to make above 1200 vibrations, before it had loſt half a degree, and was obſerved to have a ſenſible motion above twenty hours afterwards; and the clock, when firſt put together, was kept going, for ſeveral days, by a weight of only eleven ounces, hung to the end of a ſingle line. But it was not long, before I diſcovered, that this great freedom made it liable to be conſiderably affected by the leaſt motion.

A remarkable inſtance of this was publiſhed in the Philoſophical Tranſactions, N°. 453. But the greateſt objection to this method was, the points being ſubject to wear; and I found, that the leaſt alteration in them would occaſion the clock to vary much more, than (without having made the trial) I could have imagined. To remedy this inconvenience, I made the Pendulum to move upon edges, like thoſe, on which the beam of a pair of ſcales turns (a method I had good reaſon to believe had been made uſe of with ſucceſs;) but I found theſe likewiſe liable to wear, though not in ſo ſhort a time as the points; ſo that, after much time ſpent in making ſeveral experiments, in order to remedy this inconvenience, I found myſelf obliged to lay this method wholly aſide, and to hang the Pendulum upon a ſpring, as uſual.

In making this alteration, I obſerved one circumſtance, which I think deſerves to be taken notice of. Before I made any alteration in the work, I took particular notice to what height the Pendulum required to be raiſed, before the pallets would eſcape from the wheel. I next obſerved the number of degrees of each vibration of the Pendulum, when moved by the clockwork; and then, the clockwork being removed, the Pendulum was made to deſcribe an arch of two degrees; and particular notice was likewiſe taken, in what ſpace of time it had loſt half a degree each vibration. Having then made the neceſſary alterations for hanging the Pendulum by a ſpring, and particular care being taken that the pallets ſhould eſcape off from the wheel exactly at the ſame angle as before, the Pendulum being hung by its ſpring, and made to vibrate through an arch of two degrees, it was obſerved to loſe half a degree in about half the time it did when turning upon edges. But, upon being ſet a-going by the clock-work, the Pendulum was found to deſcribe an arch of near two degrees more than before: for, when it turned upon the edges, it deſcribed an arch of only three degrees; whereas, now it was hung by the ſpring, it vibrated near five degrees; which was very different from what I expected. This alteration being made, I ſoon found, that the clock went very regular; and, after a ſufficient trial, was fully ſatisfied the Pendulum would anſwer my expectations. *Philoſ. Tranſ.* Vol. 47.

Mr. Poleni ſeems to think, that, if a long Pendulum were made to ſwing in the place of the meridian, and another of equal length in a plane perpendicular to the meridian, ſome difference might be found in their vibrations from the centrifugal force ariſing from the earth's rotation about its axis. See *Philoſ. Tranſ.* N°. 468.

PENE'LOPE, in zoology, the name uſed by the authors for the bird commonly known in England by the name of the widgeon; alſo, called in ſome places the whewer; and by the Germans the ſchmey.

PE'NGUIN, in zoology, a name given by ſailors of different nations to two different ſpecies of water fowl, both web-footed, and both wanting the hinder toe.

The Penguin of the Engliſh is the bird more commonly known by the name of the goifugel.

It grows to the ſize of a common tame gooſe, and is black on its back, or upper part, and white on the belly. Its wings are very ſmall, and by no means fit for flying. Its beak is ſomewhat broad and long, compreſſed on the ſides and back, and has towards the extremity ſeveral furrows, ſeven or eight on the upper ſide, and about ten on the under; and the lower chap ſwells into a protuberance downwards. Its head has two white lines reaching from the beak to the eyes. Its tail is very ſhort, and it has no hinder toe.

PE'NNY-*earth*, in agriculture, a term uſed by the farmers for a hard loamy, or ſandy earth, with a very large quantity of ſea ſhells intermixed in it; ſome of which being round and flat, and in ſome meaſure reſembling pieces of money, have occaſioned the earth's being called by this name. It is an earth not eaſily dug, but is uſually undermined with pickaxes, and then falls in large lumps; which, with the froſts, break to pieces, and leave the ſhells looſe. It is prepared by breaking and mixing well with water, and then makes very deſireable floors. The Jerſey combers comb-pots are alſo made of it, and the ſides and roofs of ovens are plaiſtered with it; and, being rightly managed, it combines into a flower almoſt as ſtrong as plaiſter of Paris. *Moreton's Northamptonſhire.*

PEN'NYROYAL, *pulegium*, in botany, &c. See PULEGIUM.

The ſeveral ſorts of Pennyroyal all propagate themſelves very faſt by their trailing branches, which take root at every joint; ſo that no more is required in their culture and propagation than to cut off and plant out theſe rooted branches: they ſhould be planted at a foot diſtance every way, that they may have room to grow. The beſt ſeaſon for this is in September, that the plants may be rooted before winter. They love a moiſt ſoil, and generally grow very faſt. *Miller's Gard. Dict.*

PENTAEDRO'STYLA *, in natural hiſtory, the name of a genus of ſpars.

> * The word is derived from the Greek, πεντὲ, five, ἕδρα, a ſide, and ςυλὸς, a column.

The bodies of this genus are ſpars, in form of pentangular columns, terminated by pentangular pyramids at one end, and irregularly affixed at the other to ſome ſolid body.

PENTAPHYLLOI'DES, *wild tanſey*, in botany, a low plant, which never ariſes up to the ſtalk, but creeps upon the ground, emitting fibres from the joints, by which it roots in the earth, and ſpreads very much; the leaves are made up of ſeveral pinnæ ſet oppoſite; each being about an inch long, and not half ſo broad, ſerrated about the edges, and having ſeveral ſmall pieces among them, like agrimony, covered over with a ſhining ſilver-coloured down: the flowers grow at the joints on long foot-ſtalks, of five yellow leaves like cinquefoil. The root is ſlender, with many fibres of a dark-brown colour. It grows in moiſt barren places, and where water has ſtood, all the winter, flowering in May.

The leaves only are uſed, and are accounted reſtringent and vulnerary; good to ſtop all kinds of fluxes, and preternatural evacuations; to diſſolve coagulated blood, to help thoſe who are bruiſed by falls: outwardly, it is uſed as a coſmetic, to take off freckles, ſun-burn, morphew, as, alſo, in reſtringent gargariſms. *Miller's Bot. Off.*

PE'PO, *the pompion, or pumpkin*, the name of a genus of plants, allied to the melon and cucumber kinds: the characters of the genus are theſe:

The flowers conſiſt of one leaf each, ſhaped like a bell, wide open at the mouth, and divided into ſeveral ſegments at the end. Of theſe flowers ſome are male, or ſteril, having no embryo; others are female, or fruitful, having an embryo, which ripens into a large fruit, with ſometimes a ſmooth, ſometimes a rough bark. The figure is ſometimes oval, ſometimes round, and the bark often very hard, tuberous, and hollow: it is divided into three cells within, and contains flat ſeeds, ſurrounded with a ſort of ring, and fixed to a ſpongy placenta.

All the kinds of pompions are cooling, moiſtening, allay ſharp humours, and quench thirſt.

They are hard to be digeſted, weaken the ſtomach, and cauſe wind and cholic.

Pompions contain much phlegm, a middle quantity of eſſential, ſalt and a little oil.

They agree in hot weather with young bilious people; but perſons of a cold and phlegmatic conſtitution ought to abſtain from them.

They uſually mix the pompions with ſome aromatic herbs, ſuch as parſley, onions, muſtard, pepper, and ſeveral other ſharp and volatile things, fit to attenuate the viſcous phlegm of this fruit in the ſtomach.

They preſerve pompions with ſugar, in order to make them more pleaſing to the taſte and more wholeſome. In ſhort, they rarify their groſs ſubſtance by boiling them well; and beſides, the ſugar, wherewith they are mixed, gives them a little ſort of pricking quality, that makes them leſs inſipid to the taſte, and more eaſy of digeſtion. Preſerved pompions may be uſed in diſtempers of the breaſt, in order to allay the ſharpneſſes that are there.

Pompions contain a great many ſeeds, which are flat, oblong, covered with an hard rind, that is a little woody, whitiſh, or greyiſh. Under this there is a ſmall, ſweet, and very pleaſant kernel, which contains a great deal of oil, that may be eaſily preſſed out of it; and is proper to ſoften the ſkin, and make it more ſmooth. *Lemery on foods.*

PE'PPER-*water*, a liquor prepared by the curious for examination by the microſcope, as always affording a great number of ſmall animals.

The method of preparing it is this: put common black Pepper, groſly powdered, into an open veſſel ſo as to cover the bottom of it half an inch thick, and put to it rain or river water, till it covers it an inch; ſhake or ſtir the whole well together at the firſt mixture, but never diſturb it afterwards: let the veſſel be expoſed to the air uncovered; and in a few days there will be ſeen a pellicle or thin ſkin ſwimming on the ſurface of the liquor, looking of ſeveral colours.

PE'RCA, *the pearch.*— The name Perca is of Greek origin, and is derived from the word πέρκος, which ſignifies variegated with black or duſky ſpots; a character common to moſt of the ſpecies of this fiſh.

The common pearch affords good ſport for the angler. The beſt time for their biting is, when the ſpring is over, and before the heats of ſummer come on. At this time they are very greedy, and the angler, with good management, may take, at one ſtanding, all that are in the hole, be they ever ſo many.

The proper baits are a minow or young frog; but the worm called the brandling, well ſcowered, is alſo excellent at all times of the year. When the pearch bites, he ſhould always have a great deal of time allowed him to ſwallow the bait. The pearch will bite all day long, if the weather be cloudy; but the beſt time is from eight to ten in the morning, and from three till ſix in the afternoon. The pearch is very abſtemious in winter, and will ſeldom bite in this ſeaſon of the year; if he does at all, it is in the middle of the day, at which time indeed all fiſh bite beſt at that ſeaſon.

If the bait be a minow, which is the bait that affords the moſt diverſion to the angler, it muſt be faſtened to the hook alive, by putting the hook through the upper lip, or the back fin; it muſt be kept at about mid-water, and the float muſt be a quill and a cork, that the minow alone may not be able to ſink it. The line muſt be of ſilk, and ſtrong; and the hook armed with a ſmall and fine wire, that, if a pike ſhould take the bait, as is not unfrequently the caſe, he may be taken. The way to carry the minows or ſmall gudgeons alive for baits, is this: a tin pot is to be provided with holes in the lid, and filled with water, and the fiſh put into this; the water is to be changed once in a quarter of an hour by the holes, without taking off the lid at any time, except when the bait is to be taken out.

A ſmall caſting net, made for theſe little fiſh, ſhould be taken out with the pearch tackle, and one or two caſts of this will take baits enough for the day, without any farther trouble. When the bait is a frog, the hook is to be faſtened to the upper part of the leg. The beſt place for the fiſhing of pearch is, in the turn of the water near ſome gravelly ſcour. A place of this kind being pitched upon, it ſhould be baited over night with lob-worms chopped to pieces; and in the morning, on going to it, the depth is to be regularly plumbed, and then the hook is to be baited with the worm, or other bait; and, as it drags along, the pearch will ſoon ſeize upon it.

PE'RCEPIER, *parſley-piert*, in botany, a genus of plants, whoſe characters are:

The calyx is quadrifid; the flower is produced in the alæ of the leaves; the ſeeds are produced ſingle in each ſeed veſſel, which is formed by the calyx.

This is a ſmall low plant, lying generally upon the ground, whoſe round hairy branches are ſeldom an hand's-breadth long; they are full of ſmall leaves, ſet alternately at the joints, a little hairy, narrow at the ſtalk, and broadeſt at the ends, cut into three round ſections; the flowers are ſmall, and ſtamineous, growing in cluſters at the joints, among the leaves; they conſiſt of four leaves, and are ſucceeded by ſmall round ſeeds. The root is full of fibres. It grows in dry places, and in fallow fields, as, alſo, among corn.

Parſley-piert is not an officinal plant, and is ſeldom preſcribed by phyſicians; but the vulgar have a great opinion of it as a breaker or bringer away of the ſtone and gravel, and a provoker of urine; and is given by them for that purpoſe either in powder, or a decoction of it in white-wine. *Miller's Bot. Off.*

PERETE'RION, a name given by chirurgical writers to the perforating part of the trepan.

PE'RFECT, *perfecti*, in church hiſtory, a deſignation which the followers of Valentius aſſumed to themſelves. *Hoffm. Lex. in voc.*

PERFOLIA'TA, *thorow-wax*, a medicinal plant having a ſmall ſticky root, from which ſpring ſmooth, and frequently reddiſh ſtalks. The leaves are of a bluiſh-green colour, of an oval ſhape; ſmooth, and not indented about the edges; full of nerves, which run obliquely from the center to the circumference of the leaf: they are perforated by the ſtalk, which runs through them, and is divided towards the top into ſeveral branches, at the ends of which grow ſmall umbels of yellow flowers, uſually five together upon one ſtalk, with as many ſmall leaves under each umbel; the three outermoſt being the largeſt: each flower is ſucceeded by two oblong ſtriated ſeeds. It grows only among the corn, and flowers in June and July. The whole plant is uſed.

Thorow-wax is reckoned among the vulnerary plants, and is eſpecially ſerviceable in green-wounds, bruiſes, ruptures, contuſions, as, alſo, for old ulcers and ſores, either given in powder, or the decoction. *Miller's Bot. Off.*

PERI'GRAPHE, a word uſually underſtood to expreſs a careleſs or inaccurate delineation of any thing: but in Veſalius it is uſed to expreſs the white-lines or impreſſions that appear in the muſculus rectus of the abdomen.

Fiſtula of the **PE'RINÆUM**. — Sometimes, after the operation of lithotomy, or after a puncture of the Perinæum or bladder, or from an abſceſs in the Perinæum near the urethra, or from a ſcirrhus in the glandula proſtata, or when, by the bad habit of the patient, a wound or ulcer can by no means be healed, but its lips become callous, a fiſtula is formed, through which the urine is preternaturally diſcharged with great uneaſineſs to the patient. Theſe fiſtulas are ſometimes generated in the Perinæum by malignant abſceſſes, which ſpread amongſt the fat under the ſkin, to the inteſtinum rectum and ſcrotum, the urethra remaining entire; but theſe cannot be called urinary fiſtulas, becauſe no urine is diſcharged by them. The urinary fiſtulas are often occaſioned by the uſe of tents, or pipes, which have been too long retained in the wound after extracting the ſtone; or when the Perinæum has been greatly diſtended, lacerated, or burſt, by a large rough ſtone; or when, by the obſtruction of a ſtone in the urethra, the acrimony of the urine corrodes the adjacent parts, and at laſt the ſkin, eſpecially if the patient be of an ill habit of body.

The cure of this fiſtula varies according to the habit of the patient, and the degree of this diſorder. When the fiſtula is large, and has conſumed a great part of the urethra, and the patient is of an ill habit and weak, a cure is not without great difficulty, and very ſeldom, obtained; and, the more callous, or inveterate, the fiſtula is grown, the harder is the taſk to remove it. On the other hand, if the fiſtula is ſmall, and not much indurated, if the patient is young, and of a good habit, the cure may proceed with eaſe and expedition. But, if a ſcirrhus is produced in the proſtate glands, before a cure can be effected, the ſcirrhus muſt firſt be removed, which I have learned by experience to be a moſt difficult taſk.

There are four methods of treating theſe fiſtulas: Firſt, the tent-pipe, or whatever is contained in the wound, which occaſioned the fiſtula, muſt be immediately removed. Then, the patient muſt be laid upon the bed, or a ſeat, in the ſame poſition as is required for performing the operation of lithotomy; and the indurated ſides of the fiſtula muſt be extirpated with great dexterity. After the application of a vulnerary balſam, or powder, the lips of the wound muſt be brought into contact by an adhering plaiſter; and over it ſhould be laid a narrow compreſs on each ſide of the wound, and the whole muſt be ſecured with a tight bandage. After the operation, the patient ſhould be confined to his bed, with his knees tied together, and ſtrictly injoined to abſtain from motion, that the lips of the wound may more eaſily coaleſce. For a few days a very little drink muſt be allowed him, that he may not often be excited to make water. The dreſſings ought not to be renewed till the ſecond or third day, or as long as the patient can contain his urine. The wound being, by theſe means, almoſt conglutinated, the patient may be treated in the ſame manner, as if he had been cut for the ſtone; and, if he has youth in his favour, he may begin to walk about gently; and by degrees. Thus, if the fiſtula is not malignant, he may be reſtored to his former health. Secondly, another method of cure is, by conſuming the indurated or callous lips of the fiſtula with corroſive medicines; and, after removing the eſcar with baſilicon, or digeſtive ointment, the wound may be conglutinated by a vulnerary balſam, and adheſive plaiſter, as before. The moſt proper corroſives in this caſe are, the troches of red lead, the lapis cauſticus, or infernalis, or white precipitate mixed with Arcæus's balſam; or, in a recent fiſtula, a piece of bliſtering-plaiſter, according to Cheſelden's method, as we are told by Douglas, in the Appendix to his Hiſtory of the lateral operation.

It is to be obſerved, that the cure of theſe fiſtulas ſometimes advances ſlowly, eſpecially if the orifice be wide; if the callous parts are not totally extirpated or conſumed; and if the patient cannot ſufficiently refrain from motion, or obſerve a proper diet. If from theſe, or the like cauſes, the fiſtula is not removed, but begins to renew its callofity, the operation muſt be repeated, till the parts appear ſound. Thirdly, ſometimes theſe fiſtulas may be cured, by bringing the lips of the bleeding wound, after the callous part is cut off, into contact with a proper ſuture of two or more ſtitches. The dreſſings may be thoſe before directed; and, as the lips of the wound appear to conglutinate, the threads may be cut and extracted. Fourthly, it may be ſometimes neceſſary, during the cure, to keep a catheter in the bladder and urethra, by which the urine may be diſcharged, and its courſe turned from the wound, the conglutination of which it would greatly obſtruct. If the orifice of the fiſtula be too ſmall to admit of thoſe methods, it may be dilated with a ſponge-tent, or enlarged by inciſion.

I ſhall only mention another way of treating theſe fiſtulas, which is called the palliative method. For this purpoſe is the inſtrument deſcribed by Nuck and Solingen, and propoſed by Winſlow, which, while the fiſtula is compreſſed, and cloſed by it, prevents the efflux of the urine that way; and thus the diſorder, when a perfect cure cannot be obtained, may at leaſt be mitigated. But experience informs us, that this is not to be depended upon, as the urine eaſily eſcapes through it, and it is troubleſome to the patient. *Heiſter. Chirurg.*

PERISTERI'TES, *the pigeon ſtone*, in natural hiſtory, a name given by ſome whimſical people to an odd conformation of a pebble, which they ſuppoſe to repreſent very exactly a pigeon without its wings. It ſeems to have been a mere luſus naturæ, in the formation of a common pebble.

PERITE'RE, in architecture, a place encompaſſed round with columns, and with a kind of wings about it. Here the pillars ſtand without, whereas in the periſtyle they ſtand within.

PE'RIWINKLE, in natural hiſtory, the Engliſh name of a ſpecies of ſhells, called by authors buccina. See BUCCINUM.

PEROQUE'TTE, in zoology, the name of a ſmall ſpecies of the pſittacus or parrot kind, with a long tail.

PE'RSIAN *Wheel* (*Dict.*)—A machine better adapted to the uſe of raiſing water for the uſe of lands than that called the Perſian wheel given in the Dictionary, under the article WATER *Works*, and will be farther in the Supplement. See WATER *Works*, Dictionary and Supplement.

PE'RSICA, *the peach-tree.* See the article PEACH.

PERSICA *terra*, in natural hiſtory, an earth of the ochre kind, known in the colour ſhops of London by the name of Indian red.

It is a very fine purple ochre, of a conſiderably compact texture, and great weight; while in the earth it is of a pure blood colour, and it is not to be cut with the ſpade, but is dug with iron crows, and falls in irregular maſſes. It is of a rough duſty ſurface, and full of conſiderably large glittering particles: theſe are white, and of a fine luſtre. It adheres firmly to the tongue, is rough and harſh to the touch, ſtains the hands very deeply, and is of a rough aſtringent taſte, and makes a very violent effervescence with acid menſtruums.

PERSICA'RIA, *ſpotted arſmart*, in botany, a genus of plants, whoſe characters are:

The flowers are diſpoſed in ſpikes, at the top of the ſtalks and branches: the calyx is quadrifid, though ſome take it for a tetrapetaloidal flower: the ſtamina are ſix in number: the ovary, in the center of the calyx, is compreſſed, of an oval or orbicular form, and furniſhed with a bifid fimbriated tube: the ſeed is flat, and ovally acuminated. A membrane ſurrounds the ſtalk, at the riſe of the leaves, and ſmall branches, oppoſite to the leaves.

Persicaria *urens*, lake-weed, arſmart, or water-pepper. — This ſpecies of arſmart grows not ſo much branched as the Perſicaria mitis maculoſa; the leaves are long, and proportionably narrower, and more like the leaves of the peach-tree, whence it takes its name Perſicaria; but they are not ſerrated about the edges, and they want the ſpot that is in the leaves of the mild arſmart, and they have a very hot biting taſte, burning the tongue like pepper. The flowers grow in long ſlender looſe ſpikes, of a paler colour than the Perſicaria mitis maculoſa, but containing like ſeed: it grows in like places with that, and flowers about the ſame time.

This has been accounted an extraordinary plant againſt the ſtone, Mr. Boyle having, in his book of the Uſefulneſs of experimental Philoſophy, given to the diſtilled water of this plant a mighty character for its virtues againſt that diſtemper. It is commended, alſo, as very cleanſing, and good for old ſtubborn ulcers.

PE'TIOLE, *petiolum*, among botaniſts, expreſſes that ſtalk which ſupports the leaves of a plant, as the peduncle does the fructifications.

Some uſe the word petiolum to denote the whole middle rib of a leaf of any plant, which is the ſtrongeſt part of it, and runs from the ſtalk by which the leaf adheres to the tree or plant to its extremity, and from which the lateral fibres, or nerves, as they are uſually called, commonly ariſe.

PETASI'TES, *butter-bur*, in botany, a genus of plants, whoſe characters are:

The root is large and perennial; the leaves are grey, large, and orbicular. The calyx is cylindrical, multifid, ſquamous, and contains many floſcules collected into a flower. The flowers are diſpoſed in a thyrſus, and appear before the leaves; and the ovaries are furniſhed with a tube, which has a clavated bifid apex.

The roots of butter-bur are ſudorific, alexipharmic, and good for all kinds of fevers, and malignant, infectious, and peſtilential diſtempers; they are cordial, preventing fainting and ſhortneſs of breath; they likewiſe provoke urine, and are accounted good to deſtroy joint-worms. They are outwardly applied, in the form of a cataplaſm, to peſtilential buboes and plague-trees; a great quantity of them are put into the aqua theriacalis. *Miller's Bot. Off.*

PE'TROL (*Dict.*) — In Broſely, Bently, Pitchford, and other places adjacent in Shropſhire, there lies over moſt of the coal-pits, or mines, a ſtratum or layer, of a blackiſh rock, or ſtone, of ſome thickneſs, which is porous, and contains great quantities of bituminous matter.

This ſtone, being brought to the workhouſe, is ground ſmall by horſe-mills, ſuch as are uſed for grinding flints, to make glaſs of; the powder is thrown into great coppers of water, where, by boiling, the bituminous matter is ſeparated from the ſtony, or gritty, this laſt ſticking to the bottom, the other ſwimming at the top.

This bituminous ſubſtance, being gathered together and evaporated, comes to the conſiſtence of pitch, and with the help of an oil diſtilled from the ſame ſtone, and mixed with the pitch, comes to be thinner, or like tar; the uſes of both which materials, either for ſhipping, or otherwiſe, theſe ſubſtances are ſaid to ſupply, or even to excel. This has been tried on ſeveral boats, and it does not crack, like the ordinary pitch or tar, but always keeps black or ſoft; and therefore is propoſed to hinder the worms from getting into the ſhips pitched with it. There is, likewiſe, diſtilled from this ſtone an oil, which may be uſed for oil of petre, or turpentine, and has been tried in aches and pains. *Philoſophical Tranſactions.*

PE'TUNTSE, as it is uſually called Petunse, one of the two earths, or foſſil ſubſtances, of which the porcelain ware of China is made. The other is named kaolin. See KAOLIN. The Petuntſe is ſprinkled all over with bright glittering particles. It is beat into powder, and afterwards made up into a ſort of bricks, and in that form it is ſent to the places where it is to be wrought. It is of a hard texture, and of a ſomewhat greeniſh colour. Mr. Reaumur, of the Academy of Sciences of Paris, who was extremely induſtrious in ſearching into the nature of porcelain, obtained ſome ſpecimens of the Petuntſe, both in its native ſtate, and in form of the brick, which is given it after it is powdered and reduced to a paſte.

Mr. Reaumur found that the Petuntſe was ſo far from being an earth, as uſually ſuppoſed, that it was truly of the nature of the European flint or pebble, as he eſtabliſhes the character of that body: but, to underſtand this rightly, it is to be obſerved, that this author makes the flints and pebbles a very large claſs of bodies, ſome of which are more, ſome leſs tranſparent; and that this Petuntſe is of the nature of the coarſer, or leſs tranſparent kind, the ſurface of which, when broken, is not ſo ſmooth and poliſhed as that of the ordinary flint. The great character of theſe ſtones for the porcelain manufactures is, however, that they are very eaſily vitrified, without the aſſiſtance of any ſalt, and without the immediate contact of the fire, the operation ſucceeding in a crucible; which is not at all the caſe in regard to the European flint, they very differently melting alone in a crucible, and then only into a whitiſh opake glaſs.

It being certain from hence, that one of the two ingredients of the China ware is eaſily vitrifiable, it follows, from the experiment of the whole mixture, or China ware not being reducible into glaſs in a large fire, that it is a compoſition of a vitrifiable and a not vitrifiable (or at leaſt not eaſily vitrifiable) ſubſtance; and conſequently, that the kaolin is a ſcarce vitrifiable body, and that the reſult of the action of fire, on a mixture of theſe two, is a ſemivitrification; which is what we call the China ware.

If we, therefore, could, in Europe, provide the materials of China, or ſuch as were like them, we might reaſonably hope to ſucceed; and this appears far from improbable. The Petuntſe is eaſily ſupplied by many of our own earths, ſtones, and ſands, as nothing is required in it more than a property of running eaſily into a white glaſs. The kaolin ſeems moſt to be reſembled by our European talcs. *Mem. Acad. Par.* 1727.

PEUCEDA'NUM, *hog's-fennel*, in botany, a genus of plants, whoſe characters are:

The root is perennial, deeply ſunk, and hairy. The leaves are winged, narrow, graſſy, and divided into three parts. The ſeed is flat, almoſt oval, ſlightly ſtriated and marginated.

Hog-fennel is accounted good to clear the lungs of tough viſcid phlegm, and thereby to help old coughs and ſhortneſs of breath; it likewiſe opens obſtructions of the liver and ſpleen, and helps the jaundice; it likewiſe provokes the menſes, and gives eaſe in labour-pains; the juice, ſnuffed up the head, is commended by the ancients, againſt the lethargy, apoplexy, epilepſy, and other diſorders of the head and nerves. *Miller's Bot. Off.*

PE'WIT, in zoology, the Engliſh name of a common bird of the larus, or ſea gull kind, called by ſome authors larus cinereus, and by others cepphus, and, in ſome of the counties of England, the black cap and ſea crow.

It is about the ſize of a pigeon. Its beak is red, its head and throat of a greyiſh black, and its neck, tail, breaſt, and belly white; the middle of its back grey. It has its Engliſh name from its note, which ſeems to expreſs the word Pewit. It is affirmed by many, that the head of this bird is only black at a certain ſeaſon of the year. *Ray's Ornithol.*

PHAGEDE'NIC *Water* (*Dict.*) — This lime-water, to every pint of which twenty or thirty grains of ſublimate have been added, is a great deterger of foul wounds, ulcers, and other ſtuborn diſorders.

PHALA'NGOSIS, in ſurgery, the name of a tumor and relaxation of the eye-lids, which is often ſo great as to deform the eye, and very much impede viſion. Sometimes, the relaxed eye-lid ſubſides or ſinks down, occaſioned either by a palſy of the muſcles which ſuſtain and elevate the eye-lid, or elſe from a relaxation of the cutis above, from various cauſes. Sometimes, alſo, an œdematous or aqueous tumor is formed on the eye-lids, ſo as almoſt entirely to exclude viſion; but this laſt caſe ſhould be well diſtinguiſhed from the other, and may be remedied without much difficulty, by the uſe of internal and topical medicines; ſuch as purges and diuretics, given inwardly, and a compreſs dipped in warm ſpirit of wine and lime-water.

But, in the paralytic or relaxed caſe, the uſe of cordial and nervous medicines muſt be propoſed internally, and outwardly balſam of Peru and Hungary-water are to be employed. If all theſe fail, the remaining method is to extirpate a ſufficient quantity of the relaxed cutis; and then, after healing up the wound, the remainder will be ſufficiently ſhortened. *Heiſter's Surgery.*

PHALE'NÆ, in natural hiſtory, the name by which authors diſtinguiſh thoſe butter-flies which fly by night, and which the French thence call papilions nocturnes, and we vulgarly moths.

All the creatures of this claſs are quiet by day, remaining fixed to the ſtalks or leaves of plants, except only ſome of the males, which are now and then found fluttering about in the woods in ſearch of the females; but, as ſoon as night approaches, they all fly about. This diſpoſition is very remarkably implanted in their nature; for, when kept ſhut up in boxes, they always remain quiet without changing place all day, but as ſoon as the ſun is about ſetting, they always begin to flutter about, and fly as much as their priſon will permit them. The ſpecies of theſe are more numerous even than thoſe of the day butterflies. The day kinds all have trunks fitted for ſucking the juices of flowers for their nouriſhment, but many of the Phalenæ wholly want them: theſe, however, have always the beards which ſerve to defend the trunk from injuries in the day flies, and ſometimes, in the place of the trunk within theſe, there is found a ſmall white protuberance or two. It is certain, therefore, that many of the Phalenæ have no organs of eating, nor take in any food during their whole lives in that winged ſtate. *Reaumur Hiſt. of Inſ.*

PHARMACOCHE′MIA, a term uſed to expreſs that part of the chemical art which treats of the preparation of medicines. It is thus called by way of diſtinction from that chemiſtry which is wholly employed about the tranſmutation of metals by means of the philoſopher's ſtone; this being called ſpagiricochemia.

PHEA′SANT, in ornithology, a bird ſo nearly allied to our common poultry, that it would naturally appear a very eaſy thing to breed them up from young; but the proper food of them is not ſufficiently enquired into. Though they eat corn when full grown and in health, yet they have recourſe in their young ſtate, and when ſick, to another ſort of food, preying on ſeveral inſects, and that in a very voracious manner.

The young Pheaſants and partridges prey upon ants; and they will never ſucceed with us, if they have not a proper quantity of ants to have recourſe to, as ſoon as they leave their rooſt in a morning. When muſty corn, or want of due care in cleaning their houſes, has made them ſick, a repaſt of ants will often recover them. When that fails, they may be offered millepedes or earwigs, or both together, which will always do much better than either ſingly. To this medicine muſt be added a proper care that their common food of corn be very ſweet, their habitation kept nicely clean, and their water ſhifted twice a day. They muſt not be let out of the houſe in a morning till the dew is off the ground; and after ſun-ſet they muſt be immediately taken in again: in the heat of the day they muſt be allowed to baſk in the ſun in a dry ſandy place. With theſe regulations the birds of this kind will ſucceed much better than they uſually do. The Pheaſant is a bird of a ſullen diſpoſition, and, when the coupling time is over, there are ſeldom found more than one in a place. *Philoſ. Tranſ.* N°. 23.

PHILADE′LPHIA-*ſtones*, a name given by ſome authors to what are called by others Chriſtians bones, found in the walls of that city. It is a common error, that theſe walls are built of bones, and the tradition of the country is, that, when the Turks took the place, they fortified it for themſelves, and built their walls of the bones of the Chriſtians whom they killed there. Dr. Smyth, in one of his epiſtles, mentions this wall as an inſtance of the Turkiſh barbarity; but this is an idle opinion, what paſſes for bone being only a looſe and porous ſtone of the ſparry kind, found in an old aquæduct which is ſtill in the wall. Sir Paul Rycaut brought home pieces of theſe ſtones, which he alſo ſuppoſed to have been bones; but on examination they proved to be no other than various bodies, chiefly vegetable, incruſted over and preſerved in a ſpar of the nature of that which forms incruſtations in Knareſborough ſpring, and other places with us. Theſe bodies are often cemented together in great numbers by this matter, and their true ſhape loſt in the congeries, till a diligent and judicious eye traces them regularly. *Woodw. Cat. of Foſſ.* N°. 2.

PHILOME′LA, *the nightingale*, in zoology, the name of a ſmall bird, famous for his ſinging.

The nightingale has from all antiquity been allowed the firſt rank among ſong birds. He is ſomewhat leſs, though longer than a ſparrow; far from a beautiful bird, and weighs hardly an ounce. His bill is long and flexible, of a darkiſh colour; and, when opened, diſcovers a wide orange-coloured throat. The eyes are full and lively; the feathers of the head, neck, and back fallow; the wings, and eſpecially the tail, ſomewhat brighter; the throat, breaſt, and belly of a light aſh colour; the legs long, and the claws ſlender. The hen much reſembles the cock, but is a little more upon the aſh colour, as are alſo the young ones. This bird affects ſolitude, is wild and timorous, and it ſeems the effect of this natural fearfulneſs that he often jerks his tail. The moſt celebrated authors on birds mention no more than one ſpecies of nightingales, but the fanciers tell us of no leſs than three; Firſt, the mountain nightingale, being the ſmalleſt of all. Secondly, the middle-ſized field nightingale. Thirdly, the water nightingale, which frequents the banks of rivers, and is the biggeſt, ſtouteſt, and beſt ſongſter; for that will ſing eight months in the year, whereas the others ſing no more than three at moſt. However, the beſt connoiſſeurs hold that there is but one ſpecies of nightingale, in which there is a variety of ſize, ſhape, and colour, as in the gold-finch, and more eſpecially in the canary-bird.

The ordinary reſort of the nightingale is the ſide of ſome hill, or brook, eſpecially if near an echo: there he moſt delights to ſing, and interrupts his warblings by ſhort pauſes, as, if liſtenſing and making reſponſes to the echo of his own voice. Hence, few circumſtances of place can ſuit this ſongſter, and, when he quits theſe, you may be ſure he leaves off his ſinging at the ſame time; and, when he viſits them again, it is as certain that you will again hear him. I have obſerved, that of theſe favourite places he prefers that which has the advantage of an echo, and beſt favours his ambition of being heard by his hen, and every rural animal, as well as mankind; and, in caſe he repairs to any other, it is only to avoid the wind that then blows, eſpecially a northern one, which is moſt diſagreeable to him. Whilſt the hen is laying her eggs, and more eſpecially when ſhe ſits, then it is that the male utters his moſt beautiful notes, and night and day redoubles the energy of his ſong, to divert and comfort his female for the pains of laying, and the fatigue of ſitting. Accordingly, it is remarkable that he then chuſes ſome convenient place in the neighbourhood of the neſt. Sometimes he pitches upon a place fit to anſwer all his ſeveral intentions, of hearing his echo, attending upon his female, and keeping an eye upon paſſengers, and then you will hear him inceſſantly in his ſong.

The nightingale uſually builds his neſt near the ground among briars, in box or yew-trees, at the foot of an hedge or buſh; and for this reaſon many layters of eggs come to ruin, being devoured by dogs, foxes, polecats, weaſles, &c. The neſt is pretty long and deep, conſiſting chiefly of dry oak leaves, and holds very well together, provided it be not moved, for it will fall aſunder upon a touch. It is aſſured that the nightingale will in hot countries produce four layters of eggs a year; in this country but three at moſt, and the third ſeldom comes to good, on account of the cold beginning to ſet in. They commonly lay four or five eggs, which look as if they were bronzed over, and from whence are generally hatched more cocks than hens. In order to find a neſt, it will be proper to go in the morning at ſun-riſe, or in the evening towards ſun-ſet, near the place where the cock has been heard to ſing, which moſt commonly is not a great way from the neſt; there you are to remain ſtill, and without making the leaſt noiſe, and in a ſhort time you will perceive whereabouts the neſt is, by the coming and going of the cock and hen, and by the chirping of the young ones.

The right time for catching nightingales is the whole month of April, and, the ſooner they are caught after their arrival, the longer they continue in ſong. Thoſe taken in May, being already paired, muſt be caged a long while before they can be brought to ſing, and then their muſic is ſhort and trifling. From ſun-riſing to ten in the morning are the beſt hours for catching them, for after faſting the night they are eager for food, and greedily ſeize a meal-worm. In a wood it is eaſy to make choice of that nightingale which has the fineſt ſong; for, if the wood be of ſuch extent as to feed four nightingales and their families, theſe four place themſelves at the four corners of the wood, and ſeldom and never invade each other's bounds. The evening before you ſet your trap, you muſt go to the wood they frequent, and mark the places where you hear them; then take a twig, about a foot long, ſharpened at one end, a ſlit at the other, ſo as to hold a couple of meal-worms ſpitted upon a pin: ſtick it up in the ground, about twenty or thirty paces from the place you hear the bird ſing, ſo that he may eaſily eſpy it, and turn up the earth round it; and this do wherever you hear a nightingale. Next morning repair to the place where you planted your twigs, and, if you find that the baits have been eaten, you need not doubt but the nightingale will ſoon return, in expectation of a freſh ſupply. You are therefore to ſet your trap near the twig, in as private a place as poſſible, but ſo as to leave him a full view of the meal-worms, and turn up the freſh mould, which will invite the nightingale, in hopes of meeting with worms, ants, or other inſects, his ordinary food If he ſhould eſpy you placing the trap, you may depend upon his coming to it ſoon after you are retired; and, if he ſhould be gone to ſome other of his favourite places, you need only find him out by his ſong, and throw a ſtone at him, which will infallibly ſend him to his former ſtation. When he is caught in the trap, you muſt ſeize him cautiouſly by his legs, and diſengage him from the net, ſlipping him immediately into a little ſilk purſe, at leaſt ſix inches long, and two wide, taking all poſſible care not to rumple his wings or tail, which would conſiderably retard his ſinging. I know a fancier, who, to avoid the inconveniency of a net, in which the bird attempting to eſcape is apt to entangle himſelf, makes uſe of a piece of thin green ſilk, of which he is no more ſhy than of a net; and thus the feathers are ſecured from the leaſt damage. On your return home, you are to fix a cage on the outſide of your window, which is to remain there the nightingale's whole ſinging ſeaſon, wherein you muſt place his meat and drink, as will be hereafter deſcribed. The wires of the cage muſt be quite covered with a piece of green ſerge, or cloth, ſo as to exclude the light. It is abſolutely neceſſary that this cage ſhould be expoſed to the eaſt, as much as poſſible. The heat of the ſouth fatigues the bird, and hinders his ſinging, and, beſides, ſo dries him up, that he will be apt to turn blind in a few months.

The cage, placed as above directed, muſt be ſheltered from the rain, and the heat of the ſun, by an umbrella, or boarded ſhed. Some ſet it upon a ſmall table within the window, but then the caſement muſt be left open night and day, and nobody muſt come into the room, but the perſon that is to take care of the bird, who muſt give him his meat and drink as ſoftly as poſſible, and without jarring his cage. Under ſuch management, a nightingale, newly taken, will ſometimes begin to ſing in three days, but never exceeds eight, provided he was caught before May. In the cage muſt be placed two ſmall cups, one with water, in which you muſt put three or four meal-worms, which the nightingale will ſoon find out; in the other you muſt put between twenty and thirty meal-worms for his food at firſt. In caging the nightingale, you muſt open that end of the purſe next the head, and ſlide him out gently, and, when he is halfway out, you muſt make him ſwallow a few drops of water to refreſh him, by dipping his beak again and again into the water; when you may let him ſlip out of the purſe into his cage, preſently cloſing the door. The bird will continue ſullen for ſome time under his new confinement, but the meal-worms will ſoon revive his ſpirits, and make him forget his loſs of liberty. About four hours after caging the bird, it will be proper to viſit him, and, ſoftly opening the door of the cage, take out the meal-worm cup to put in twenty freſh worms, and at the ſame time the bottom of the cup ſhould be covered with a little of the paſte I ſhall hereafter deſcribe, which is to be his conſtant food. About ſeven in the evening, viſit him again, and give him twenty-five more worms, ſome of which ſhould be cut in two, that the paſte may cling to them, which the nightingale ſwallowing, will be inſenſibly brought to like it. The next day give him twenty-five more at eight in the morning, as many at noon, and alſo at ſeven in the evening, all cut in two, and mixed with a little of the paſte. Be very careful not to ſtir the cage, which will make the bird wild, nor muſt you ever ſuffer him to ſee you. Do the like the third day, only now cut the worms in three or four pieces, to mix the better with the paſte. So you are to go on for three weeks, when you may leſſen gradually the number of the meal-worms, and increaſe the quantity of the paſte, and this as you find he reliſhes it; for ſome will take to it ſooner than others, and it is no ſmall advantage to have a nightingale ſoon reconcileable to this ſort of meat, for it makes him very ſtout, and continues him long in his ſong. If you can eaſily procure meal-worms, it will be proper to give your bird ten or fifteen three times a day, the whole ſinging ſeaſon. But you muſt remember not to put them at firſt into a tranſparent glaſs cup, by which miſconduct many have loſt their birds in three days, without knowing that the bird, ſeeing the worms through the ſides of the cup, endeavours in vain to ſeize them, and ſo is ſtarved to death. It may ſeem ſurpriſing that to make a nightingale ſing you muſt darken him up on all ſides, whereas all other birds are quite mute under this circumſtance; but experience has ſhewn that this little creature is ſo extremely timorous, that every thing he ſees is a new object of terror, which ſets him a fluttering till he kills or maims himſelf againſt the wires of the cage; but, when kept without light, he conſoles himſelf very well with eating and drinking.

The trap, commonly uſed in England, Mr. Ward deſcribes to conſiſt of a board about the bigneſs of a round trencher, a ſpring and a wire as round as the trencher, with a green ſilk net faſtened to it; there is a little cork that comes through with a ſtring, and keeps up the trap; on the cork is pinned a meal-worm, and, when the bird pulls the worm, the trap falls.

Of breeding nightingales. — Towards the end of the ſpring, which is the time of their laſt laying, catch a pair of old birds. To which purpoſe find a neſt, as was before directed; then ſet two traps baited with meal-worms, very near the neſt, thus you will ſoon have both cock and hen; when you have brought them home along with the neſt and young ones, you are to put them altogether in a dark cloſet where not the leaſt light can penetrate. Their meat and drink muſt be placed near them in two china cups, and in a third about fifty meal-worms; and, every day at the ſame hours, you muſt do as has been preſcribed for nightingales newly taken: and thus you will ſoon have the ſatisfaction of ſeeing the cock and hen fetch the meat and meal-worms to feed their young; their meat ſhould be one half bread, the other bruiſed hempſeed, and minced boiled beef, with a little parſley, and now and then ſome yolk of egg boiled hard; or the paſte which I ſhall hereafter deſcribe, mixed with equal parts of raw ſheep's heart, or beef finely minced, firſt, clearing away very carefully all the ſkin, fat, and ſinews. The affection theſe creatures have for their young ones cauſes them, without a moment's regret of their loſt liberty, immediately to ſet about nurſing them up in their priſon. As ſoon as they can feed themſelves, you may put the cock and hen in two ſeparate cages, where they are to be kept the whole winter till the next ſpring. But, in caſe the eggs ſhould not be hatched when you take the old ones, you muſt be content with the birds only, which you are to keep ſeparate, as I have ſaid, but in the ſame dark cloſet where you purpoſe they ſhall lay eggs the next ſpring, that ſo they may be uſed to the place, for which end you may ſometimes ſuffer them to get out of their cages; and thus you will have a pair of nightingales prepared in every reſpect for home breeding at the proper ſeaſon.

The next year about the beginning of April, open the cages for the whole ſeaſon, and about the cloſet ſcatter dry oak leaves, picked dog's graſs, and deer's hair, with one or two old nightingale's neſts. In the corner of the cloſet near the window, ſtick faſt two or three branches of ſlender dry twigs, tied ſlightly together, letting the lower end reſt on the floor. Then take ſome handfuls of the oak leaves and ſtuff them among the twigs, leaving open the paſſage where your hand went in, for an entrance to the nightingales; you muſt likewiſe place near at hand a ſmall wooden tray full of ordinary garden mould, and a ſmall ſhallow earthen pan of water for them to bathe themſelves in, which ſhould be renewed every day. This pan however muſt be taken away when the hen ſits. The ſituation of the cloſet ſhould be towards the ſouth, ſo as to be expoſed as much as may be to the ſun-ſhine, and ſkreened from the north-wind. I have known perſons of curious taſte incloſe a pair of nightingales in a grand aviary, or cage built on purpoſe, in a proper corner of a garden, and ſurrounded with little yew-trees, maples, and liliacs, where they built their neſt and brought up their young as well as in the open country.

With the above precautions you will find the œconomy of our nightingales very diverting. And, if the cloſet looks into a garden, you may ſafely venture to take out a pane of the window glaſs, and leave the old ones at liberty to go out and return, which they will not fail to do, whilſt their young ones are incapable of feeding themſelves. At firſt, it will be beſt not to truſt them both out together, but the cock by himſelf, and then the hen by herſelf, and at laſt both together; obſerve too, that the hole they paſs through ſhould be as near the neſt as may be. By this management, you will have the pleaſure of hearing the cock ſing almoſt continually day and night in your garden, whilſt the hen is ſitting; and they will have the opportunity of procuring a thouſand little inſects, after the eggs are hatched, wherewith to feed their young. You muſt be cautious of viſiting the cloſet too often, eſpecially whilſt you allow them the liberty of the garden, and it ſhould be the buſineſs of only one perſon to look after them, which will make them the more familiar. But it is neceſſary, above all, that neither dog, cat, mouſe, or rat, ſhould ever diſturb them, for any of theſe would infalliably drive them away ſo as never to return again.

How to bring up your nightingales without the cock or hen. You muſt get a neſt of the firſt layter, as being ever the moſt ſtout and vigorous birds, and conſequently the beſt ſingers, and the leaſt liable to fail in their moulting. The neſt ſhould not be taken till the birds are pretty ſtrong, and, when taken, ſhould be carried home in a dark baſket, with only a few breathing-holes. To feed them properly is a delicate point, to give them too much or too little is equally dangerous. Their gaping wide is no indication that they want meat, for this they will do whenever you come nigh them, or touch their neſt; provided you underſtood well their language, their cry would be the moſt ſignificant token; but, if you do not, it will be beſt to obſerve the following directions. About half an hour after ſun-riſing, give them their firſt feed, the ſecond an hour after, and ſo on by the hour till ſun-ſet; the laſt feed ſhould be ſomewhat more plentiful than the reſt. They ſhould be fed with a ſkewer flatted at the end; give them but four mouthfuls at a time, though they would take more, even to burſting; be ſure likewiſe not to miſtake one for another, elſe ſome may be ſtarved and others over-crammed. At a month's end, or ſooner, if they are of the firſt layter, they will be able to feed themſelves, which you may know by preſenting a ſmall meal-worm to them; you may then ſeparate them in different cages. The young ones being ſo far brought up, you may, for perfecting their ſong, carry them into the country to hear the old nightingales ſing, otherwiſe they will ſcarce anſwer the trouble which has been taken about them; at leaſt, you muſt wait a long while before they will be able to entertain you to your liking. I know a fancier who has been theſe twenty years bringing up nightingales from the feeding ſtick, of which he always has a large ſtock by him; ſome of them he had twelve years, and may be called tolerably good, but no ways equal to thoſe bred in the country. This is however an eaſier way for ſuch as are already provided with old nightingales taken with the trap, and kept a whole year or more. Take a neſt of young ones, and place them in the ſame chamber with an old nightingale. Begin feeding the young ones with the ſtick, and leave the old one's cage open day and night, taking care to place a ſmall pot of the young ones meat, that is, the paſte mixed with minced beef or mutton, cloſe to his own feeding trough. This done, if you ſuffer the young ones to cry a little while before you proceed to feed them, you will ſoon perceive the old bird to go out of his cage, chirp to the young ones, fill his bill with their paſte, and feed them. When, therefore, at your morning viſit, you find that he has been diſtributing meat to the young ones, you may truſt that buſineſs to him entirely, for he will feed them till they can feed themſelves: or you may afterwards have the pleaſure of ſeeing them eat with him at the ſame pot, and follow him into his cage. Put them into ſeparate cages. If you purſue this method, as I have done, with ſucceſs, and may be practiſed on various other birds, as ſparrows and gold-finches, you may ſpare yourſelf the pains of attending your young nightingales, which requires a deal of time and fatigue. The old bird will take as good or better care of them than you can, and, beſides, will teach them their ſong.

I will add, that, if you chuſe this way of bringing them up, it will be beſt to provide yourſelf with a hen, and keep her a whole year in a cage, in order to be a nurſe, under which management ſhe never fails to prove one; whereas a cock often fails in this point of duty, nor does he ever ſing as long as he is engaged in it.

Of the time and manner of teaching young nightingales tunes by whiſtling, or the flageolet.

When you perceive, by the chirping of a young one, that he is a cock, put him into a cage covered with green ſerge; and let him hang in a chamber quite out of the hearing of nightingales, as well as of all other birds. For the firſt week let him be kept near the window, or the lighteſt part of the room; then remove him by degrees backward to the darkeſt part, where he muſt remain all the time of his learning, nor muſt he be annoyed or diverted by any kind of noiſe whatever, nor diſturbed by people's coming near him. His tune ſhould not be whiſtled or piped to him too often; half a dozen leſſons a day will be fully ſufficient, two in the morning, two at noon, and as many in the evening. Two ſeveral tunes are enough for one bird. The flageolet ſhould be of the ſofteſt and melloweſt tone, and not of too high a pitch. I muſt again inſiſt upon the neceſſity of keeping a young nightingale apart, as ſoon as he is able to feed, if your intention be to learn him a tune. And another thing I am to admoniſh the reader of, that notwithſtanding he has kept conſtantly whiſtling or piping to his bird, even to his moulting time, without having any thing from him in return, more than a little chirping, yet this ſhould not diſcourage him. The bird's voice is ſeldom formed before the enſuing ſpring, and therefore his leſſons ſhould be continued without intermiſſion. When that ſeaſon arrives, you will find to your equal ſurprize and delight, that your ſcholar has not forgotten his inſtructions. I have known it happen, that when the piping has been neglected at the autumn and winter, out of mere deſpair, the nightingale has notwithſtanding of his own accord ſtruck into his tune, and gone through a great part of it at the beginning of the ſpring.

How to have ſinging nightingales all the year.

About the beginning of December put an old cock into the blind cage, then ſhut him up in a cloſet, which you muſt darken by degrees, ſo that not a ray of light can enter, till June, when you may gradually let in the light. In this month, as others ceaſe, he will begin to ſing. Then you are to put another old cock in a light cage, and keep him in the dark till December, and as much as poſſible from hearing the ſinging of the other, and comfort him with a little wood fire in the chimney of the room during the cold of the winter, all which ſeaſon he will likewiſe ſing.

But if you would bring a nightingale to an almoſt conſtant ſong, by blinding him, you muſt proceed thus: keep him in the blind cage a whole year, then take the bird in your hand, and cloſe up his eyelids thus: break off the bole of a tobacco-pipe, and, having heated the thick end of the ſtem red-hot, bring it near the bird's eye, and blow through it, which will cauſe him to ſhut it, and a glutinous tear will iſſue, which will perfectly cloſe it up, without any farther inconvenience to your bird; a dexterous operator will eaſily do this without at all ſcorching of the eye-ball, for, though the anguiſh would not kill him, yet he would be a good while in recovering, beſides being diſfigured; whereas, if proper care be taken, you may reſtore his ſight by ſeparating the eye-lids with the fine point of a pen-knife.

As ſoon as the bird is blinded, make him ſwallow a drop of water, then put him in his cage in the ſame dark room, keep him till the ſoreneſs of his eyes be gone off, which uſually is in a week or ten days; then let in the light upon him by degrees.

How to make nightingales reſort to places unfrequented by them.

In the month of May find a neſt of the firſt layter, but do not take it till the young ones are at leaſt a week old; then go early in the morning, and ſet two traps, baited with meal-worms, near the neſt, ſo you will eaſily get the father and mother in your poſſeſſion in leſs than an hour; as ſoon as you have caught them, put them in ſeparate ſilk bags, and ſo bring them to the place where you deſign to fix them. Take alſo with you two ſmall ſquare cages covered with thick green ſerge, without wires or perches. In taking the neſt, do not ſeparate it from the branches that ſupport it, but cut them off, and bring away the neſt and them together; and it will be beſt to remove the whole tree, if it be a ſmall one; when you have brought it to your intended place, plant it in the ſame aſpect as before; the neſt ſhould be covered with wool or cotton in the tranſporting, to keep the young ones from getting out or taking cold. Having fixed the neſt, place the two cages with an old one in each, ſo that the neſt may be between them at twenty or thirty paces diſtance, and let the doors of the cages be turned towards the neſt. To each door muſt be faſtened a thread forty or fifty yards long, whoſe ends you muſt hold together in your hands, and, concealing yourſelf behind ſome tree or hedge, pull open the doors and ſuffer the old ones to eſcape from their cages with the following precautions. Let the young ones grow hungry and chirp for their food before you let the old ones eſcape, who then will readily find them: releaſe the hen firſt, and, ſome little while after, the cock; then carry off the cages as quietly as you can, and come no more there that day. Thus from your window you may entertain yourſelf with the pleaſure of ſeeing the old ones bring up their young, which will, themſelves, be ſure to breed upon the ſame ſpot the next year.

Of the tokens of health and ſickneſs in nightingales, and how to cure them.

A nightingale may be looked upon to be in a good ſtate of health: 1. If he ſings much. 2. If he often feathers himſelf. 3. If he be briſk and alert, and jerks his wings much. 4. If he rooſts on one leg only, and is greedy of meal-worms. On the contrary, when a nightingale ſleeps on his belly in the bottom of the cage, it is a ſign he is either ſick or ſullen, provided his feet are not baked up and diſabled with his dung, in which caſe a little warm water in a ſaucer, placed in his cage, ſoon relieves him. Sometimes a little impoſthume forms on the bird's rump, which ſhould be ſnipped with the point of a pair of ſciſſars, and the matter ſqueeſed out, giving him a few meal-worms to cheriſh him, or a ſpider or two, which never ſhould be omitted at the beginning of March, be he ſick or well. If he grows lean through much ſinging, mix poppy ſeeds in his meat. When his ſong and moulting are over, he is apt to grow too fat, therefore the poppy ſeeds muſt then be left out. If he be very lean, feed him with raw ſheep's heart well cleared of all its ſkin and fat, minced very ſmall and mixed with an equal quantity of the paſte hereafter deſcribed. If he is bound up, give him four or five meal-worms, and, if he dungs too looſe and often, ſheep's heart and poppy ſeeds will bring him to rights. The cramp often afflicts him, which, if it once attacks a young one, it is ſure to kill him; in old ones, it generally ariſes from too much expoſure to the cold, and a warmer place is the remedy. There is an odd diſorder to which this bird is very liable, it may be called the falling ſickneſs. After a few precipitate motions he ſhall drop from his perch on his back at once, with his legs ſtretched upwards, and his eyes diſtorted, when, without ſpeedy relief, he ſoon breathes his laſt. The only method is to take him, and, with a pair of ſciſſars, cut off the hind claws ſo near the heel as to draw a drop or two of blood; then waſh his feet in white wine, of which if he does not ſoon revive, make him ſwallow a drop worm, and he will be quite reſtored in an hour or two. To conclude, if you would ſecure a nightingale in a healthy conſtitution, do not fail in the month of March to purge him with half a dozen black ſpiders, one every day.

Of the proper food for nightingales.

There is not perhaps a bird eaſier to feed than a nightingale; all meat agrees with him, provided it be mixed with fleſh, without which he will not be nouriſhed. He is naturally carnivorous, and lives on ſpiders, wood-lice, ants eggs, flies, and ſeveral ſorts of worms, all of them animal ſubſtances, which agree with his conſtitution; the knowledge whereof has put many upon preparing compoſitions proper to be ſubſtituted in the room of his natural food. The moſt common of this ſort in France is equal parts of bruiſed hempſeed, crumbed bread, and minced boiled beef, well mixed together; this does very well for them, but it is troubleſome to the feeder, as it muſt be made freſh every day in ſummer. I ſhall therefore give the compoſition of a paſte, which will keep good a long time, and what I have uſed many years with great ſucceſs.

Take two pounds of lean beef ſtakes, Spaniſh or chick peaſe huſked, millet ſeeds, poppy ſeeds, ſweet almonds, of each half a pound: wheat flour two ounces; virgin honey, a pound; ſaffron in powder, a drachm and an half; the yolks of twelve new laid eggs; freſh butter, the quantity of a hen's egg.

Firſt let the peaſe and millet ſeeds be powdered and ſifted. The poppy ſeeds muſt be only well bruiſed, becauſe their oilineſs will not admit of ſifting. The beef muſt be either finely minced or pounded in a marble mortar, and cleared of all fat and ſkin; the almonds muſt be likewiſe pounded after blanching in hot water, and they muſt be wrought to a perfect paſte, otherwiſe the birds cannot digeſt them. Then break the eggs and ſeparate the yolks into a broad earthen diſh, and add the honey and the ſaffron. When theſe three are well mixed, incorporate therewith ſucceſſively the beef, almonds, meals, and flour, ſtirring the whole with a wooden ſpatula, till no clots remain; then turn the mixture into another glazed earthen diſh, whoſe inſide has been rubbed over with butter. Set it on a gentle fire, ſtirring it continually, eſpecially the bottom, to keep it from burning; continue it on the fire till the paſte will no longer ſtick to your fingers, and has acquired the ſtiffneſs of a new kneaded biſcuit. This done, remove it from the fire, and let it cool in the diſh. Afterwards put it into a tin box cloſe covered, and keep it in a dry place for uſe.

It is not eaſy to ſucceed in the preparation at the firſt trial; it depends on a degree of drying to be found out only by experience; when it is over dry, it loſes its ſubſtance, and ſheep's heart muſt be often mixed up with it, elſe the birds will loſe their fleſh; on the other hand, if it be under dried, it will turn mouldy in keeping, if you have not a good number of birds to feed: for it is calculated at the rate of a ſix months proviſion for one bird. For the want of the Spaniſh peaſe, maize, or Turkiſh corn, will do as well.

Laſtly, notwithſtanding I have experienced that this paſte is of itſelf ſufficient to keep nightingales full in fleſh, yet I am convinced that, when I mixed with it an equal quantity of ſheep's heart for regaling them upon certain occaſions, their ſong would be ſtronger and more laſting. I would therefore recommend ſuch addition during the ſinging ſeaſon.

PHILO'NIUM *Londinenſe*, the name by which the medicine commonly called Philonium Romanum, is called in the late London Diſpenſatory. The compoſition is alſo much altered, as well as the name, and is now ordered to be made thus : take white pepper, ginger, carraway-ſeeds, of each two ounces ; opium, ſix drachms ; ſyrup of diacodium boiled to the conſiſtence of honey, three times the weight of all the reſt. The opium is to be diſſolved in a little wine, and then mixed with the ſyrup ; after which the powders are to be ſtirred in, and the whole made into an electuary. *Pemberton's London Diſpenſatory.*

PHILOSO'PHIC *Chemiſtry*, an art of dividing or reſolving all the bodies in our power by means of all the inſtruments that can be procured, and that as well into integrant as into conſtituent parts, and joining theſe parts together again, ſo as to diſcover the principles, relations, and changes of bodies, make various mixtures and compoſitions, find out the phyſical cauſes of phyſical effects, and hence improve the ſtate of natural knowledge, and the arts depending on it. *Shaw's Lectures.*

PHILO'SOPHY (*Dict.*)—Philoſophy may be divided into three parts, intellectual, moral, and phyſical. The intellectual part compriſes logic and metaphyſics. The moral part contains the laws of nature and nations, ethics and politics. And, laſtly, the phyſical part comprehends the doctrine of bodies, animate or inanimate. Theſe, with their various ſubdiviſions, will take in the whole of Philoſophy.

Wolfius makes the three parts of Philoſophy to be the doctrine of God, the human ſoul, and of bodies. However, when he ſubdivides, and comes to treat the ſeveral branches ſeparately, his diviſions readily come under the three heads intellectual, moral, and phyſical, before-mentioned. The doctrine of God and the human ſoul may be ranged under the ſame head metaphyſics, the notion of the divine nature being formed from that of the human ſoul, excluding limitations and imperfections.

PHILOSOPHY *of the Aſiatics.* All the inhabitants of Aſia are either Mahometans, Pagans, or Chriſtians. The Mahometan ſect is the moſt numerous ; one part of the people which inhabit this part of the world have preſerved the worſhip of idols ; what few Chriſtians are found among them, are ſchiſmatics, and only the remains of ſome ancient ſects, eſpecially that of Neſtorius. What will appear at firſt moſt ſurpriſing, is yet true, that the latter are the moſt ignorant, and perhaps the moſt ſuperſtitious people in all Aſia. As to the Mahometans, they are divided into two ſects, that of Abubeker and that of Ali : theſe two ſects mutually hate each other, though the difference between them conſiſts rather in ceremonies and ſome private opinions than in fundamental doctrines. Some among the Mahometans have preſerved certain opinions of the ancient philoſophic ſects, particularly thoſe of the old Oriental philoſophy. The information which the famous M. Bernier gives us, who lived a long time among them, and was himſelf well ſkilled in philoſophy, has put this matter paſt all doubt. ' He tells us the Perſian magi, whom he calls cabaliſts, aſſert that God or the almighty being whom they term Achar, immoveable, immutable, not only produced ſouls out of his own proper ſubſtance, but every material and corporeal being of the univerſe alſo ; and that this production is not performed ſimply in the manner of efficient cauſes, but in the ſame manner as a ſpider, who ſpins a thread from her navel firſt, and ſpreads it when ſhe will. The creation, therefore, according to this doctrine, is an extraction and extenſion, which God makes of his own proper ſubſtance, of theſe nets, which he draws as it were out of his entrails; and deſtruction, therefore, is nothing but a reſumption which the almighty being makes of his own divine ſubſtance within himſelf ; ſo that the laſt day, which they call maperle or pralia, at which they believe all things ſhall be deſtroyed, will be nothing but a general reſumption of all theſe filaments, which God had in this manner drawn out of himſelf. Therefore, ſay they, there is nothing of reality, in all we imagine of ſeeing, hearing, ſmelling, taſting, and feeling : the univerſe is nothing but a dream and an illuſion ; the multiplicity and variety of objects that ſtrike us, are only one and the ſame thing, which is God alone, as all the different numbers we know, ten, twenty, &c. are nothing more than the ſame unit repeated ſeveral times.' But if you aſk them ſome reaſon for their opinion, or to explain how this extraction and reſumption of ſubſtance is performed, this extenſion and apparent diverſity ; or how it is poſſible that God, not being corporeal but ſimple, as they acknowledge, and incorruptible, can nevertheleſs be divided into ſo many portions of ſouls and bodies ; they only reply by allegories, and never anſwer directly : God, ſay they, is like an immenſe ocean, in which ſeveral phials full of water moved ; that theſe phials, which way ſoever they went, were yet in the ſame ocean, and that, if any of them broke, the water, contained in them, was at the ſame time united to its whole, to this ocean of which they were parts. Or they will tell you that God, like light, is the ſame through the whole univerſe, and yet, like that, appears in a hundred different forms, according to the diverſity of objects on which it falls, or according to the different colours and figures of glaſſes through which it is tranſmitted : thus they avoid anſwering objections by recurring to allegories, and throw duſt in the eyes of an ignorant people. The laſt recourſe of the magi themſelves is to reveries, and the aurea carmina of their Goult-hen-raz.

This is the doctrine of the Pendets, heathens of the Indies ; and the cabala of the magi and the generality of the Perſian literati is of a piece with it, and which is ſet forth in moſt lofty and ſublime verſes in their Goult-hen-raz, or Flower bed of Myſteries : this was the doctrine of Fludd, whom the famous Gaſſendi has ſo learnedly refuted ; and from the little we know of the doctrines of Zoroaſter, and the Oriental philoſophy, it ſeems highly probable the philoſophy we have now ſpoken of proceeded from them.

After the Perſians come the Tartars, whoſe empire is the moſt extenſive in all Aſia, for they poſſeſs all that vaſt tract of land which lies between mount Caucaſus and China. What accounts travellers have given us of this people are ſo uncertain, that it is difficult to determine, whether they ever had any tincture of philoſophy We only know that they have ſunk into the groſſeſt ſuperſtition, and are either Mahometans, or idolaters. But, as there are numerous orders of prieſts among them called lamas, it may be worth enquiring whether they had not more learning than the people committed to their care ; but no great inſight can be got from what authors have publiſhed on this ſubject.

The worſhip which theſe lamas pay to idols proceeds on the belief that the idols are images of the divine emanations, and that ſouls which are alſo emanations from God dwell in them. All theſe lamas have a high-prieſt over them called the grand lama, whoſe common reſidence is on the top of a mountain. One can ſcarce imagine the profound veneration the idolatrous Tartars have for him ; they look on him as immortal, and the inferior prieſts keep up the cheat by their tricks. All travellers in ſhort agree, that the Tartars are the moſt rude, ſuperſtitious, and ignorant people of all Aſia. The law of nature is almoſt totally extinguiſhed among them ; we muſt not therefore be ſurpriſed at their having made no greater progreſs in philoſophy.

If we go out of Tartary into India, we ſhall not meet with leſs ignorance and ſuperſtition, and theſe to ſo great a degree that ſome authors have been of opinion that the Indians had no knowledge of a God : but this opinion ſeems not well grounded. Abraham Rogers in ſhort tells us that the Bramins acknowledge one ſole and ſupreme God whom they call Viſtnou ; that the firſt and moſt ancient production of this God was an inferior deity called Brama, which he formed out of a flower that floated on the great abyſs before the creation of the world. The virtue, fidelity, and gratitude of Brama were ſo eminent, they tell us, that Viſtnou gave Brama power to create the univerſe. The particulars of their doctrine are related by different authors with a variety ſo very perplexing, that it is extremely difficult to diſtinguiſh the truth : this variety proceeds in ſome meaſure from the great reſervedneſs of the Bramins to all ſtrangers, but principally from this, that thoſe travellers who have taken upon them to tranſmit their opinions to us, have been very little ſkilled in their language. But all modern accounts concur in this, that the Indians acknowledge one or ſeveral Deities.

We cannot in this place omit ſpeaking of Budda or Xekia, ſo much celebrated among the Indians, for having taught them the worſhip of the Deity ; theſe people look upon him as the greateſt philoſopher that ever exiſted, but the hiſtory of him is ſo full of fables and contradictions, that it is impoſſible to reconcile them : all we can conclude from the diverſity of ſentiments which authors have delivered upon this ſubject, is that Xekia made his firſt appearance in the ſouthern part of India ; that he at firſt taught the inhabitants dwelling on the ſea-coaſts, and that from thence he ſent his diſciples forth who ſpread his doctrine throughout all India.

The Indians and Chineſe both unanimouſly bear witneſs, that this impoſtor had two ſorts of doctrine ; one public calculated for the people, the other kept as a ſecret and revealed only to ſome of his diſciples. Le Comte, La Loubere, Bernier, and eſpecially Kempfer, have ſufficiently explained the former to us, which they call the exoteric ; and theſe are its principal tenets.

1ſt. There is a real difference between good and evil.

2d. The ſouls of men and brutes are immortal, and only differ in proportion to the ſubjects they inform.

3d. The ſouls of men, ſeparated from their bodies, receive either recompenſe of their good actions in a place of delights, or the puniſhment of their crimes in a place of torments.

4th. The retreat of the bleſſed is a place where they ſhall taſte happineſs without end, and this place they call Gokurakf.

5th. The gods differ from each other according to their nature, and the ſouls of men according to their merits ; conſequently the degree of happineſs they ſhall enjoy in theſe Ely-ſian fields ſhall be in proportion to their deſerts: notwithſtanding the proportion of happineſs that each of theſe ſhall enjoy will be ſo great, that they ſhall not deſire any thing beyond it.

6. Amida is the governor of theſe bleſſed retreats and protector of human ſouls, eſpecially of thoſe deſtined to enjoy eternal happineſs. He is the ſole mediator who can obtain the remiſſion of ſins for men, and life eternal. Note. Many Indians and Chineſe aſcribe this to Xekia himſelf.

7th. Amida will not grant this happineſs but to ſuch as follow the law of Xekia, and lead a virtuous life.

8. Now the law of Xekia contains five general precepts, on the practice of which depends eternal ſalvation. The firſt forbids killing any thing that hath life: the ſecond forbids theft: the third inceſt: the fourth lying: the fifth and great commandment forbids the uſe of ſtrong liquors.

Theſe five precepts are held in great reverence, throughout all ſouthern and eaſtern Aſia. Several of their learned men have wrote comments on them, and conſequently rendered them obſcure, for they have divided them into ten counſels, to enable them to acquire the perfection of virtue, every counſel is ſubdivided into five go frakkai, or private admonitions, which have rendered the doctrine of Xekia extremely ſubtile.

9. All men, both lay and eccleſiaſtic, who ſhall have rendered themſelves unworthy of eternal happineſs, by the iniquity of their lives, ſhall be ſent after death into a place of horror, called Dſegokf, where they ſhall ſuffer torments which ſhall not be eternal, but endure a certain undetermined time; theſe torments ſhall be in proportion to their crimes, and inflicted more ſeverely in proportion to the neglect of occaſions offered for the practice of virtue.

10. Jemma O is the governor and judge of theſe dreadful priſons; he will examine all the actions of men, and puniſh them with different torments.

11. The ſouls of the damned may receive ſome alleviation of their woe from the virtue of their relations and friends, and nothing can be more ſerviceable to them, than prayers and ſacrifices made for the dead, by the prieſts, and addreſſed to Amida the great father of all mercies.

12. The interceſſion of Amida prevails on the inexorable judge of hell to mitigate the rigour of his decrees, and render the puniſhments of the damned more ſupportable, without offending his juſtice, by ſending them back again into the world as ſoon as poſſible.

13. After ſouls have been thus purified, they are ſent into the world again to animate bodies, not of men, but of unclean beaſts, whoſe nature correſponds to the vices which had infected the damned during their lives.

14. Souls ſhall paſs by ſucceſſion from baſer into more noble ſubtile bodies, till they again deſerve to animate the human frame, in which they may, by a virtuous life, merit eternal happineſs. But if on the contrary they again commit ſin, they muſt undergo the ſame puniſhments and tranſmigrations.

This is the doctrine Xekia taught the Indians, and which he wrote with his own hand on the leaves of trees. But his exoteric and eſoteric doctrine differed greatly. Indian authors tell us that, when Xekia drew near his end, he called his diſciples to him, and diſcovered to them thoſe dogmas which he had kept ſecret during his life-time. Thoſe which follow have been extracted from the books of his ſucceſſors.

1. The void, vacuum, is the beginning and end of all things.

2. From that all men proceeded and to that they ſhall return after death.

3. All that exiſts comes from this principle, and returns to it again after death; this principle conſtitutes our ſouls and all the elements, conſequently all things which think and have a being, however different they ſeem to be, differ not really in themſelves, and have no diſtinct eſſence.

4. This principle is univerſal, wonderful pure, limpid, ſubtile, infinite, can neither be born, die, nor be diſſolved.

5. This principle has neither virtue, nor intelligence, nor power, nor any ſuch-like attribute.

6. Its eſſence is to do nothing, think of nothing, deſire nothing.

7. He that deſires to lead an innocent and happy life muſt uſe all his endeavours to become like his principle, that is to ſay, he ought to conquer or rather extinguiſh all his paſſions, that he may not be troubled or diſquieted by any thing whatever.

8. He who obtains this point of perfection, ſhall be abſorbed in ſublime contemplations, without any uſe of his intellectual faculties, and will enjoy a divine repoſe which is the completion of all happineſs.

9. When we have arrived at the knowledge of this ſublime doctrine, we muſt leave the exoteric doctrine to the people, and countenance it.—It is probable this ſyſtem gave birth to a famous ſect among the Japaneſe, which teaches, that there is only one principle of all things; that this principle is clear, luminous, incapable of increaſe or decreaſe, without figure, powerfully perfect, wiſe, but deſtitute of reaſon or intelligence, being in an abſolute inaction, and perfectly tranquil, like a man whoſe attention is fixed intenſely on one object without thinking on any other: they tell you farther, that this principle is in all and every being, and communicates its eſſence to them, in ſuch a manner, that they are the ſame thing with it, and reſolve themſelves into it, upon their diſſolution.

This opinion is different from Spinoſiſm, becauſe it ſuppoſes the world to have been formerly in a very different ſituation from what it is at preſent. A follower of Confucius has refuted the abſurdities of this ſect by the common maxim, *Ex nihilo nihil fit*; from whence it appears they taught, that nothing was the firſt principle of all things, and conſequently that the world had a beginning, without matter or cauſe efficient; but it is more probable that they meant, by the word void, only ſome thing which has not the ſenſible properties of matter, perhaps the ſame as the moderns call ſpace, which is a being very diſtinct from body, the extenſion of which is indiviſible, impalpable, penetrable, immoveable, and infinite. It is very evident ſuch a being could not be the firſt principle, if it was incapable of acting as Xekia aſſerted. Spinoſa has not carried the abſurdity ſo far; the abſtract idea which he gives of the firſt principle, is, properly ſpeaking, nothing but the idea of ſpace to which he has attributed motion, in order to join to it all the properties of matter afterwards.

The modern Jews are not unacquainted with the doctrine of Xekia; their cabaliſts account for the origin of things by emanations from a firſt cauſe, which muſt neceſſarily have been pre-exiſtent, though perhaps under another form. They ſpeak alſo of a return of all things into the firſt ſtate, as if they were of opinion, that their enſoph or firſt infinite being contained all things, and that the ſame quantity of beings ſubſiſted before, as after creation. When the being is in its uncreated ſtate, God is ſimply all things; but when the being comes into the world, it does not therefore increaſe in quantity, but God opens and expands himſelf by emanations. Therefore, they often ſpeak of great and ſmall veſſels deſtined to receive theſe emanations of rays which proceed from God, and of canals by which theſe rays are tranſmitted; in a word, when God withdraws theſe rays, the external world periſhes, and all things become God again.

What we have ſaid concerning the doctrine of Xekia may help us to trace out its true original. It ſeems probable that India was not his native country, not only becauſe his doctrine appeared new, when he carried it thither, but farther becauſe there is no Indian nation that boaſts of having given him birth, and Croza's authority, who relates that all the Indians agreed in ſaying Xekia was born of an Indian king, is not ſufficient to make us alter our opinion: for Kempfer has very well obſerved that all the nations ſituated on the eaſt of Aſia give the name of India to all the ſouthern parts of that vaſt country. This unanimous concurrence of the Indians only proves therefore that Xekia was born in ſome ſouthern climate. Kempfer conjectures he was an African, that he had been inſtructed in the Philoſophy and myſteries of the Egyptians, that a war which laid all Egypt waſte, drove him thence, whereupon he, with ſome companions, took refuge among the Indians, who received him as another Hermes and a new legiſlator; he taught them not only the hieroglyphic doctrine of the Egyptians but their myſteries alſo: Kempfer offers theſe arguments in ſupport of his opinion.

1. The religion which the Indians received from this legiſlator has a very evident connection with that of the ancient Egyptians: for all theſe nations repreſented their gods under the ſhape of animals and men of monſtrous figures.

2. The two principal dogmas of the religion of the Egyptians were the tranſmigration of ſouls, and the worſhip of Serapis under the figure of an ox or cow. Now the ſame doctrines are evidently the grounds of the religion of the Aſiatic nations. Every one knows, the blind reverence theſe people have for all animals, even the moſt noxious, from a perſuaſion that human ſouls inhabit their bodies; they pay ſuperſtitious honours to the cow, and her image is placed in their temples. It is remarkable theſe notions prevail more among all theſe barbarous people, as they come nearer to Egypt.

3. The people of Aſia, on the Eaſt, have the Egyptian deities, and worſhip them, though under different names.

4. This conjecture is confirmed by a paſſage in hiſtory. Cambyſes king of Perſia, 536 years before Chriſt, made an invaſion into Egypt, ſlew Apis, which was the palladium of this kingdom, and drove all the prieſts out of the country. Now, if we compare the eccleſiaſtical epocha of the Siameſe, which begins from the death of Xekia, with the time of the expedition of Cambyſes, we ſhall find them coincide exactly.

5. Laſtly, the image of Xekia repreſents him with an Ethiopian viſage and woolly hair, which are particular to the people of Africa. All theſe arguments, well weighed, ſeem to leave no room to doubt but that Xekia was an African, and taught the Indians thoſe doctrines he had learned in Egypt.

PHLEBO'TOMY (*Dict.*)— In bleeding it ſometimes happens, that an artery is opened either inſtead of, or together with, the vein: an accident of this kind is attended with the utmoſt danger. An artery is known to be wounded when the blood ſpins out very forcibly from the orifice, and that, by ſtarts or leaps, not in an even ſtream, and extends itſelf in a greater arch from the orifice to the baſon. The colour of the blood from an artery is alſo much more florid than from a vein; to which add, that, on preſſing the finger on the veſſel below the orifice, the blood ſtarts out more violently than before, and ſtops, or at leaſt abates, on preſſing above the orifice; quite the contrary of what happens on the opening a vein.

In an accident of this kind, the ſurgeon ſhould have preſence of mind not to betray the caſe by his fears to the patient, or attendants: he ſhould obſerve whether the blood flows freely from the orifice, or whether it inſinuates itſelf in any conſiderable quantity between the integuments. If the firſt is the caſe, he muſt take a large quantity of blood away, even till the patient faints, perſuading the attendants that the heat of the blood requires it; and, while the patient is in his fainting fits, as the flux then ceaſes, he may commodiouſly dreſs and bind up the wound, and by this precaution hinder a freſh hæmorrhage or an aneuriſm. The ſurgeon muſt place ſome ſmall piece of money between the folds of the firſt compreſs, and on this place two, three, or more compreſſes, each larger than the other: and then, binding the cubitus, apply two bandages in this manner, as after bleeding in the vein, only a little tighter; and lay a thick, long, and narrow compreſs over the artery, from the cubitus to the axilla: and the patient muſt be warned to wear his arm in a ſling, pinned to his cloaths, for a fortnight, and refrain from all uſe of it.

If the blood from the wounded artery be found to inſinuate itſelf between the integuments, the orifice muſt be immediately compreſſed, and tied up as before directed; and the arm often inſpected, to ſee whether a bleeding within the integuments does not yet continue. The patient muſt be frequently bled in the other arm, and if a large quantity of blood ſhould be lodged from the wounded artery under the integuments, it will be neceſſary to open the integuments to diſcharge it.

It is too common an accident to find a nerve or a tendon punctured in bleeding, and this is generally known to be the caſe by the patient's making a ſevere outcry at the time; and eſpecially if he complains afterwards of acute pains, and the limb begins to ſwell and be inflamed, convulſed, ſtiff, and extended as in the cramp; which ſymptoms, if not timely relieved, threaten convulſions of the whole body, a gangrene of the part, and even death in a ſhort time.

The beſt method to be taken in this accident, is, to firſt bathe the part with a mixture of oil of turpentine and ſpirit of wine, and then inveſt the whole arm with the diachalciteos plaiſter, melted down in oil of vinegar and roſes, retaining it on by the expulſive bandage; which, beginning upon the hand, ends gradually by ſpiral turns to the top of the ſhoulder; by which means the impulſe of the blood on the part is not only much abated, but alſo the pain and inflammation much diminiſhed: and, laſtly, the following cataplaſm ſhould be applied to the arm, to complete the cure: take flour of barley and bitter vetch, of each two ounces; chamomile flowers and melilot flowers, of each two handfuls, freſh butter, an ounce and an half: boil theſe into a cataplaſm with ſoap ſuds, and apply them to the arm, till the pain and other bad ſymptoms are removed. *Heiſter's Surgery.*

PHO'CA, *the ſea calf*, in the Linnæan ſyſtem of zoology, a diſtinct genus of animals, the characters of which are, that they have two paps placed near the navel, feet adapted to ſwimming, and have no ears.

There are two kinds of this animal: the common one, called the ſea calf, which has its canine, or dog-teeth, incloſed, like the others, in its mouth; and the other, which ſome improperly call the hippopotamus, or ſea horſe, which has theſe teeth exerted or thruſt out. *Linnæi Syſtem. Natur.*

We have a draught of this animal in the Philoſophical Tranſactions, Nº. 469, by Dr. Parſons, who obſerves, that Aldrovandus, Johnſton, Rondeletius, and Geſner, have made ſeveral miſtakes in the figure of this creature, ſo as to convey no juſt idea of it.

This animal is viviparous, and ſuckles its young by the mamillæ, like quadrupeds; and its fleſh is carneous and muſcular. That diſſected by Dr. Parſons was ſeven feet and an half long, though very young, having ſcarce any teeth, and having four holes regularly placed about the navel, which in time become papillæ.

PHO'LAS, in natural hiſtory, the name of a genus of ſhells, the characters of which are theſe: it is an oblong multivalve ſhell, compoſed of five ſhells, though in ſome improperly accounted ſpecies of this genus, only of two. It is ſmooth in ſome ſpecies, in others rough, and in ſome reticulated; in ſome ſpecies it ſhuts cloſe and even, in others it gapes always open.

PHO'LIS *, in natural hiſtory, the name of a genus of foſſils of the claſs of the gypſums or plaiſter-ſtones, the diſtinguiſhing characters of which are, that the bodies of it are conſiderably hard, compoſed of ſomewhat broad particles, and of a bright cryſtalline luſtre.

* The word is derived from the Greek φολὶς, a ſcale, or ſmall flake, from theſe bodies being compoſed of particles of that form.

PHO'SCAS, in zoology, the name of a freſh water fowl of the duck kind, and of the ſize of the common widgeon. Its body is remarkably flat; its beak and legs are blue; its head and neck are of a browniſh colour, variegated all over with numerous triangular black ſpots; and on the top of the head theſe ſpots are larger than elſewhere, and are of a ſomewhat greeniſh hue; the back, wings, and tail are of a duſky brown, but the edges of the feathers are pale or whitiſh; the wings are variegated by two long white ſtreaks; the breaſt and ſides are of the ſame colour with the back, but paler; and the belly of a fine white, but with a few duſky ſpots under the tail. *Ray's Ornithol.*

Antimonial PHO'SPHORUS, in chemiſtry, the name of a ſubſtance, having the qualities of the Phoſphorus diſcovered by Mr. Geoffroy in his experiments on antimony. This gentleman had prepared a ſoap from pot-aſhes, quick-lime, and oil, with which he made ſeveral experiments on antimony; among others, he was deſirous, by means of this, to reduce ſome diaphoretice antimony, which he had before made from two parts of the regulus antimony, and three parts of nitre; but, inſtead of the reduction which he was labouring after, his operations afforded him a much more ſingular phænomenon: the reſult of them being a Phoſphorus, which he had never thought of; a matter, which, after having remained perfectly quiet, while cloſely ſtopped down, took fire, as ſoon as ever it was expoſed to the air; and that with a violent detonation, and darting every way a ſhower of fire.

It is eaſy to ſee, that there are in the preparation all the requiſites for ſuch an effect; nitre, charcoal furniſhed by the burnt ſoap, and ſulphur both from the ſoap and from the regulus of antimony; and, to all theſe, a ſort of calx, either from the ſoap, or from ſome earthy parts of the antimony. It is eaſy to conceive, that all theſe ſubſtances, coming to a mixture together, ſhould be ready to catch fire, and blaze upon a proper application; but it is not leſs difficult to account for this effect's being produced merely by the air, after the whole had been for a long time in a ſtate of reſt.

The method of preparing this new ſpecies of Phoſphorus is this: Mr. Geoffroy mixed two ounces of his ſoap with one ounce of this diaphoretic antimony; this mixture, being put by little and little into a red-hot crucible, took fire, and ſwelled very much. After it had done flaming, the maſs ſubſided, and became a red or fire-coloured ſubſtance, of an even ſurface, but ſtill throwing up a vaſt quantity of bluiſh green luminous vapours; and all this regularly happens on every freſh throwing in of the matter, without the leaſt variety. When the whole quantity was thrown in, and had ceaſed to give any flame or luminous vapour, it remained in the crucible in the form of an inverted muſhroom, being hollow, very porous, and of a black colour. When the crucible was taken out of the fire, the edges of this ſubſtance were beaten down into the middle, and the whole covered with an ounce of freſh ſoap. When this laſt ſoap was burnt, and a ſmall bluiſh flame appeared upon the ſurface of the maſs, the crucible was covered with a lid, and a large quantity of charcoal laid upon it, and the fire blowed up very briſkly, by an hundred blaſts of the bellows, or thereabouts; but, notwithſtanding the fierceneſs of the fire, there were no fluid ſcoriæ formed, but the whole maſs remained ſpongy and porous. The fire was then ſuffered to go out, and the crucible placed in a corner of the elaboratory to reſt for five hours. In the evening, when the crucible was perfectly cold, Mr. Geoffroy went to examine the matter, and a ſervant went to uncover the maſs, by removing its ſurface with an iron inſtrument; but, the moment the air was admitted, the whole maſs took fire, burning with a very conſiderable noiſe, and darting its flames to a very great diſtance.

Mr. Geoffroy repeated the proceſs ſeveral times, and always with the ſame ſucceſs, whether his own diaphoretic antimony, or that made in the common manner. The great caution, to inſure the ſucceſs, ſeems to be the taking care of not carrying the fire too far before the addition of the laſt quantity of ſoap. *Mem. Acad. Scienc. Par.* 1736.

PHOSPHORUS *of ſulphur*, the name given by the French academians to a new-diſcovered ſpecies of the Phoſphorus, which readily takes fire on being expoſed to the open air.

The invention was M. le Fevre's, and the proceſs is this: the ingredients are two drachms of common ſulphur, half an ounce of ſteel filings, ten grains of colophony, and ſix drachms of common water. Theſe things being all weighed and ſet apart, powder about half a drachm of the ſulphur in a ſmall mortar, then add the colophony, and afterwards the remainder of the ſulphur. When this is all reduced to a fine powder, put in the ſteel-filings, and rub the whole together till it is ſo thoroughly mixed, that the ſteel does not appear, but the colour of the whole looks every-where uniform and regular: then add about twenty drops of the water, and, after beating the whole together, add as much more, and continue to do ſo till the maſs is of the ſubſtance of a paſte, but not too moiſt. Put this paſte into a ſmall matraſs that will contain about three ounces, and pour on it more of the water till it ſwim above the ſurface of the paſte near a quarter of an inch. The matter of the paſte will then break, and appear in form of a granulated powder under the water; put the matraſs on a ſand furnace, but give it no greater heat than that the hand can lie upon the matraſs. When it begins to heat, the mixture will ferment and ſwell, and become black; it is then to be ſtirred with an iron rod, and a little more water muſt be added every quarter of an hour, till the whole is uſed. The matter will then be very black and liquid, and it is to be then taken from the fire, and ſet by for the whole night. This is the firſt and moſt eſſential part of the operation, and, in this, great care is to be taken that the fire be not too violent; for if the ſulphur be burnt, the operation will be ſpoiled, and the matter would ferment ſo high as to run over at the mouth of the veſſel.

To finiſh the operation, a little water muſt be added to the matter, ſo as to ſwim over it, and the veſſel muſt be again ſet in the ſand, and a ſtronger fire given than before; this is known to be ſtrong enough, when there is any humid vapour obſerved to ariſe out of the mouth of the veſſel. This fire is to be continued about two hours, that the greater part of the humidity may be evaporated; which is known by the iron rod finding ſome reſiſtance when put into the veſſel, and the matter it brings up being granulated and ſolid, or no longer moiſt; it muſt then be immediately taken from the fire, and the whole is then finiſhed. It is neceſſary to be very exact in this laſt critical minute, for a very little longer ſtanding on the fire will burn the ſulphur, and render all the former care of no effect. The black matter remaining in the matraſs is to be taken out, and the ſides ſcraped clean with an iron rod; any piece of this that happens to fall on a paper takes fire in a very little time, and burns away like the other Phoſphorus. The proceſs is a very nice one, but, by obſerving all the rules here laid down, ſeveral perſons have ſucceeded in making the Phoſphorus to perfection: the whole intent of the operation ſeems to be to join together the minute particles of ſteel and ſulphur; which, when thus joined, cannot fail to be very inflammable, and to take fire on receiving the ſmalleſt humidity from the air to make them ferment.

It cannot but be obſerved, that this Phoſphorus is founded on Lemery's experiments of ſteel and ſulphur taking fire together; but this is a greatly more nice and accurate operation, and a fine improvement on the original plan, which was only, by mixing large quantities of ſteel filings and ſulphur together into a paſte with water, and burying this in the earth, to make it take fire of itſelf, and thus repreſent the natural phænomena of vulcanos, thunder, lightning, &c. *Mem. Acad. Par.* 1728.

PHRY'GIAN *ſtone*, *phrygius lapis*, in natural hiſtory, the name of a ſtone deſcribed by the ancients, and uſed in their time in dying; probably from ſome vitriolic or aluminous ſalt contained in it, which ſerved to enliven or fix the colours uſed by the dyers.

It was a light ſpongy maſs, reſembling a pumice, and the whiteſt and lighteſt were eſteemed the beſt. Pliny gives us an account of their preparing it for uſe for dying, which was by moiſtening it with urine, and then heating it red-hot, and ſuffering it to cool again; this calcination was repeated three times, and the ſtone was then fit for uſe; and Dioſcorides recommends it in medicine after burning ;he ſays it was drying and aſtringent.

PHYLLERE'A, *phyllerey*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts only of one leaf, and is of a bell-like ſhape, and divided into four ſegments at the edges. The piſtil ariſes from the cup, and is fixed in the manner of a nail to the hinder part of the flower. This finally becomes a fruit of a roundiſh figure, containing roundiſh ſeeds.

PHYLLI'TIS *marina*, *ſea hart's tongue*, in natural hiſtory, a name given by ſome authors to a ſpecies of ſea plant, the leaves of which, in ſome degree, reſemble thoſe of the common hart's tongue. It grows on the rocks at great depths, and is ſeldom ſeen, unleſs when taken up by the coral-fiſhers. Its leaves are ſometimes ſingle, ſometimes they divide into two: they are of a duſky green colour, and are about two inches in length: they have each a nerve or rib running along their middle: they are very thin and tranſparent, and are of a ſort of cartilaginous ſtructure; and each has ſeveral rows of ſmall points on each ſide of the middle rib, which not unaptly reſemble the ſeed ſpots on the leaves of ſome of the capillary plants; but not on thoſe of the Phyllitis, or hart's tongue, in particular, becauſe they are in that plant not round but oblong, and ſtand only in a ſingle row on each ſide the rib. When this plant is viewed by the microſcope, it appears, in all parts of the leaf, full of little holes; and thoſe which are ſo plain to the naked eye, are no other way different from the imperceptible ones, but in that they are larger. The plant has no root, and therefore takes in its nouriſhment by theſe numerous holes in its ſurface. *Marſigli*, *Hiſt. de Mer.*

PHYLLOBO'LIA, φυλλοβόλια, in antiquity, a cuſtom, that prevailed among the ancients, to ſtrew flowers and leaves on the tombs of the dead. The Romans adopted this cuſtom from the Greeks, and added likewiſe wool.

The Phyllobolia was alſo uſed on occaſion of a victory obtained at any of the public games, when not only the victors, but likewiſe their parents, were ſtrewed with flowers and leaves. *Hoffm. Lex. Univ. in voc.*

PIANI'SSIMO, in the Italian muſic, is uſed to ſignify that the part to which it is added ſhould be played very ſoftly, and ſo as that the ſound may ſeem at a great diſtance, and almoſt loſt in air.

PIA'NO, in the Italian muſic, ſignifies ſoft and ſweet, by way of an echo.

Piano Piano, in the Italian muſic, is nearly the ſame with pianiſſimo; or rather a degree between it and Piano.

Piu Piano, in the Italian muſic, ſignifies more ſlow or more ſoft, and is much the ſame with Piano Piano.

PI'CA, *the pye, or magpye*, in the Linnæan ſyſtem of zoology, the name of one whole order of the bird kind; the character of which is, that they have a convex beak, flatted above. The birds of this order are, the bird of paradiſe, the magpye, the crow, the cuckow, the wood-pecker, the ſitta, the creeper, the hoopoe, and the iſpida. *Linnæi. Syſt. Nat.*

Pica *marina*, in ornithology, the name of a bird called in Engliſh the ſea pye, and, by Bellonius and ſome others, the hæmatopus. It is of the ſize of the common magpye; its beak is three fingers breadth long, ſtraight, and of a reddiſh or a blackiſh colour, and ending in a point, and ſeeming well fitted for its buſineſs of rooting up the limpets from the rocks, the bodies of this fiſh being its common food; its legs are red; it has no hinder toe, and has its other toes ſo far connected by a membrane, as to ſeem almoſt of a middle nature between the web-footed and other birds; its head, neck, back, throat, and half its breaſt are black, as is alſo its rump; its tail is half black and half white, as are alſo its wings. It is common on the weſtern ſhores of England, and on the ſhores of Wales. *Ray's Ornithology.*

PICK, among miners, is a tool with which they uſe to cut down the clifts and rocks of ſtone to make paſſages in the earth. *Houghton's Complete Miner in the Explanation of the Terms.*

Pick-*ax*, in the military art, a tool carried by the pioniers to dig up ground that is too hard for the ſpade; they are of great uſe for mending ways, and in fortification.

PI'CKER, or *horſe* Picker, in the manege, an iron inſtrument five or ſix inches long, bent or crooked on one ſide, and flat and pointed on the other. It is uſed by the grooms to cleanſe the inſide of the horſes feet, and to pick out the earth, ſand, or ſmall ſtones that get into them.

PI'CKEREL, in ichthyology, an Engliſh name uſed by ſome authors for the jack or pike.

PICTAVIE'NSIS *colica*, the name of a kind of very terrible nervous cholic, more uſually called colica Pictonum; and by the natives in the Weſt-Indies, where it rages, the dry belly ach. It is ſo popular a diſeaſe in the Leeward iſlands, that it may be very juſtly reckoned endemic among them; moſt of the people there having been at one time or other ſubject to it in all its fury.

PIE'RRE *d'Automne*, a French name tranſlated from the Chineſe. It is the name of a medicinal ſtone, famous throughout the Eaſt for curing all diſorders of the lungs.

It is a tedious preparation of human urine, and made as follows: they put thirty pints of the urine of a ſtrong and healthy young man into a large iron pot, and ſet it over a gentle fire; and when it begins to boil, they add to it, drop by drop, about a large tea cup full of rape oil: it is then left on the fire till the whole is evaporated to a thick ſubſtance reſembling black mud; they then take it out of the pot, and laying it on a flat iron, they dry it ſo that it may be powdered very fine. This powder they moiſten with freſh oil, and put the maſs into a double crucible, ſurrounded with coals, where it ſtands till thoroughly dried again. They finally powder this again, and, putting it into a china veſſel covered with ſilk, cloth, and a double paper, they pour on boiling water, which makes its way, drop by drop, through theſe coverings, till ſo much is got in, as is ſufficient to reduce it to a paſte. This paſte is well mixed together in the veſſel it is kept in, and this is put into a veſſel of water, and the whole ſet over the fire. The matter thus becomes again dried in balneo mariæ, and is then finiſhed. *Obſerv. ſur les Cout. de l'Aſie.*

PIE'RIDES, among the ancients, an epithet given to the muſes, upon account of their having been born in that part of the country of Macedon which was called Pieria. *Pitiſc. in voc.*

PIGA'YA, in natural hiſtory, a word uſed by the natives of Brazil as a name for the famous ipecacuanha-root.

PI'GUS, in zoology, the name of a ſpecies of leather-mouthed fiſh, very much approaching to the nature of the carp.

It is of the ſame ſhape and ſize with the common carp, and its eyes, fins, and fleſhy palate wholly the ſame. From the gills to the tail there runs a crooked dotted line: its back and ſides are bluiſh, and its belly reddiſh: it is covered with large ſcales, from the middle of every one of which there riſes a fine, pellucid, and very ſharp prickle.

It is a finer fiſh than the carp for the table, and is in ſeaſon in the months of March and April. It is caught in lakes in ſome parts of Italy, and is mentioned by Pliny, though without a name.

PIKE, in ichthyology, a name given by us to the fiſh called by authors the lucius and eſox, and by the old Greek writers oxyrynchus.

This fiſh is the tyrant of the freſh waters, and is at once the moſt voracious and the longeſt-lived of all fiſh, according to the generality of naturaliſts.

The very large Pike are eſteemed as a pompous fiſh at the tables of great people; but they are coarſe, and the middling ones are in reality much the beſt.

The Pike never ſwims in ſhoals, as moſt other fiſh do, but always lies alone, and is ſo bold and ravenous, that he will ſeize upon almoſt any thing leſs than himſelf. This fiſh breeds but once in a year, which is in March. It is found in almoſt all freſh waters, but is very different in goodneſs, according to the nature of the places where it lives. The fineſt Pike are thoſe which feed in clear rivers; thoſe in ponds and mires are inferior to theſe, and the worſt of all are thoſe of the fen ditches. They are very plentiful in theſe laſt places, where the water is foul and coloured, and their food, ſuch as frogs, and the like, very plentiful, but very coarſe; ſo that they grow large, but are yellowiſh and high-bellied, and differ greatly from thoſe which live in the clearer waters.

The fiſhermen have two principal ways of catching the Pike; by the ledger, and by the walking bait.

The ledger bait is fixed in one certain place, and may continue while the angler is abſent: this muſt be a live bait, a fiſh or frog; and, among fiſh, the dace, roach, and gudgeon, are the beſt; of frogs, the only caution is to chuſe the largeſt and yelloweſt that can be met with. If the bait be a fiſh, the hook is to be ſtuck through the upper lip, and the line muſt be fourteen yards at leaſt in length: the other end of this is to be tied to a bough of a tree, or to a ſtick driven into the ground near the Pike's haunt, and all the line wound round a forked ſtick, except about half a yard. The bait will by this means keep playing ſo much under water, that the Pike will ſoon lay hold of it.

If the bait be a frog, then the arming wire of the hook ſhould be put into the mouth, and out of the ſide; and with a needle and ſome ſtrong ſilk the hinder leg of one ſide is to be faſtened by one ſtitch to the wire-arming of the hook. The Pike will ſoon ſeize this, and muſt have line enough to give him leave to get his haunt and poach the bait.

The trolling for Pike is a pleaſant method alſo of taking them: in this a dead bait ſerves, and none is ſo proper as a gudgeon. This is to be pulled about in the water till the Pike ſeizes it, and then it is to have line enough, and time to ſwallow it: the hook is ſmall for this ſport, and has a ſmooth piece of lead fixed at its end, to ſink the bait; and the line is very long, and runs through a ring at the end of the rod, which muſt not be too ſlender at top.

The art of feeding Pike, ſo as to make them very fat, is, the giving them eels, and, without it, it is not to be done under a very long time; otherwiſe pearch, while ſmall, and their prickly tender fins, are the beſt food for them. Bream put into a Pike pond are very proper food: they will breed freely, and their young ones make excellent food for the Pike, who will take care that they ſhall not increaſe over much. The numerous ſhoals of roaches and ruds, which are continually changing place, and often in floods get into the Pike's quarters, are food for them a long time.

Pike, when uſed to be fed by hand, will come up to the very ſhore, and take the food that is given them out of the finger of the feeder. It is wonderful to ſee with what courage they will do this, after a while practiſing; and it is a very diverting ſight, when there are ſeveral of them nearly of the ſame ſize, to ſee what ſtriving and fighting there will be for the beſt bits, when they are thrown in. The moſt convenient place is near the mouth of the pond, and where there is about half a yard depth of water; for, by that means, the offal of the feedings will all lie in one place, and the deep water will ſerve for a place to retire into and reſt in, and will be always clean and in order.

Carp will be fed in the ſame manner as Pike; and though by nature a fiſh as remarkably ſhy and timorous as the Pike is bold and fearleſs, yet, by cuſtom, they will come up to take their food out of the perſon's hand, and will, like the Pike, quarrel among one another for the niceſt bits. See the article Feeding *of fiſh*.

Half Pike, in the military art, is the weapon carried by an officer of foot. It differs from a Pike, becauſe it is but eight or nine feet long, and the ſpear is ſmaller and narrower.

Pike, is alſo the name of an Egyptian meaſure, of which there are two kinds, the large and the ſmall.

The larger Pike, called alſo the Pike of Conſtantinople, is 27 $\frac{920}{1000}$ Engliſh inches. They meaſure all foreign goods with this, excepting only ſuch as are made of flax and cotton: for then they uſe the ſmall Pike, called Pike belledy, or the Pike of the country; becauſe they meaſure with it all the manufactures of the country. This Pike conſiſts of about 25 $\frac{576}{1000}$ Engliſh inches. *Pocock's Egypt.*

PI'LATRO, or Pilatro *di Levante*, a ſalt uſed in the glaſs trade, in ſome particular caſes. It is extracted from the froth of the ſea, coagulated by heat in the hot countries. *Merret's Notes on Neri.*

PILCHA'RDUS, *the common pilchard*, in zoology, a fiſh much approaching to the nature of the common herring, but ſmaller and differing in ſeveral other particulars.

It is generally found ſwimming in vaſt ſhoals, and is caught on many parts of the Engliſh ſhores. Its fleſh is better taſted than that of the herring.

PILE-*worms*, are a kind of worms found in the Piles of the ſea dykes in Holland. Theſe worms are of various ſizes, ſome of the young ones are not above an inch or two in length; but others have been found of thirteen or fourteen inches long. The heads of theſe creatures were covered with two hard ſhells, or hemicrania; which together form a figure reſembling an augre, and with which they bore the wood. The beſt remedy againſt them is, to perforate the Pile with many ſmall holes, about an inch aſunder; then it muſt be done over with a varniſh in the hotteſt ſun, and, while the varniſh is hot, brick duſt muſt be ſtrewed over it; and this being ſeveral times repeated, the pile will be covered with a ſtrong cruſt, impenetrable to all inſects. See a farther account of theſe creatures in the *Phil. Tranſ.* N°. 455.

PILES, the popular name for the hæmorrhoids. See the article Hæmorrhoides, *in the Dictionary.*

PILE (*Dict.*)—As we are often obliged to ſet inclined Piles, in order to give more ſtrength to works intended to ſupport a ſwell of water or projection of earth, the deſcription of a machine to drive them may not be diſagreeable, as it is quite a modern invention, and never publiſhed in Engliſh that we know of.

Plate XXXIV. *fig.* 1, 2, and 3, exhibit this machine fully; *fig.* 3, which is the plan of it, is compoſed of four ſhafts, on one of which A B are raiſed the uprights C D, E F, marked with the ſame letters in *fig.* 1, 2, which ſhew the elevation and profile of the machine, and, conſequently, the inclination theſe parts have to their baſe; the two in the middle ſeen in the reverſe, as well as the others, ſerve for guides to the ram G, the ears of which H H are faſtened with keys; theſe uprights exceed the height of the croſs-piece I to ſupport the pulley K on which the rope paſſes that makes the ram play. The two pieces, in form of a buttreſs, ſupport the fore part of the machine, and the axis N, common to both wheels, made like a drum; on each of which is twiſted a cord, but contrariwiſe, ſo that one may wind off as the other winds on, and reciprocally, while a third, correſponding to the axis, winds off or on as the ram aſcends or deſcends. As, for example, to raiſe it, draw the rope T which winds off above the great drum P; then the ſecond V winds on the little drum O, and the third rope Y which communicates with the ram G winds up on the axis N, and, when the ram is come to the top of the guide, draw the rope of the counterpoiſe Z, and the ram falls.

To repeat the operation, draw the rope V of the ſmall wheel, then the rope T winds on as the former winds off, which alſo cauſes the third rope Y to be drawn downwards by the counterpoiſe which is hooked to the ram; then proceed as before.

The great wheel P is ſuppoſed to be ſix feet in diameter, the little wheel O three feet, and the axis N one; conſequently the power T, communicating with the great wheel, will be as one to ſix, to the weight of the ram; therefore ſix men can eaſily raiſe a ram of 900 pounds, eſtimating the power of each man at no more than 25 pounds, which is the loweſt it can be rated at in a work of this kind; becauſe, as the ram reſts on an inclined plane, the rope Y does not abſolutely ſupport the whole weight; but I do not mention this as any great abatement, becauſe the friction of the machine may be ſuppoſed to compenſate for it. It is eaſy to ſee that the inclination of the guide may be increaſed or diminiſhed by lengthening or ſhortening the buttreſſes L M, according to the ſituation of the Pile, and the deſign of direction in driving it.

A deſcription of a machine to draw Piles.—It is ſometimes neceſſary to draw Piles when we intend to erect new buildings, in places where the veſtigia of old buildings remain; or to make uſe of Piles, which have been driven formerly, and are of no ſervice where they ſtand at preſent; this laſt was the caſe, when, on the demolition of Dunkirk, a great part of the Piles were drawn, and timbers made uſe of to form the ſluice of Mardyke.

Plate XXXIV. *fig.* 4, 5, repreſent a machine of this kind; *fig.* 5. exhibits a wooden frame, ſupporting a ſcrew B and nut D placed over the Pile A, the head of which is ſuppoſed to have been bored, in order to receive an iron pin, which takes firm hold on the Pile, by the help of a rope or chain ſuſpended to a hook, repreſented *fig.* 4. By turning the nut with levers as you do a capſtan, the ſcrew is forced to aſcend and draws the Pile with it. The principal difficulty is to fix the machine on a foundation ſolid enough to reſiſt the power of the ſcrew; if it ſhould happen that the Pile is under water, a flying ſcaffold placed on boats may be made uſe of.

Fig. 6. and 7. repreſent another machine of the ſame kind, which are intelligible enough by the draught without any long explanation; its deſign is to lift, at the extremity L, a beam G L placed on a fulcrum B, to make the counterpoiſe, becauſe there is a notch at K to prevent it from ſlipping; we will ſuppoſe the length of the beam being divided into nine equal parts, G K to be one, conſequently the remaining part K L will be equal to eight. This beam muſt likewiſe be furniſhed at its extremities with proper irons to draw the Pile C. We are to ſuppoſe it at firſt in a ſtate of reſt, repreſented by the dotted lines; that a rope is faſtened at its extremity O, which after having paſſed on pullies, comes out oppoſite to the roll of the machine; which, being put in motion, raiſes L, the

Fig. 1. Pile

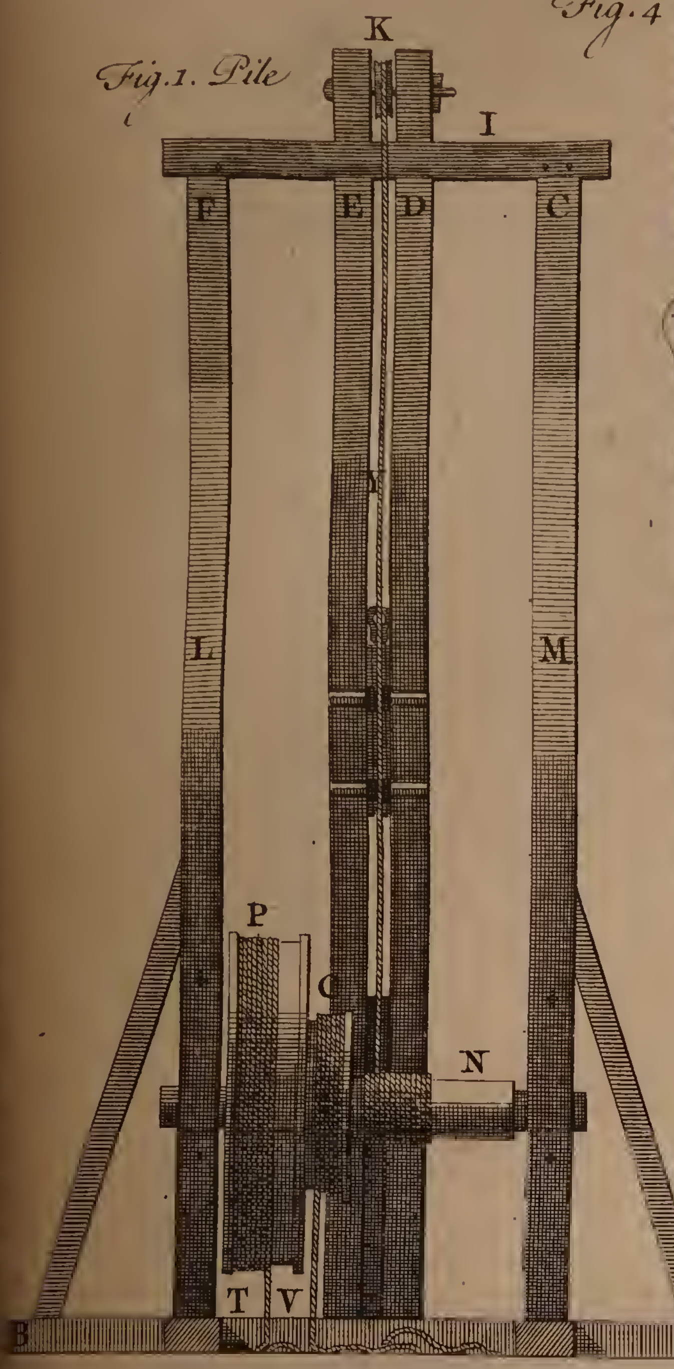


Fig. 4 Pile

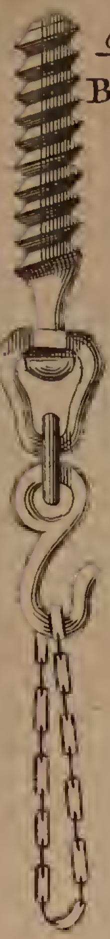


Fig. 2 Pile

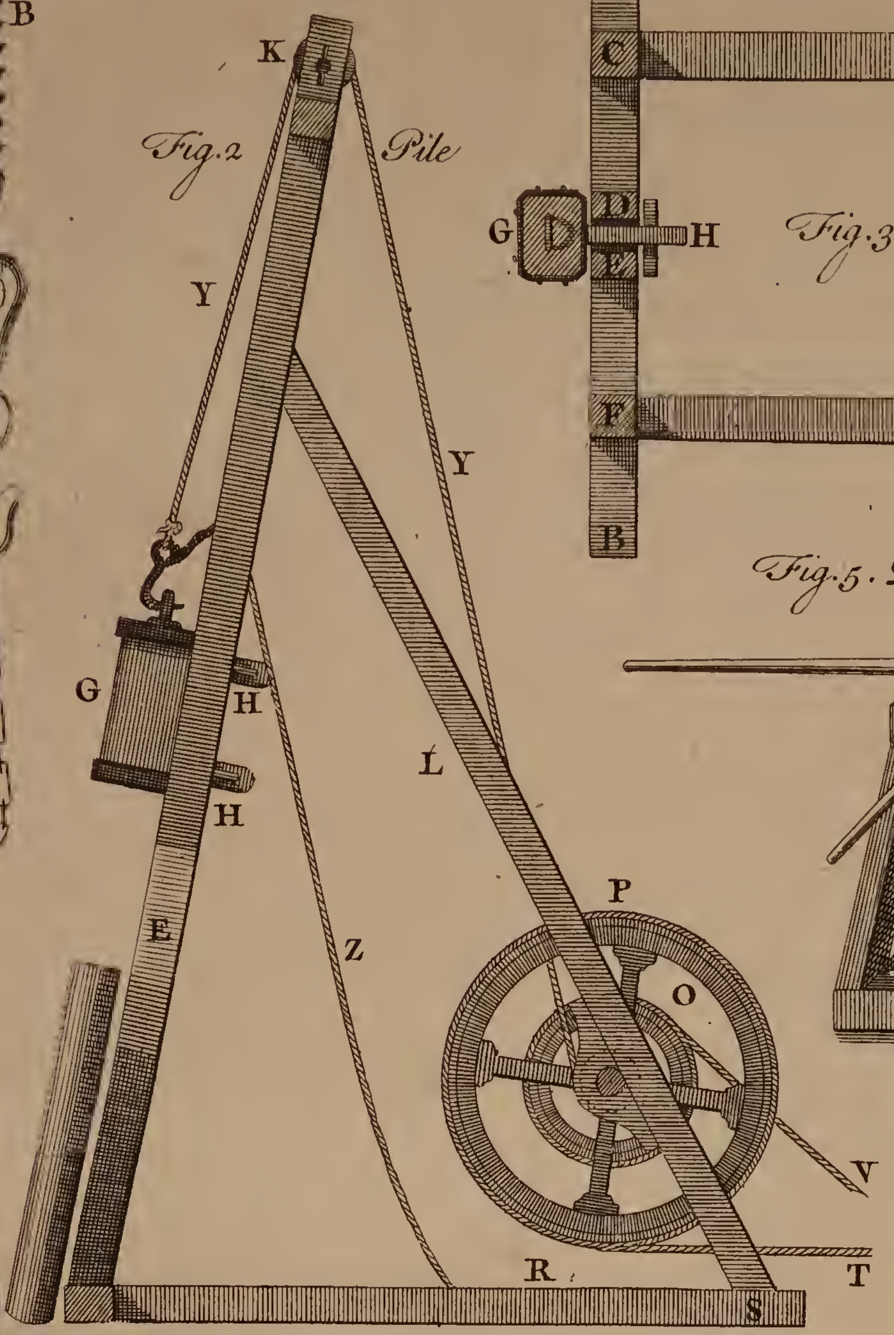


Fig. 3. Pile

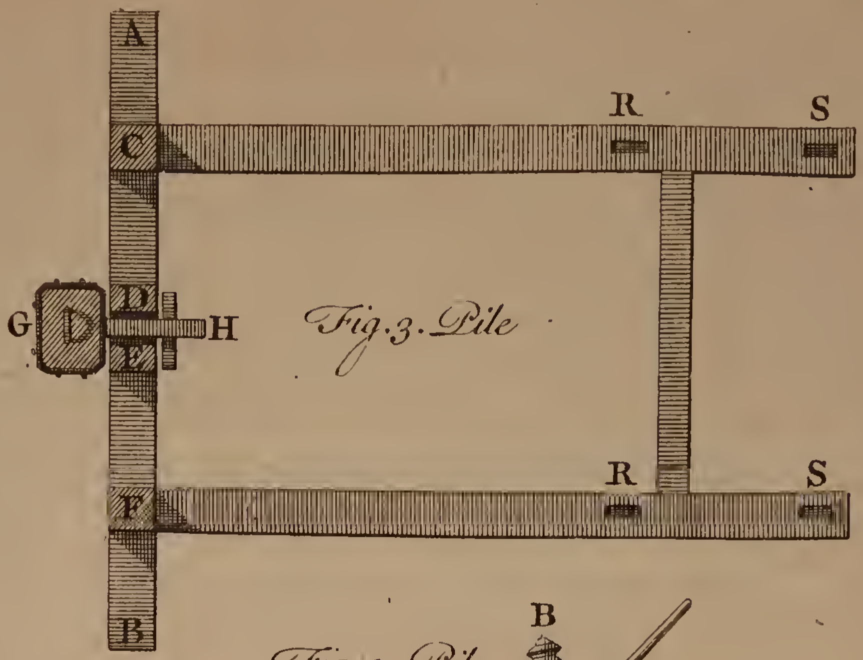


Fig. 5. Pile

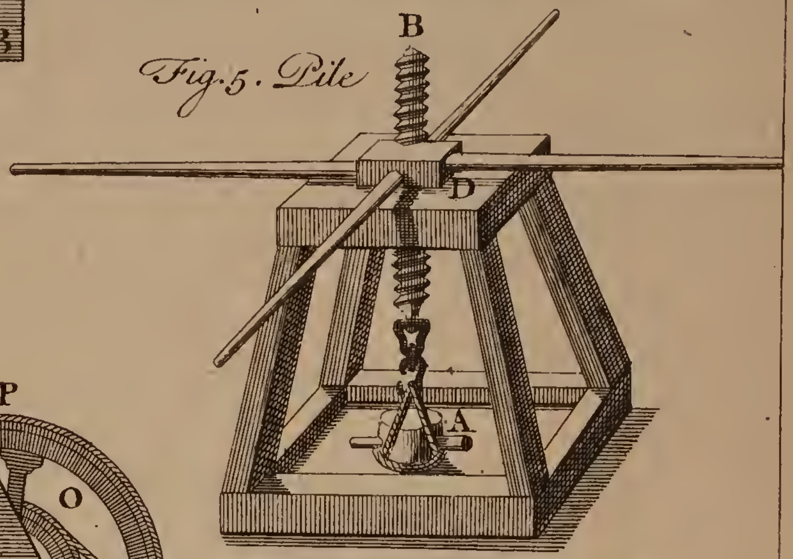


Fig. 6 Pile

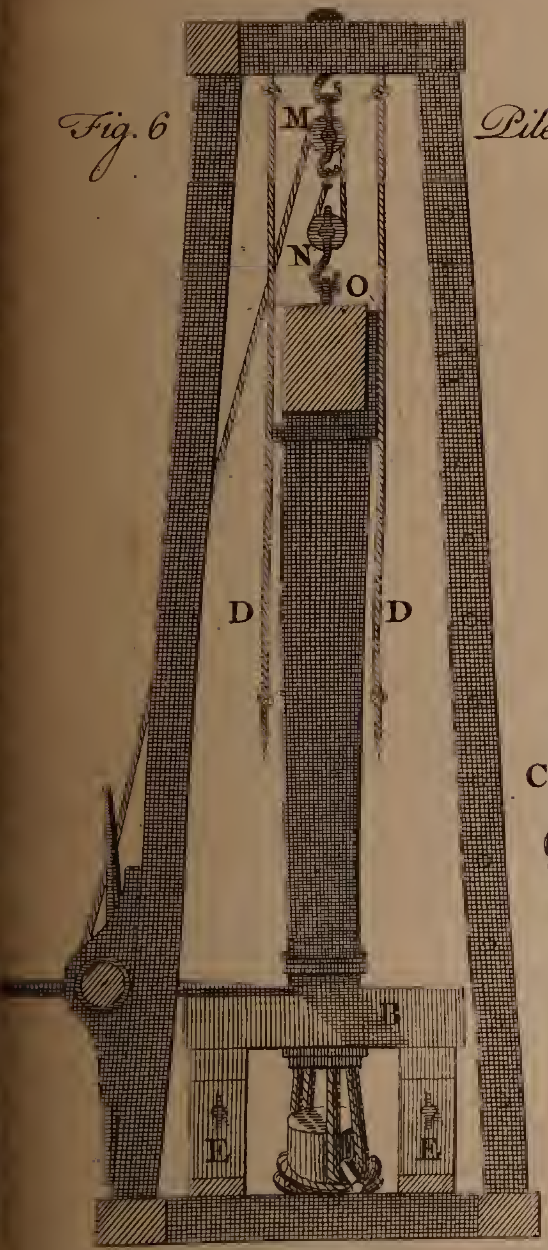


Fig. 8. Polype

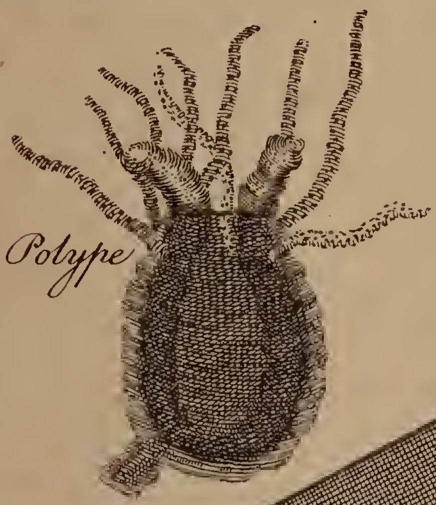


Fig. 7. Pile

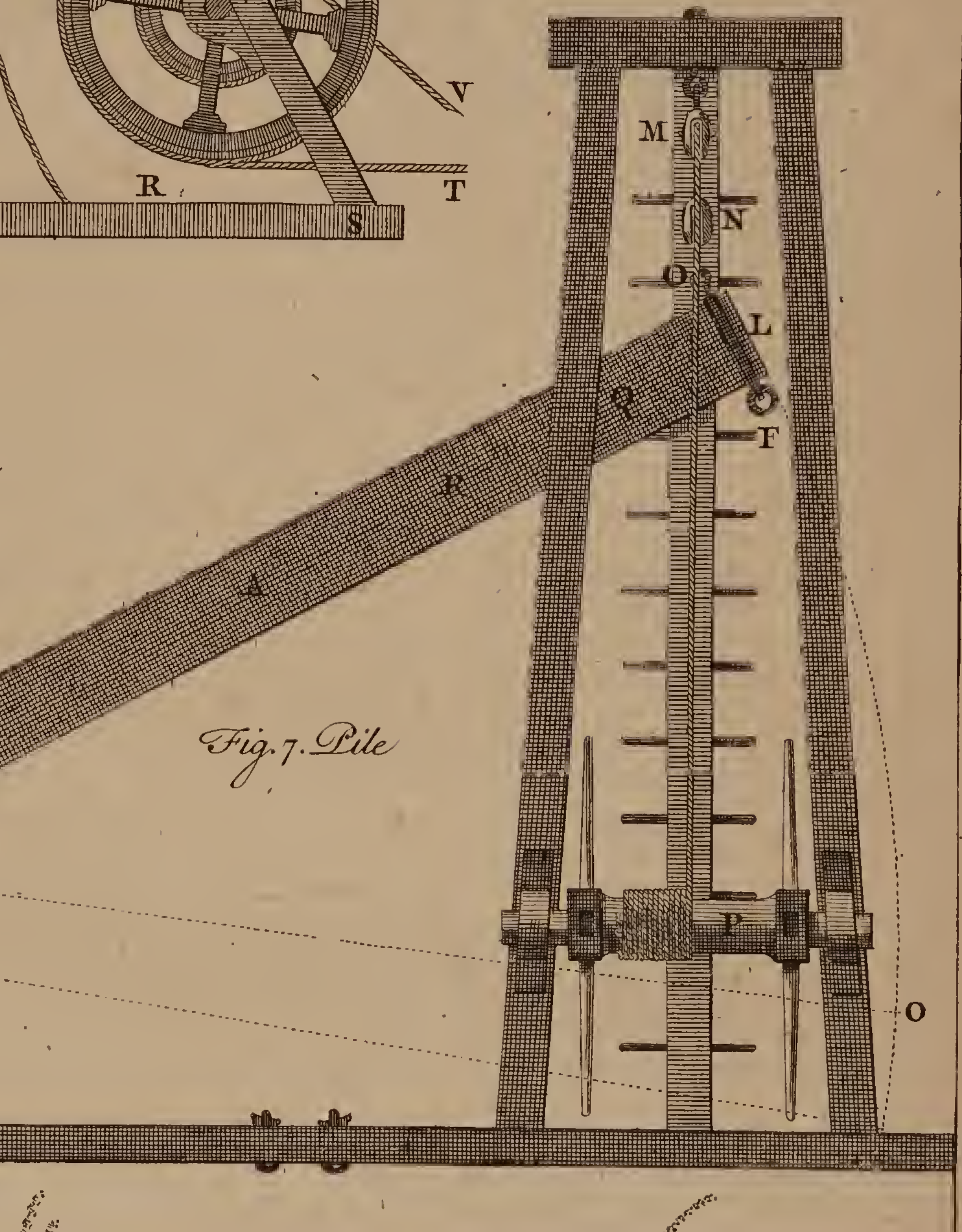


Fig. 9. Polype

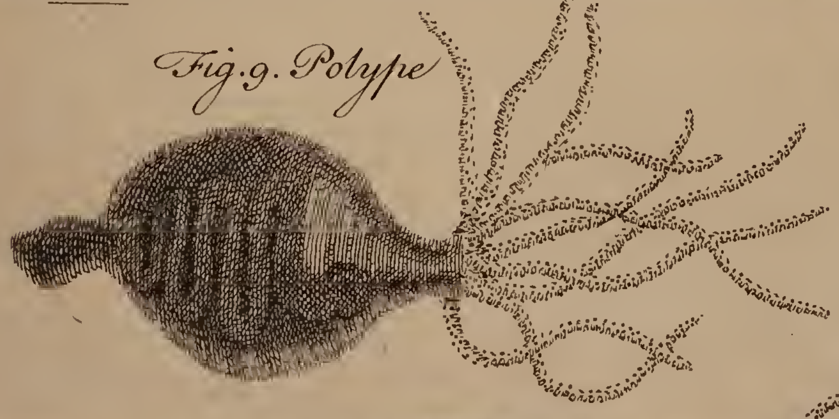


Fig. 10. Polype

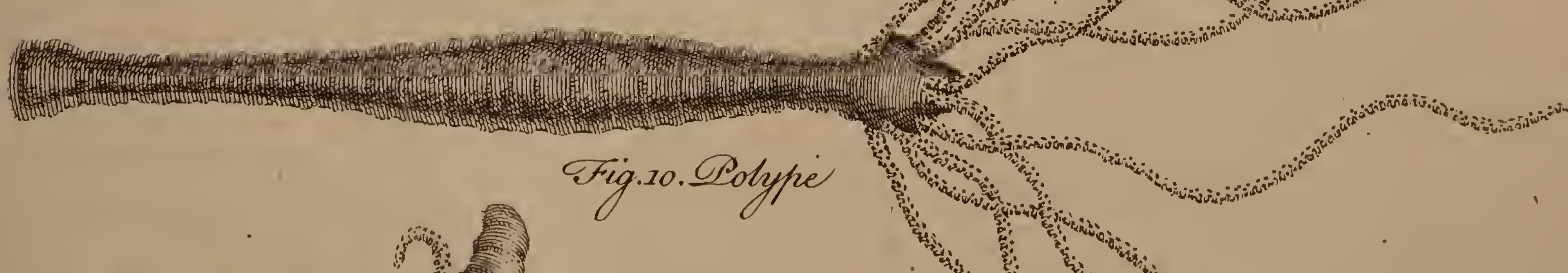


Fig. 12. Polype

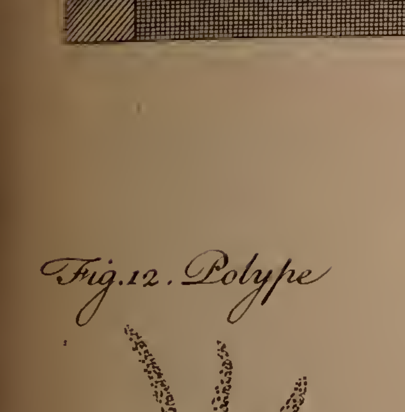
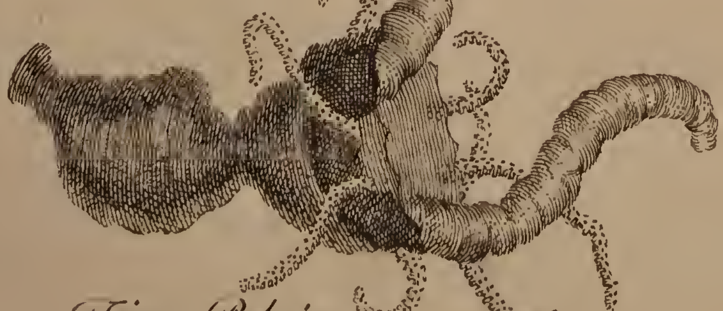


Fig. 11. Polype



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the extremity of the beam into the poſition we ſee it, to hook the rope which goes round the Pile at the lower extremity G; then the roll is let looſe, to leave the beam to its own proper weight; which, aſſiſted by the advantage that the arm of a lever gives it, acts very forcibly on the Pile, as may be judged from the following calculation.

To calculate the action of this beam, we will ſuppoſe it eighteen feet in length and twelve inches ſquare; then G K will be two feet, and K L ſixteen feet in length: now, a ſolid foot of dry oak weighs about ſixty pounds, we will call it ſo in the preſent calculation: to be exact, we muſt take K H, equal to G K, in order to look on both parts of the weight of the beam, as in equilibrium to each other; then imagine the remainder of its gravity to be reunited in A, the center of gravity of the part H L, which acts on the Pile, is equal to a power of 840 pounds, which is the weight of fourteen cubical feet of oak timber, equal to the arm of the lever K A of nine feet, while the other K G acts in proportion to its length two feet; thus, in a ſtate of equilibrium, the power A equal to 840 pounds will be to its action on the Pile as K G to K A, or 2 to 9, which is equal to 3780 pounds; this may be increaſed in proportion to a power applied at the extremity R L; let us ſuppoſe, for example, 600 pounds applied at the extremity of the lever K Q the ſextuple of K G, their effort on the Pile will be 3600 pounds; which, added to 3780 pounds, make 7380 pounds, for the force acting upon the Pile. This machine was experienced by Marſhal Belleiſle, in 1749, to be of the greateſt uſe in drawing Piles, when he had a mind to deſtroy the two bridges he had thrown over the Var; theſe ſtood on a foreſt of Piles, but they were eaſily extracted by theſe engines; thoſe driven into a ſtrong ſoil fourteen or fifteen feet could not reſiſt them above four or five minutes.

The force of this machine may be ſurpriſingly increaſed, by making uſe of a roller to draw down the extremity of the beam L, notwithſtanding the reſiſtance of the Pile C. Put the beam in the poſition G L, *fig.* 7; unhook the pulley M N, the beam will keep its place; then hook the pulley M by an S to the ring F, faſten the other end of the pulley N in like manner to the foot of the machine, in order to obtain a fulcrum, and you may draw the beam down eaſily by a power applied to the lever of the roller. It might ſtill be made to produce a greater effect, if the impulſe of a ram were applied at the extremity of the beam, and this might eaſily be contrived in one machine.

A deſcription of a ſaw to cut off PILES *under water.*— The ſaw contrived for this purpoſe is in the form of a triangular priſm, and repreſented in *Plate* XXXV. *fig.* 1, 2, 3; twenty-eight men may be employed in working it, though a leſs number may ſuffice; theſe men are placed upon a float to work the machine; the uſe of the ſaw is to cut the Piles and ſtakes in the platform of the pier down level; the manner of its working is ſhewn *fig.* 1, K is the blade, which weighs about 250 pounds, is four inches broad and ſeven lines thick on the fore part, which declines gradually to four or five lines on the back, F, F, F, F, the frame, A, A, A, A, the plat-form of piles.

At the ſame time that the men are employed in puſhing and drawing the ſaw perpendicularly to the ſide of the Piles, being ſet to the arm which are at the top L, *fig.* 2, 3, the extremities of the blade are drawn parallel to the ſame ſides by weights ſuſpended at the extremity of the ropes R R, *fig.* 1, which go on pullies faſtened at the head of the compaſs of the frame of the periphery of the Pile.

PILL, *Aromatic* PILLS, *pilulæ aromaticæ*, a form of medicine in the New London Diſpenſatory, intended to ſtand in the place of the pilulæ diambræ of the former, and the pilulæ alephanginæ, or aloephanginæ, of that, and ſome other diſpenſatories.

The compoſition is this: take ſocotrine aloes, an ounce and an half; gum guaiacum, an ounce; the aromatic ſpecies and balſam of Peru, of each half an ounce; let the aloes and gum guaiacum be powdered ſeparately, and afterwards mixed with the reſt, and formed into a maſs with ſyrup of orange peel. *Pemberton's Lond. Diſp.*

PILLS *of colocynth with aloes*, *pilulæ colocynthide cum aloe*, a name given, in the New London Pharmacopœia, to the purging pill, commonly known by the name of pilulæ cociæ minores.

As this is originally a preſcription of Galen's, and the manner of proportioning the ingredients has been altered for the worſe, ſince his time, by enlarging the quantity of that nauſeous ingredient the colocynth; the college have reduced it to its former proportions, and ordered it to be made in this manner: take ſocotrine aloes and ſcammony, of each two ounces; pith of coloquintida, one ounce; oil of cloves, two drachms; let the dry ſpecies be reduced to powder ſeparately, the oil mixed among them, and the whole formed into a maſs, with ſyrup of buckthorn. *Pemberton's Lond. Diſp.*

Mercurial PILLS, *pilulæ mercuriales*, a form of medicine preſcribed in the late London Pharmacopœia, and containing crude mercury mixed for internal uſe.

The compoſition is to be made as follows: take of pure quickſilver, five drachms; of Straſburg turpentine, two drachms; of the cathartic extract, four ſcruples; rhubarb powder, one drachm; grind the quickſilver with the turpentine till it makes one uniform maſs, and then add the other ingredients, and beat up the whole into Pills. If the turpentine be too hard, it muſt be ſoftened with a little oil of olives. *Pemberton's Lond. Diſp.*

Soap PILLS, *pilulæ ſaponaceæ*, a form of medicine preſcribed in the late London Diſpenſatory, and ordered to be made in the following manner: take almond ſoap, four ounces; ſtrained opium, half an ounce; eſſence of lemons, a drachm; ſoften the opium a little with wine, and beat that and the ſoap with the eſſence, till it be reduced to the form of a Pill.

This is intended to ſtand in the place of the Pill, commonly called Mathews's Pill, and is very happily corrected, in regard to the taſte of the ſoap, by the addition of the eſſence of lemons. *Pemberton's Lond. Diſp.*

Ward's PILL. See WARD's *Pill.*

PI'LLOW *of a plough*, a term uſed by the farmers to expreſs that part of a plough which ſerves to raiſe or ſink the beam, and with it the ſhare, as the land is to be plowed ſhallower or deeper.

This Pillow is a croſs piece of wood, reaching from one of the crow-ſtaves or uprights to the other; and, as they are bored with two rows of holes, this Pillow can be ſlipped up or down to any height, and kept there by pegs or cords in the holes. *Tull's Huſb.* See PLOUGH.

PILULA'RIA, *pepper-graſs*, the name of a very remarkable little plant, of which Mr. Bernard de Juſſieu has given a very accurate account in the Memoirs of the Academy of Sciences of Paris.

PI'MPERNEL, *pimpernella*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one petal, which is of a rotated form, and is deeply divided into four ſegments, and contains a vaſt number of ſtamina, or a fimbriated ſtyle. The cup finally becomes a fruit uſually of a quadrangular figure, and pointed at each end: this is ſometimes divided into two cells, ſometimes it conſiſts only of one; and it contains numerous ſeeds, uſually of a longiſh figure.

The ſeeds of this plant are warm, carminative, and diſcutient: they are given with ſucceſs in cholics and flatulencies, and in ſuppreſſions of urine. The leaves and roots alſo poſſeſs the ſame virtues; and when the diuretic property only is expected from it, the root alone, freſh taken up, cut ſmall, and boiled in water, is the beſt. The decoction is to be drank in large draughts, and often repeated.

PI'MPLE, in medicine, a ſmall puſtule ariſing on the face.

By mixing equal quantities of the juice of houſeleek, ſedum minus, paſſed through paper, and of ſpirit of wine rectified by itſelf, a white coagulum of a very volatile nature is formed, which Dr. Burghart commends for curing Pimples of the face; and ſays, that the thin liquor ſeparated from it, with ſugar-candy, is an excellent remedy for thick viſcid phlegm in the breaſt. *Satyr. Sileſiac. Spec.* 4. *Ob.* 2.

PIN (*Dict.*)— The perfection of Pins conſiſts in the ſtiffneſs of the wire, and its blanching, in the heads being well-turned, and the points filed. The London pointing and blanching are in moſt repute; becauſe after forming the points on the ſtone, our Pin-makers ſmooth them again on the poliſher; and in blanching, uſe fine tin well calcined, and ſometimes ſilver leaves prepared by the gold-beaters; whereas, in other parts, they uſe a mixture of tin, lead, and quick-ſilver, which not only blanches worſe than the former, but is alſo dangerous, by reaſon of the ill quality of that mineral, which renders a puncture with a Pin thus blanched very difficult to cure.

The conſumption of Pins, and the number of artificers employed in the manufacture thereof, are incredible. In Paris alone there were anciently above 1000 people employed in it, at preſent there are none; yet there is every year ſold above 50,000 crowns worth of the Pin-wire, to the Pin-makers of the neighbouring places, all brought thither from Stockholm.— In the little town of Rugle in Normandy, there are computed at leaſt 500 workmen employed in the Pin manufacture; the whole town being peopled therewith.

Notwithſtanding that there is ſcarce any commodity cheaper than Pins, there is none that paſſes through more hands before they come to be ſold.— They reckon twenty-five workmen ſucceſſively employed on each Pin, between the drawing of the braſs-wire and the ſticking of the Pin in the paper.

Pins are diſtinguiſhed by numero's; the ſmaller called from N° 3, 4, 5, thence to the 14th, when they are only accounted by two to two, viz. N°. 16, 18, and 20, which is the largeſt ſize.

Beſides the white Pins, there are alſo black ones made for mourning from N°. 4, to N°. 10.—Theſe are uſually of iron-wire.

Laſtly, there are Pins with double heads, of ſeveral numero's, uſed by the ladies to fix the buckles of their hair for the night, without danger of being diſturbed by their pricking, &c.

PINE-*tree*, *pinus*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the amentaceous kind, being compoſed of a great number of ſtamina, but it is barren: the embryo fruit appear in other parts of the tree, and finally become a ſort of cone, between the ſeveral ſcales of which, each having two hollows, there are found two ſeeds contained in a ſtony huſk, which is frequently elated. To this it is to be added, that the leaves grow more than one out of the ſame theca.

Pitch, tar, reſin, and turpentine, are all made from theſe trees by a very familiar proceſs. In the ſpring time, when the ſap is moſt free in running, they pare off the bark of the Pine-tree, to make the ſap run down into a hole which they cut at the bottom to receive it: in the way, as it runs down, it leaves a white matter like cream, but a little thicker: this is very different from all the kinds of reſin and turpentine in uſe, and it is generally ſold to be uſed in the making of flambeaux, inſtead of white bee's wax. The matter that is received in the hole at the bottom, is taken up with ladles, and put in a large baſket; a great part of this immediattly runs through, and this is the common turpentine. This is received into ſtone or earthen pots, and is ready for ſale. The thicker matter, which remains in the baſket, they put into a common alembic, adding a large quantity of water; they diſtil this as long as any oil is ſeen ſwimming upon the water; this oil they ſeparate from the ſurface in large quantities, and this is the common oil or ſpirit of turpentine: the remaining matter, at the bottom of the ſtill, is common yellow reſin. When they have thus obtained all that they can from the ſap of the tree, they cut it down, and, hewing the wood into billets, they fill a pit dug in the earth with theſe billets, and, ſetting them on fire, there runs from them. while they are burning, a black thick matter: this naturally falls to the bottom of the pit, and this is the tar. The top of the pit is covered with tiles, to keep in the heat; and there is at the bottom a little hole, out at which the tar runs like oil: if this hole be made too large, it ſets the whole quantity of the tar on fire; but, if ſmall enough, it runs quietly out.

The tar, being thus made, is put up in barrels, and, if it be to be made into pitch, they put it into large boiling veſſels, without adding any thing to it: it is then ſuffered to boil a while, and, being then let out, is found, when cold, to be what we call pitch. *Phil. Tranſ.* N°. 243.

Pine-*apple*. See ANANAS, Dictionary and Supplement.

Pine-*apple*, in metallurgy, a word uſed to expreſs a ſort of mould, uſed in the refining ſilver. It has this name from its ſhape, reſembling the fruit of that name.

When the refiners have taken the mixture of the ſilver and mercury together out of the cauldron, and ſtrained it through two coarſe wet cloths, to make it the thicker, they then beat it with a ſort of battledoors, to drive out yet more of the quickſilver; and, ſtraining it again after this, they take out the remaining amalgame, and, forming it into little pellets, they put theſe carefully into the moulds called Pine-apples, preſſing them down. The amalgame, when put into this veſſel or mould, is uſually ſo rich as to be about one fifth ſilver. The manner of diveſting this of the quickſilver afterwards is by means of fire; in which the quickſilver riſes in vapour, and the ſilver is left pure behind: but the careleſsneſs of the workmen in doing this, and particularly the uſing bad veſſels, or the not luting them cloſe, cauſes a waſte of this mineral greater than could be conceived. Alonſo tells us, that in the city of Potoſi alone, at the time of his writing, when the trading in metals ran but low, above thirty-thouſand pieces of eight were waſted in quickſilver that was loſt one year with another. To prevent this, they then principally ſtudied the means of keeping the ſilver as dry of quickſilver as they could, in the Pine-apple; but, it then holding four fifths of the whole maſs in quickſilver, the great waſte was in the ſeparating it afterwards. *Alonſo Barba de Metal.*

Pine-*ſalt*, a name given to a preparation of the bark of the Pine-tree, uſed as a ſort of ſeaſoning to food in the manner in which we uſe ſalt.

Scotch Pine, generally called the Scotch fir, is the moſt profitable of all the ſorts, to cultivate in large plantations; and will grow in almoſt any ſoil or ſituation; for in the moſt barren ſand, where little elſe but fern and heath would grow, I have ſeen plantations of theſe trees thrive much beyond expectation; and upon chalky hills, where there have been ſcarce three inches of earth, there are many noble plantations of this ſort. I have alſo obſerved, where they have been planted in a ſtrong clay, and alſo in a moiſt peaty ſoil, that they have grown to admiration; ſo that there is no part of England, in which theſe trees might not be propagated to a great advantage.

But where theſe trees are deſigned to be planted in large quantities, it will be much the better way to make a nurſery on the ſpot where the ſeeds ſhould be ſown, and the plants raiſed until they are three years old, which is a proper age to plant them out for good; for, the younger they are planted, the better they will thrive, provided they are kept clear from weeds; and, if the ſituation where they are intended to ſtand is much expoſed to winds, the plants ſhould be planted cloſer together, that they may be a ſhelter to each other, and draw themſelves upward; and, as the trees advance, they may be thinned by degrees; and the thinnings of theſe plantations have, in many places, paid the expence of planting; for theſe are very ſerviceable for ſcaffolding, and many other uſeful buſineſſes.

It is the wood of this tree which is the red or yellow deals, and is more valuable than that of any other ſort of pine or fir: this is a native of Denmark, Sweden, and many other northern countries: and in the High-lands of Scotland there are ſeveral large woods of this tree now growing; and the ſeeds being brought from thence into England, has occaſioned the name of Scotch Fir being generally applied to it here, but in Norway it is called grana.

PINK, a well known flower in our gardens, being a ſpecies of the genus of the carnation. See Carnation.

The damaſk Pink, white ſhock, ſcarlet, pheaſant's-eyed Pink, of which there are great varieties, both with ſingle and double flowers, the old man's head, and the painted lady pinks, with ſeveral others. Theſe may be propagated by layers, as the carnations, and many of them by cuttings planted in July, or from ſeeds, by which method new varieties may be obtained. The manner of ſowing theſe ſeeds being the ſame with the carnations, I ſhall refer back to that, to avoid repetition, and ſhall proceed to the China Pink, which is a flower of later date amongſt us than any of the former; which, although it hath no ſcent, yet, for the great diverſity of beautiful colours which are in theſe flowers, with their long continuance in flower, merits a place in every good garden.

The double China-Pink. — There is a great variety of different colours in theſe flowers, which vary annually as they are produced from ſeeds, ſo that, in a large bed of theſe flowers, ſcarcely two of them are exactly alike, and their colours in ſome are exceeding rich and beautiful; we ſhould therefore be careful to ſave the ſeeds from ſuch flowers only as are beautiful; for they are very ſubject to degenerate from ſeeds.

And the ſeeds of the double ſort will produce many double flowers again, but the ſeeds of the ſingle will ſcarcely ever produce a double flower.

Theſe flowers are only propagated by ſeeds, which ſhould be ſown towards the end of March, in a pot or box of good light earth, and ſet under a glaſs to forward its vegetating; giving it water as often as you ſhall ſee neceſſary, and in about a month's time your plants will come up and be of ſome bigneſs; you muſt therefore expoſe them to the open air, and in a ſhort time after prepare ſome beds of good freſh earth, not too ſtiff, in which you may prick out theſe plants, about three inches ſquare, obſerving to water and ſhade them, as the ſeaſon may require.

In thoſe beds they may remain until the middle of June, at which time you may remove and plant them in the borders of the pleaſure garden, being careful to preſerve as much earth to their roots as poſſible; and in a month's time after they will begin to flower, and continue until the froſt prevent them. About the middle or latter end of Auguſt their ſeeds will begin to ripen, at which time you ſhould look over them once a week, gathering off the pods that are changed brown, and ſpread them on papers to dry, when you may rub out the ſeed, and put it up for uſe. Though theſe plants are uſually termed annuals, and ſown every year, yet their roots will abide two years, if ſuffered to remain, and will endure the greateſt cold of our winters, if planted in a dry ſoil, and without any ſhelter; as I experienced anno 1728, at which time I had a large bed of theſe flowers, which was raiſed a foot above the level of the ground; and, although its ſituation was ſuch, that the ſun never ſhone upon it from October to March, yet I had not one root deſtroyed in the whole bed, although it ſtood open, and without any care taken of it. *Miller's Gard. Dict.*

PIN'NA, *a fin*, in natural hiſtory, the name of that part of a fiſh which diſtinguiſhes it from other aquatic creatures, no animal but a fiſh having fins and wanting legs.

The fin is properly a part ſtanding out, or hanging from the body of the fiſh, and conſiſting of a membrane ſupported by ſeveral rays or oblong bones; which are in ſome hard and firm, and in others cartilaginous.

Pinna *marina*, in natural hiſtory, the name of a ſhell fiſh, by the lateſt writers on theſe ſubjects referred to the genus of muſcles.

PINTA'DO, *or Afra avis*, in natural hiſtory, a name given by the antient Roman authors to the Guinea hen.

Varro, Columella, and Pliny, with many others, make the meleagris the ſame ſpecies of bird; but Suetonius, Scaliger, and ſome others are of opinion, that the antients meant two very different birds by theſe names; and the latter of theſe authors endeavours to bring Varro over to his ſide, by altering the pointing in the paſſage of that author which relates to it. The bird is of late become very common in England, and breeds with us in great plenty. The hen lays her eggs and ſits upon them in the ſame manner with the common hen; but the eggs are ſmaller and not ſo white as the hen's eggs, but have a tinge of fleſh colour and ſome black ſpots. They are not ſo tame and domeſtic as our own fowls, and particularly they will not lay in houſes, but get into the hedges and among buſhes, where they lay and hatch; but this is the occaſion of great loſs among them, the wild vermin deſtroying a great part of the young brood. The female alſo is leſs careful about the great buſineſs of hatching and taking care of them, than any other bird we are acquainted with. She will often leave her neſt when the eggs are near hatching, and never return to it again; and often will deſert the young as ſoon as hatched, if ſhe remains at her neſt till that time. The beſt method, therefore, is to ſet other fowls upon the eggs of this kind. The young fowls of this kind are very beautiful, they look like ſo many partridges. Their beaks and legs are red, and their whole plumage is at that time of the colour of the partridge. See *Tab. of birds*, N°. 21.

The hen, if her neſt is found, and the eggs at times taken away, but ſo as always to have one there, will continue to lay till ſhe has depoſited an hundred, or ſometimes an hundred and fifty eggs, which are very well taſted. This is a very active and ſprightly bird, and of an unquiet and troubleſome diſpoſition to the owner. It runs very ſwiftly, in the manner of the quail and partridge; but its wings are ſhort, and it is not made for flying; yet at night it will not rooſt among other fowl, but gets upon a houſe or tree, or any other high and ſafe place. The cry of the bird is ſharp and diſagreeable to many ears, and it is almoſt continually making it. It is of a quarrelſome diſpoſition, and will be miſtreſs of the yard: its agility, and the ſharpneſs of its beak, generally obtaining it the victory with whatever bird it fights.

PIPE, in mining, is where the ore runs forwards end-ways in a hole, and doth not ſink downwards or in a vein. *Houghton's Compl. Miner*, *in the explan. of the terms*.

PIQUET, or *picket*, a celebrated game at cards, much in uſe throughout the polite world.

It is played between two perſons, with only thirty-two cards; all the duces, threes, fours, fives, and ſixes, being ſet aſide. In reckoning at this game every card goes for the number it bears, as a ten for a ten; only all court-cards go for ten, and the ace for eleven: and the uſual game is one hundred up.— In playing, the ace wins the king, the king the queen, and ſo down. Twelve cards are dealt around, uſually by two and two; which done, the remainder are laid in the middle: if one of the gameſters finds he has not a court in his hand, he is to declare he has carte-blanche, and tell how many cards he will lay out, and deſire the other to diſcard, that he may ſhew his game, and ſatisfy his antagoniſt, that the carte-blanche is real; for which he reckons ten.

Each perſon diſcards, i. e. lays aſide a certain number of his cards, and takes in a like number from the ſtock. The firſt, of the eight cards, may take three, four, or five; the dealer all the remainder, if he pleaſes.

After diſcarding, the eldeſt hand examines what ſuit he has moſt cards of, and reckoning how many points he has in that ſuit: if the other have not ſo many in that, or any other ſuit, he tells one for every ten of that ſuit.—He who thus reckons moſt is ſaid to win the point.

The point being over, each examines what ſequences he has of the ſame ſuit, viz. how many tierces, or ſequences of three, quartes or fours, quintes or fives, ſixiemes or ſixes, &c. For a tierce they reckon three points, for a quarte four, for a quinte fifteen, and for a ſixieme ſixteen, &c. And the ſeveral ſequences are diſtinguiſhed in dignity by the cards they begin from: thus ace, king, and queen are called tierce major; king, queen, and knave, tierce to a king; knave, ten, and nine, tierce to a knave, &c. and the beſt tierce, quarte, or quinte, i. e. that which takes its deſcent from the beſt card, prevails; ſo as to make all the others in that hand good, and deſtroy all thoſe in the other hand.—In like manner a quarte in one hand ſets aſide a tierce in the other.

The ſequences over, they proceed to examine how many aces, kings, queens, knaves, and tens each holds; reckoning, for every three of any ſort, three: but here too, as in ſequences, he that, with the ſame number of threes, has one that is higher than any the other has, for example, three aces, has all his others made good hereby, and his adverſary's all ſet aſide.—But four of any ſort, which is called a quatorze, always ſets aſide three.

All the game in hand being thus reckoned, the eldeſt proceeds to play, reckoning one for every card he plays above a nine, and the other follows him in the ſuit; and the higheſt card of the ſuit wins the trick.—Note, unleſs a trick be won with a card above a nine (except the laſt trick) nothing is reckoned for it; though the trick ſerves afterwards towards winning the cards; and that he who plays laſt does not reckon for his cards, unleſs he wins the trick.

The cards being played out, he that has moſt tricks reckons ten for winning the cards.—If they have tricks alike, neither reckons any thing.—The deal being finiſhed, and each having marked up his game, they proceed to deal again as before, cutting afreſh each time for the deal.

If both parties be within a few points of being up, the carte-blanche is the firſt thing that reckons, then the point, then the ſequences, then the quatorzes or threes, then the tenth cards. He that can reckon thirty in hand by carte-blanche, points, quintes, &c. without playing, before the other has reckoned any thing, reckons ninety for them;—and this is called a repique;—if he reckons above thirty, he reckons ſo many above ninety.—If he can make up thirty, part in hand, and part play, before the other has told any thing, he reckons for them ſixty. — And this is called a pique. Whence the name of the game.

He that wins all the tricks, inſtead of ten, which is his right for winning the cards, reckons forty,—and this is called a capot.

This game has in ſome caſes been the object of mathematical computations.

Thus Mr. de Moivre has propoſed and ſolved the following problems.

1°. To find at Piquet the probability which the dealer has for taking one ace or more in three cards, he having none in his hands. He concludes from his computation, that it is 29 to 28, that the dealer takes one ace or more.

2°. To find at Piquet the probability which the eldeſt has of taking an ace or more in five cards, having no ace in his hands. Anſwer, 232 to 91, or 5 to 2 nearly.

3°. To find at Piquet the probability which the eldeſt has of taking both an ace and a king in five cards, he having none in his hand. Anſwer, the odds againſt the eldeſt hand taking an ace and a king are 331 to 335, or 21 to 20 nearly.

4°. To find at Piquet the probability of having twelve cards dealt to, without king, queen, or knave; which caſe is commonly called cartes-blanches. Anſwer, the odds againſt cartes-blanches are 323 to 578,956, or 1791 to 1 nearly.

5°. To find how many different ſets, eſſentially different from one another, one may have at Piquet before taking in. Anſwer, 28,967,278. This number falls ſhort of the ſum of all the diſtinct combinations, whereby 12 cards may be taken out of 32, this number being 225,792,840; but it ought to be conſidered, that, in that number, ſeveral ſets of the ſame import, but differing in ſuit, might be taken, which would not introduce an eſſential difference among the ſets.

Mr. de Moivre alſo gives ſome obſervations on this game, which he had from an experienced player. See *Doctrine of Chances*, *pag.* 151 to 159.

Monſ. de Monmort has alſo treated of Piquet in his Analyſe des Jeux de Hazard.

PISSASPHA'LTUM, in natural hiſtory, the name of a genus of foſſils, the characters of which are theſe: they are fluid mineral bodies, of a ſomewhat thick conſiſtence, duſky, and opake, of a ſtrong ſmell, and readily inflammable, but leaving a reſiduum of greyiſh aſhes after burning.

Brine PITS, the name given, by the people of Worceſterſhire and Cheſhire, to the wells or Pits affording the ſalt water, out of which they extract the ſalt.

Theſe waters, though they all contain ſalt, yet have other things alſo in them, and theſe not in ſmall quantity. They all contain a very large proportion of ſtony matter; this is common to the whole ſet, but particular ſubſtances beſides this are found in the particular Pits. At Northwich in Cheſhire, there are four Pits, the water of all which ſtinks very ſtrongly of ſulphur, and contains ſo much vitriol, that it will turn black like ink, with a decoction of galls; yet this is boiled into a very fine and pure kind of ſalt, common at our tables under the name of baſket ſalt, and having no ſuch properties.

There is a vaſt quantity of ſtony matter precipitated from theſe pans of brine in the boiling them to ſalt; this is partly ſaved in ſmall pans ſet at the ſide of the boiler, and partly precipitates to the bottom of the pan, where it forms a cruſt like that at the bottoms and ſides of our tea-kettles, which the workmen find it neceſſary to remove every week; but there is no vitriol or ſulphur ſeparated. *Phil. Tranſ.* N°. 150.

In the country near where theſe brine Pits are, the inſtruments uſed in boring bring up fine and hard ſalt; ſo that they give proofs of there being rocks of ſalt in many places. All along the river Weever, on each ſide, the earth affords brine wherever it is opened; but all theſe are not fit for boiling, many of the Pits affording a brine too weak to be worked to any advantage. The very ſtrongeſt Pits ſometimes alſo become at once too weak; it is owing to the irruptions of freſh openings into them, and ſometimes the river itſelf makes its way into them, and overflows them with ſuch a quantity of freſh water, that they are utterly ſpoiled. The brine-Pits at Weſton, near Stafford, afford a brine that ſtinks like rotten eggs; this turns inſtantly to ink with galls, and purges and vomits violently, if taken even in a ſmall quantity. This in boiling depoſits a white flaky ſand, or ſtony matter, without ſmell or taſte, and the ſalt is pure and fine.

The Pit at Droitwich, in Worceſterſhire, affords no ſand in the boiling, nor any the leaſt ſediment of the ſtony matter at the bottom of the pan, and the ſalt is the pureſt of all the others; and by the people of the country is eſteemed the moſt wholeſome, becauſe of its being without the ſand. This and the other Pits hereabout all have the ſmell of rotten eggs, eſpecially after a little reſt, as on the Monday morning after the Sunday's reſt. If meat be put to pickle in the brine of theſe Pits, inſtead of being preſerved it will ſtink in twenty-four hours, ſometimes in twelve, yet they yield the beſt ſalt of any inland Pits in the world.

The ſulphur ſpaws of Yorkſhire, which are very numerous in different parts of the county, all ſtink violently of rotten eggs; but, if well drawn and worked, they would prove as inoffenſive as the reſt, and only ſo many weaker or ſtronger brine-Pits; and the ſmell is no other than that of the Cheſhire and Staffordſhire brine, when it has been left ſome time at reſt.

It is remarkable, that, though the ſtony matter is depoſited in ſuch vaſt plenty by the waters of all our ſalt ſprings, it is not found in any abundance in thoſe places where ſalt is made out of the ſea-ſand, as in Lancaſhire and ſome other places; ſo that it is much more than the natural quantity of ſpar contained in water that is thus depoſited: and indeed it appears from trial, that the brine of our ſalt-ſprings, in general, contains more than twenty times the quantity of ſpar that common water does.

This ſtony matter ſeparates itſelf from the water before the ſalt does, and thus it appears to do in many other waters impregnated with mineral particles. The vitriolic waters all contain ochre and ſalt, and in all theſe the ochre ſeparates itſelf firſt in the boiling, and then the vitriol, and the ſtony matter precipitated from common ſalt ſprings affords, on an analyſis, the ſalt called nitrum calcarium, in conſiderable abundance. *Phil. Tranſ.* N°. 156.

PITH (*Dict.*)—As the ſubſtance of the trunk in trees becomes more woody, the Pith is compreſſed and ſtrained to ſuch a degree, that it wholly diſappears.

The Pith of trees is continued farther into their minute parts than is generally conceived; the ſmalleſt branches and pedicles of the leaves and flowers have their ſhare of it, according to the nature of the trees they belong to; and even the middle ribs of the leaves, when examined by the microſcope, are not without it: a tranſverſe ſection of one of theſe ribs of the leaf of a pithy tree ſhews a very beautiful arrangement of veſſels, or little bladders, containing a quantity of clear liquor, and reſembling in all reſpects thoſe of which the Pith in the branches is compoſed. The Pith in theſe is not round, however, as in the others, but flat, and runs from one end of the pedicle to the other, in form of a thin white rib, gradually leſſening to a point.

The Pith of plants, in fine, ſeems what the marrow is in animals, a congeries of an infinite number of veſicles, which ſeem deſtined to ſeparate a finer juice than is neceſſary for the nouriſhment of the coarſer parts of the tree. It is obſerved of plants which have a larger than ordinary ſhare of Pith, that they produce larger quantities of flowers than others; inſtances of this are ſeen in the roſe, the iliac, and the common elder: and, in the ferulaceous plants, the quantity of flowers is not only profuſely large, according to the great quantity of Pith in their ſtalks, but the Pith ſeems carried up the ſtalks all the way to the ſeeds themſelves; the long ſeeds of the ſweet myrrhis, and other the like plants, while not ripe, being only Pith. *Mem. Acad. Scien.* 1709.

PLANE *tree*, *platanus*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the amentaceous kind, and is of a glomerated ſhape, and compoſed of a great number of ſtamina with their apices. Theſe flowers are barren, and the embryo fruits are found on other parts of the plant; theſe finally become larger, and contain ſeveral ſeeds winged with down.

PLANET (*Dict.*) — *Plate* VII. *fig.* 2, 3, 4, 5, 6, 7, and 8, exhibit the proportion that the ſeveral Planets bear to each other.

PLANS *of bridges*, the repreſentations of theſe ſtructures laid down on a plane, ſuch as they appear on the ground.

PLANTA'GO, *plantain*, in botany, a genus of plants whoſe characters are:

The calyx is monophyllous, quadrifid, tubulous, and very tender. The flower in it is monopetalous, ſhaped ſomewhat like a baſon, quadripartite, and expanded in form of a ſtar: the ovary is guarded by four long ſtamina; whence ſome take the flower to be apetalous. The fruit is a ſhell, almoſt of an oval or conic form, when ripe, opening tranſverſly into two parts (one of which reſts upon the other;) and is divided by an intercloſure into two capſules, full of oblong ſeeds.

Plantain is cold, dry, and binding, and uſeful in all kinds of fluxes and hæmorrhages, as ſpitting and vomiting of blood, bleeding at the noſe, the exceſs of the catamenia, or lochia, as alſo, for the involuntary making of urine, its heat and ſharpneſs, and the gonorrhœa. It is likewiſe good to ſtop the bleeding of wounds, and to conſolidate their lips.

The only officinal preparation is the ſimple diſtilled water. *Miller's Bot. Off.*

Its leaves are bitter, aſtringent, and give a faint red colour to the blue paper; the roots give it a deeper, and are only aſtringent; which ſhews, that, in the leaves, the ſal ammoniac, and the terreſtrial parts of this plant, are clogged with a great deal of ſulphur; thus the Plantain is vulnerary, reſolving, and febrifugous. Tragus commends it very much for the phthiſic. In the country they drink the juice, from two ounces to four, at the firſt acceſs of the paroxyſm of intermitting fevers; two drachms of the extract of this plant, or a drachm of its ſeed reduced to powder, cure a looſeneſs, and all ſorts of hæmorrhages. The ptiſan and water of Plantain have the ſame virtues. They are preſcribed in the dyſentery, ſpitting of blood, in the immoderate flux of the piles, or terms, for the whites, and loſſes of blood. In fine, the Plantain is uſed in all vulnerary and deterſive potions. In the inflammation of the eyes, Camerarius made a collyrium with the juice and leaves of this plant mixed with roſe-water and ſugar. Simon Pauli uſed the extract of Plantain, and the decoction of ſarſaparilla, to cure a young man that made bloody urine, after a gonorrhœa. The gargariſm of Plantain is excellent for the diſeaſes of the throat; this plant is an ingredient in the powder which Julian Paulmier has preſcribed to cure madneſs. *Martyn's Tournefort.*

PLA'SHING, a term uſed by our farmers to expreſs an operation performed at certain times upon the quick-ſet hedges, in order to aſſiſt their growth and continuance. This operation is performed ſometimes in October, but more uſually in February; and this is by much the better ſeaſon for it. Suppoſe a hedge to be of twenty or thirty years growth, and full of old ſtubs, as well as young ſhoots, this is the kind of hedge that requires Plaſhing moſt of all.

The old ſtubs muſt be cut off within two or three inches of the ground, and the beſt and longeſt of the middle-ſized ſhoots muſt be left to lay down. Some of the ſtrongeſt of theſe muſt alſo be left to anſwer the purpoſe of ſtakes. Theſe are to be cut off to the height at which the hedge is intended to be left, and they are to ſtand at ten feet diſtance one from another: when there are not proper ſhoots for theſe at due diſtances, their places muſt be ſupplied with common ſtakes of dead wood. The hedge is to be firſt thinned, by cutting away all but thoſe ſhoots which are intended to be uſed either as ſtakes, or the other work of the Plaſhing: the ditch is to be cleaned out with the ſpade, with ſloping ſides each way; and when there is any cavity on the bank on which the hedge grows, or the earth has been waſhed away from the roots of the ſhrubs, it is to be made good by facing it, as they expreſs it, with the mould dug from the upper part of the ditch; all the reſt of the earth dug out of the ditch is to be laid upon the top of the bank, and the owner ſhould look carefully into it, that this be done; for the workmen, to ſpare themſelves trouble, are apt to throw as much as they can upon the face of the bank; which, being by this means overloaded, is ſoon waſhed off into the ditch again, and a very great part of the work undone again, whereas what is laid on the top of the bank always remains there, and makes a good fence of an indifferent hedge.

In the Plaſhing the quick, two extremes are to be avoided; theſe are, the laying it too low, and the laying it too thick: this makes the ſap run all into the ſhoots, and leaves the Plaſhes without ſufficient nouriſhment; which, with the thickneſs of the hedge, finally kills them. The other extreme of laying them too high is equally to be avoided; for this carries up all the nouriſhment into the Plaſhes, and ſo makes the ſhoots ſmall and weak at the bottom, and, conſequently, the hedge thin. This is a common error in the north of England. The beſt hedges, made any where in England, are thoſe of Hertfordſhire; and they are plaſhed in a middle way between the two extremes, and the cattle are by that prevented both from cropping the young ſhoots, and from going through; and a new and vigorous hedge ſoon forms itſelf.

When the ſhoot is bent down that is intended to be plaſhed, it muſt be cut half-way through with the bill: the cut muſt be given ſloping, ſomewhat downwards, and then it is to be wound about the ſtakes; and, after this, its ſuperfluous branches are to be cut off, as they ſtand out at the ſides of the hedge. If, for the firſt year or two, the field where a new hedge is made can be plowed, it will thrive the better for it; but, if the ſtubs are very old, it is beſt to cut them quite down, and to ſecure them with good dead hedges on both ſides, till the ſhoots are grown up from them ſtrong enough to plaſh; and, wherever void ſpaces are ſeen, new ſets are to be planted to fill them up. A new hedge, raiſed from ſets in the common way, generally requires Plaſhing about eight or nine years after. *Mortimer's Huſbandry.*

PLA'STERING. The modern taſte runs greatly into Plaſtering, and it were much to be wiſhed that this art could be again brought to its ancient perfection. In our beſt buildings, the plaſtered walls and ceilings crack and fly, and in a little time grow damp, or moulder to decay. The Romans had an art of rendering their works of this kind much more firm and durable, and there is no reaſon to deſpair of reviving this art by proper trials.

The ancient Plaſtering of theſe people, preſerved to this time, where it has not met with violent blows or injuries from accidents, is ſtill found as firm and ſolid, as free from cracks and crevices, and as ſmooth and poliſhed on the ſurface, as if made of marble. The bottoms and ſides of the Roman aqueducts were made of this Plaſtering, and endured many ages without hurt, unleſs by accidents; witneſs that, whereof ſome yards are ſtill to be found on the top of the Ponte de Gards, near Niſmes, for the ſupport of which that famous bridge was built to carry water to the ſaid town. The roofs of houſes and the floors of rooms at Venice are covered with a ſort of plaſter, made of later date, and yet ſtrong enough to endure the ſun and weather for ſeveral ages, without cracking or ſpoiling, and without much injury from people's feet.

The ſecret of preparing this Venetian plaſter is not among us; but it would be worth while to try whether ſuch a ſubſtance might not be made by boiling the powder of gypſum dry over the fire, for it will boil in the manner of water; and, when this boiling or recalcining was over, the mixing with it roſin, or pitch, or both together, with common ſulphur, and the powder of ſea ſhells. If theſe were all mixed together, and the water added to it hot, and the matter all kept hot upon the fire till the inſtant of its being uſed, ſo that it might be laid on hot, it is poſſible this ſecret might be hit upon.

Wax and oil of turpentine may be alſo tried as additions: theſe being the common ingredients in ſuch cements as we have accounts of as the firmeſt. Strong ale-wort is by ſome directed to be uſed, inſtead of water, to make mortar of lime-ſtone be of more than ordinary ſtrength. It is poſſible, that the uſe of this tenacious liquor to the powdered ingredients of this propoſed plaſter might greatly add to their ſolidity and firmneſs. *Philoſ. Tranſ.* N°. 93.

PLATES, in gunnery.—The prize Plates are two Plates of iron on the cheeks of a gun carriage, from the cape ſquare to the center, through which the prize bolts go, and on which the hand-ſpike reſts where it poiſes up the breach of the piece. Breaſt Plates are the two Plates on the face of the carriage, one on each cheek. Train Plates are the two Plates on the cheeks at the train of the carriage. Dulidge Plates are the ſix Plates on the wheel of a gun carriage, where the fellows are joined together, and ſerve to ſtrengthen the dulidges.

PLA'TFORM (*Dict.*) — All practitioners are agreed, that no ſhot can be depended on, unleſs the piece be placed on a ſolid Platform; for, if the Platform ſhakes with the firſt impulſe of the powder, it is impoſſible but the piece muſt likewiſe ſhake; which will alter its direction, and render its ſhot uncertain. To prevent this accident, the Platform is uſually made extremely firm to a conſiderable depth backwards, ſo that the piece is not only well ſupported in the beginning of its motion, but likewiſe through a great part of its recoil. However, it is ſufficiently obvious, that, when the bullet is ſeparated from the piece, it can be no longer affected by the trembling of the piece or Platform; and by a very eaſy computation it will be found, that, in a piece ten feet in length, carrying a bullet of twenty-four pounds, and charged with ſixteen pounds of powder, the bullet will be out of the piece before it has recoiled half an inch; whence, if the Platform be ſufficiently ſolid at the beginning of the recoil, the remaining part of it may be much ſlighter, ſince its unſteadineſs beyond the firſt half inch will have no influence on the direction of the ſhot: and hence a more compendious method of conſtructing Platforms may be found out. *New Princip. of Gunn.*

PLA'TONISM (*Dict.*)—In after-times, about the firſt ages of the Chriſtian church, the followers of Plato quitted the title of Academiſts, and took that of Platoniſts.

It is ſuppoſed to have been at Alexandria in Egypt, that they firſt aſſumed the new title, after having reſtored the ancient academy, and re-eſtabliſhed Plato's ſentiments; which in proceſs of time had many of them been laid aſide.

Porphyry, Plotin, Iamblichus, Proclus, and Plutarch, are thoſe who acquired the greateſt reputation among the Greek Platoniſts: and, among the Latins, Apuleius and Chalcidius.—Among the Hebrews, Philo Judæus.—The modern Platoniſts own Plotin the founder, at leaſt the reformer of their ſect.

The Platonic philoſophy appears very conſiſtent with the Moſaic; and a great party of the primitive fathers follow the opinions of that philoſopher, as being favourable to Chriſtianity.—Juſtin is of opinion, Plato could not learn many things he has ſaid in his works, from mere natural reaſon; but thinks he might have learnt them from the books of Moſes, which he read when in Egypt.

Hence Numenius, the Pythagorean, expreſſly calls Plato the Attic Moſes; and upbraids him with plagiariſm, in that he ſtole his doctrine about the world and God, from the books of Moſes. Theodoret ſays expreſsly, that he has nothing good and commendable about the Deity, and his worſhip, but what he ſtole from the Hebrew theology; and Clemens Alexandrinus calls him the Hebrew philoſopher.

Gale is very particular in his proof of the point, that Plato borrowed his philoſophy from the ſcriptures, either immediately, or by means of tradition; and, beſides the authority of ancient writers, brings ſome arguments from the thing itſelf.—As, for inſtance, Plato's confeſſion that the Greeks borrowed their knowledge of the one infinite God, from an ancient people, better and nearer to God than they; by which people, our author makes no doubt, he meant the Jews: from his account of the ſtate of innocence; as, that man was born of the earth, that he was naked, that he enjoyed a truly happy ſtate, that he converſed with brutes, &c.—In effect, from an examen of all the parts of Plato's philoſophy, phyſical, metaphyſical, and ethical, this author finds, in every one, evident characters of its ſacred original.

As to the manner of the creation, Plato teaches that the world was made according to a certain exemplar, or idea, in the divine architect's mind. And all things in the univerſe, in like manner, he ſhews, do depend on the efficacy of eternal ideas. This ideal world is thus explained by Didymus: 'Plato ſuppoſes certain patterns or exemplars of all ſenſible things, which he calls ideas; and, as there may be various impreſſions taken off from the ſame ſeal, ſo is there a vaſt number of natures exiſting from each idea.' This idea he ſuppoſes to be an eternal eſſence, and to occaſion the ſeveral beings in nature to be ſuch as itſelf is: and that moſt beautiful and perfect idea, which comprehends all the reſt, of whatever kind, he maintains to be the world.

Further, Plato teaches that the univerſe is an intelligent animal, conſiſting of a body and a ſoul.

The firſt matter whereof this body was formed, he obſerves, was a rude indigeſted heap, or chaos: now, adds he, the creation was a mixed production; and the world is the reſult of a combination of neceſſity and underſtanding, i. e. of matter, which he calls neceſſity, and the divine wiſdom.

The principles, or elements, which Plato lays down, are fire, air, water, and earth.

He ſuppoſes two heavens; the empyrean, which he takes to be of a fiery nature, and to be inhabited by angels, &c. and the ſtarry heaven, which he teaches is not adamantine or ſolid, but liquid and ſpirable.

His phyſics, or doctrine de corpore, is chiefly laid down in his Timæus; where he argues on the properties of body, in a geometrical manner; which Ariſtotle takes occaſion to reprehend in him.—His doctrine de mente is delivered in his tenth book of Laws, and his Parmenides.

St. Auguſtine commends the Platonic philoſophy; and even ſays, that the Platoniſts were not far from Chriſtianity: he adds, that the generality of the new Platoniſts of his time embraced the faith.

Juſtin Martyr profeſſes, that Plato's doctrine was of the utmoſt advantage to him, in helping him to believe the myſteries of the Chriſtian faith.—To which it may be added, that it was in good meaſure by Plato's help that Origen confuted Celſus.

Indeed, the late author of Platoniſme devoilé carries things to an extravagant length, when he contends, that the dogmata of of our religion are only the opinions of Plato; that the fathers give us nothing of the myſteries thereof, but what they learnt from him; and that Chriſtianity is only Platoniſm veiled, or covered over. To which opinion, however, M. le Clerc ſeems a little inclined.

Among the multiplicity of things to be done, and to be avoided, for the preſervation of animal life, &c. how ſhould we have diſtinguiſhed between the one and the other, but for the ſenſations of pleaſure and pain? Theſe are not only ſpurs, to urge us on, but alſo guides, to direct us whither we are to go. Where-ever nature has fixed pleaſure, we may take it for granted, ſhe there injoins a duty; and ſomething is to be there done, either for the individual, or the ſpecies.

Hence, it is that our pleaſures vary at different ſtages of life; the pleaſures, for inſtance, of a child, a youth, a grown man, an old man, &c. all tending to thoſe particular things required by nature in that particular ſtate of life, either for the preſervation, ſimply, or for that and propagation, &c.

Hence, from the different conſtitutions of the body, at different ages, it were very eaſy to account for all the particular taſtes and pleaſures thereof: not by deducing the pleaſures mechanically from the diſpoſition of the organs in that ſtate; but by conſidering what is neceſſary for the perfection and well-being of the individual in that ſtate, and what it is to contribute to that of the ſpecies.—In a child, mere preſervation in the preſent ſtate is not enough; it muſt likewiſe grow: to bring this to paſs, nature has made the returns of hunger, &c. more frequent, as well as more acute; and the pleaſures of feeding more exquiſite. And, that the exceſs of aliment in proportion to the bulk of the body may be diſpenſed withal, ſhe has made one of the great pleaſures of that ſtate to conſiſt in a ſeries of ſportive exerciſes, by means whereof the parts of the body come to be opened and expanded, and arrive at maturity. This done, the pleaſures that conduced thereto diſappear; and others, ſuited to the new ſtate, ſucceed.

PLEURONE'CTES, in ichthyology, the name of a genus of fiſhes of the malacopterygious kind, the characters of which are theſe: the branchioſtege membrane, on each ſide, contains ſix bones of a cylindric figure; and in the middle between theſe, but lower down, there are two others joined together at the end, but theſe are ſcarce conſpicuous. Both the eyes are placed in one ſide of the head; in ſome they are in the right ſide, and in others in the left. The eyes are covered with a ſkin. One ſide of the fiſh is always white, the other is ſpotted or obſcure.

PLO'MO, in metallurgy, a name given by the Spaniards, who have the care of the ſilver mines, to the ore of that metal when it is found adhering to the ſurface of ſtones, and incruſting their cracks and cavities in the form of ſmall and looſe grains of gunpowder. Though theſe grains be but few in number, and the reſt of the ſtone have no ſilver in it, yet, they are always very happy in meeting with it, as it is a certain token that there is a very rich vein ſomewhere in the neighbourhood. And, if, in digging forwards, they ſtill meet with theſe grains, or the Plomo, in greater quantity, it is a certain ſign that they are getting nearer the good vein.

PLO'VER, *pluvialis*, in zoology, a bird of paſſage well known among ſportſmen.

The Plovers are very eaſily taken at the time of their firſt coming over, when they have not got any other birds mixed among them; but, when they afterwards pick up the teal and other ſhy birds among them, it becomes more difficult. The beſt ſeaſon for taking them is in October, eſpecially in the beginning of that month: after this they grow timorous, and are not eaſily taken again till March, which is the time of their coupling. The ſevereſt froſts are not the beſt ſeaſon for taking them in nets, but variable weather does better. The north-weſt wind is found diſadvantageous to the taking of them;

and, in general, great regard is to be paid to the courſe of the wind in ſetting of the nets. All ſea fowl fly againſt the wind when the land lies that way; and the nets for the taking them are therefore to be placed in a proper direction accordingly.

PLOUGH (*Dict.*)— The advantage of digging with the ſpade, or ſuch other inſtrument, very naturally led men to the invention of the Plough, a greatly more expeditious way of doing the ſame thing; that is, cutting and breaking the earth into ſmall pieces; but in this the ſpade has the advantage of the common Plough, as it goes deeper, and divides the earth more minutely; but the improvement of the common Plough into the four-coultered one, ſhews that it is eaſy to make the Plough perform this office as much better, as it uſually does it worſe than the ſpade.

The Plough deſcribed by Virgil had no coulter; and at this time, the Ploughs of Italy and the ſouth of France, have none; and the Ploughs in Greece, and in the eaſtern nations in general, are of the ſame kind. Neither is it indeed poſſible to uſe a coulter in ſuch a Plough; becauſe the ſhare does not cut the bottom of the furrow horizontally, but obliquely: in going one way it turns off the furrow to the right-hand, but in coming back it turns it off to the left; therefore if it had a coulter, it muſt be on the wrong ſide every other furrow.

It is a great miſtake in thoſe who ſay that Virgil's Plough had two earth-boards, for it had really none at all; but the ſhare itſelf, always going obliquely, ſerved inſtead of an earth board; and two ears, which were the corners of a piece of wood lying under the ſhares, did the office of ground-wriſts. This faſhion of the Plough continues to this day in thoſe countries; and in Languedoc this ſort of Plough performs tolerably well when the ground is fine, and makes a ſhift to break up light land. This is the ſort of land that is common in the Eaſt, and the arable lands about Rome, being never ſuffered to be fallow ſo long as to come to turf: this Plough ſucceeds very well in ſuch places, but it would be wholly impoſſible to turn up what in England we call ſtrong land, with it.

The Engliſh Ploughs are therefore different from theſe, as the ſoil is different. Our Ploughs, where well made, cut off the furrow at the bottom horizontally; and therefore, it being as thick on the land ſide as on the furrow ſide, the Ploughs cannot break it off from the whole land at ſuch a thickneſs, being ſix times greater than what the eaſtern Ploughs have to break off, and for this purpoſe it muſt have, of neceſſity, a coulter to cut it off: by this means the furrow is turned perfectly whole, and no part of the turf of it is broken; and if it lie long without new turning, the graſs from the edges will ſpread, and form a new turf on the other ſide, which was the bottom of the furrow before the turning; but is now become the furface of the earth, and will ſoon become greener with graſs than it was before plowing.

If whole, ſtrong, turfy furrows are plowed croſs-ways, as is too commonly practiſed, the coulter cannot eaſily cut them; becauſe, being looſe underneath, they do not make a proper reſiſtance or preſſure againſt its edge, but are apt to be drawn on heaps, and turned in all directions, but without cutting.

Some of our Ploughs have heavy drags, with long iron tines in them; and though theſe broken pieces of furrows, being now looſer than before, require keener edges to cut them, theſe tines have no edges at all. Thus the clods of earth are toſſed into heaps again, and the ſurface left bare between them, and great labour and expence is uſed to very little purpoſe: all this is owing to the one coulter.

If the ſoil be ſhallow, it may be broken up with a narrow furrow, which will the ſooner be brought into tilth; but if it be a deep ſoil, the furrows muſt be proportionably enlarged, or elſe a great part of the good mould will be left unmoved, and ſo be loſt. The deeper the land is, the worſe it is broke by one coulter; that is, it is broke into larger furrows, and it requires ſuch repeated labour to conquer this, that, often, the beſt land will ſcarce pay the tillage.

This gives an opportunity to ſervants to cheat their maſters. They plow ſuch deep land with a ſmall furrow, and ſhallow, to the end, that the turf and furrows may be broken the ſooner, and the ſuperficial part made fine. They pretend the Plough will go deeper the next time; but this is never the caſe.

This ſort of land muſt not be plowed the ſecond time in wet weather; for this will cauſe the weeds to multiply, and the earth will be formed into thick and heavy clods where trodden: and in dry weather, the reſiſtance of the untouched earth below, and the ſlight preſſure of the Plough above, will always be reaſons why the Plough will enter no deeper the ſecond time than it did the firſt.

Another way to conquer a ſtrong turf, is to plow it up firſt with a breaſt Plough, very thin; and when the ſwerd is rotten, then it is to be plowed to the proper depth: but this method is liable to great objections; it is very troubleſome and expenſive, and if the turf be pared off in the winter, or early in ſpring, it is a chance but the rains come on, and ſet it to growing faſter than before: if, on the other hand, it be pared later in the year, though the turf be thoroughly killed by the ſucceeding dry weather, yet the time is loſt, and the farmer loſes the ſowing ſeaſon for wheat, which is the proper corn for ſuch ſtrong land.

The four-coultered Plough is the proper inſtrument for the farmer to have recourſe to on this and many other the like occaſions. This is an improvement on the common Plough, that makes it cut the pieces of earth into four; that is, it thus divides the earth four times as ſmall as the common Plough.

The common two-wheeled Plough has of late years become univerſally uſed in many countries, and is found greatly preferable to the Ploughs they uſed before; there is an objection to it, indeed, in regard to ſome ſtiff and miry lands, in which the wheels become clogged up, and cannot turn. This, however, is eaſily remedied by twiſting thumb ropes of ſtraw about the iron circle and ſpokes of the wheels; theſe ſpreading as they turn, and, as the circle twiſt bears upon the ground, throw off the dirt, and never clog. The two principal parts of this Plough are the head and the tail: the Plough-head contains the two wheels and their axis, or ſpindle, paſſing through a box, and turning round both in it and in the wheels. There are fixed perpendicularly in this box two crow-ſtaves, as they are called, which are flat and narrow boards, each having on it two rows of holes, whereby to raiſe or ſink the beam of the Plough, by pinning up or down the pillow, to increaſe or diminiſh the depth of the furrow. Behind are a pair of gallows, through which the crow-ſtaves paſs at the top by mortiſes, into which they are pinned; and to theſe are faſtened what are called the wilds, which are rings and crooks of iron, by which the whole Plough is drawn in the working. From the box to the center of the beam there is carried an iron-chain, conſiſting of four, five, or more long links, and called the tow-chain: this faſtens the Plough-tail to the Plough-head. It is fixed to an iron collar, faſtened in the beam at one end, and at the other paſſes through a hole in the middle of the box, and is pinned in with a wooden pin.

From the ſame iron-collar to which the tow-chain is fixed, there is alſo another chain faſtened, called the bridle-chain: this runs above the beam, as the tow-chain does below it, and is compoſed of ſmaller and more numerous links. At the upper end, as the tow-chain enters the box of the Plough, this bridle-chain is fixed to the top of what is called the ſtake of the Plough: this is a perpendicular ſtick, carried up parallel with the left crow-ſtaff, and pretty near it, and faſtened to it by a wyth or rope, or by the end of the bridle-chain itſelf, when that is long enough. This ſtake is alſo faſtened in its lower part, under the gallows, to the ſame crow-ſtaff, by another wyth or piece of rope.

Theſe are the parts of which the head-part of the Plough is compoſed. The Plough-tail conſiſts of the beam carried from the head to the very extremity, and ſerving as the ſupport and baſe of all the reſt. A little below the collar to which the tow-chain and bridle-chain are faſtened, this beam is pierced with a large hole, which lets through the coulter: this is a long and narrow piece, terminating in an edge, and reaching juſt to the ſhare; and it is fixed immoveably in its place by means of a wedge which is driven into the hole of the beam with it: the office of this coulter is to cut the earth as it is thrown up by the ſhare. Behind theſe, the ſame beam is pierced with two more holes, one very near its end: theſe give paſſage to two oblong pieces, called the fore-ſheat and hinder-ſheat, by which the Plough-ſhare is ſupported in its place. To the top of the hinder-ſheat there is faſtened a ſhort handle by a wooden pin. Parallel to the hinder-ſheat there runs up a piece of wood of much the ſame form, called the drock; and to this is faſtened another horizontal piece, called the ground-wriſt: theſe are all on the right-hand ſide of the Plough, and parallel with the fore-ſheat. There runs another piece of much the ſame form with it, on the right-hand; and the bottom of this is the earth-board. The long handle of this, which reaches as far that of the ſheat, is faſtened to the drock by a pin, the other end of which goes into the beam. Near the lower end of the fore-ſheat, there are two flat pieces of iron, which paſs from the two ſides of it up to the beam; and being let through it, are faſtened to the upper part by ſcrews and pins. Theſe keep the ſheat in its place.

The ſtructure of the four-coultered Plough is different, in ſome reſpects from this, though in general founded on it. Its beam is ten feet long, whereas that of the common Plough is but eight. The beam is ſtraight in the common Plough, but in this it is arched in one fourth part of its length, near the Plough-head. At the diſtance of three feet two inches from the end of the beam at the Plough-tail, the firſt coulter, or that next the ſhare, is let through; and at thirteen inches from this, a ſecond coulter is let through: a third at the ſame diſtance from that; and, finally, the fourth at the ſame diſtance from the third, that is, thirteen inches.

The crookedneſs of the upper part of the beam in this Plough is contrived to avoid the too great length of the three foremoſt coulters, which would be too much, if the beam was ſtraight all the way; and they would be apt to bend and be diſplaced, unleſs they were vaſtly heavy and clumſy. Aſh is the beſt wood to make the beam of, it being ſufficiently ſtrong, and yet light.

The ſheat in this Plough is to be ſeven inches broad. The fixing

Engraved for the Supplement

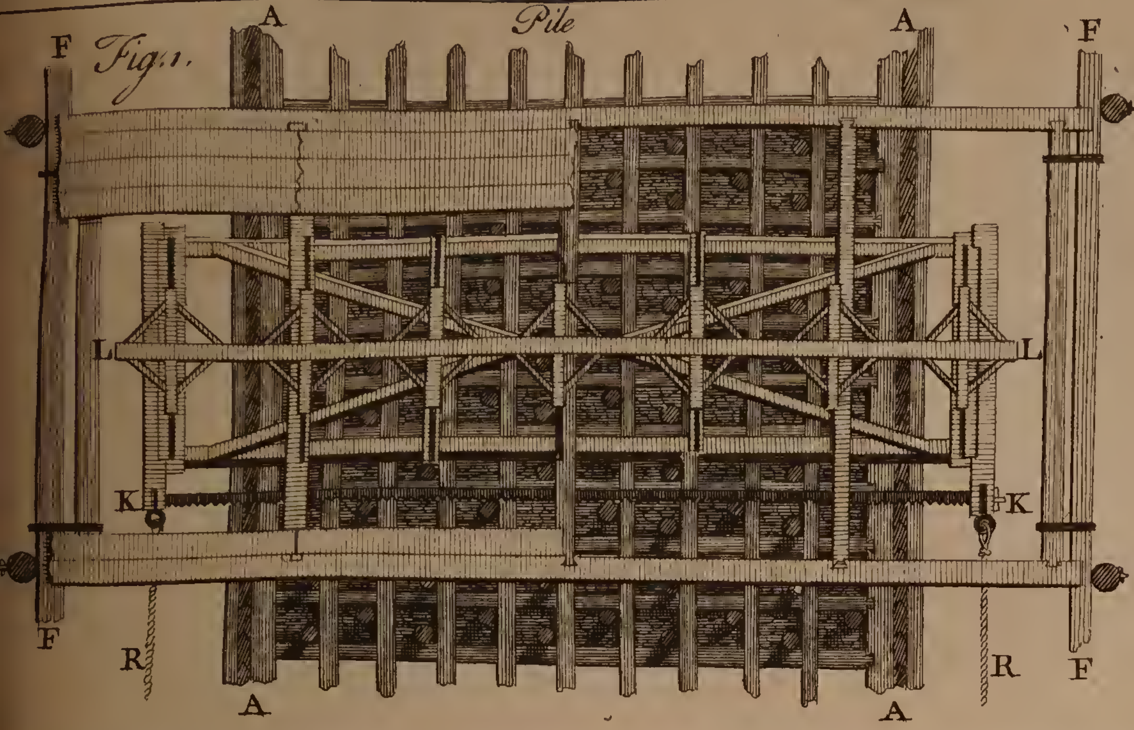


Fig. 1.

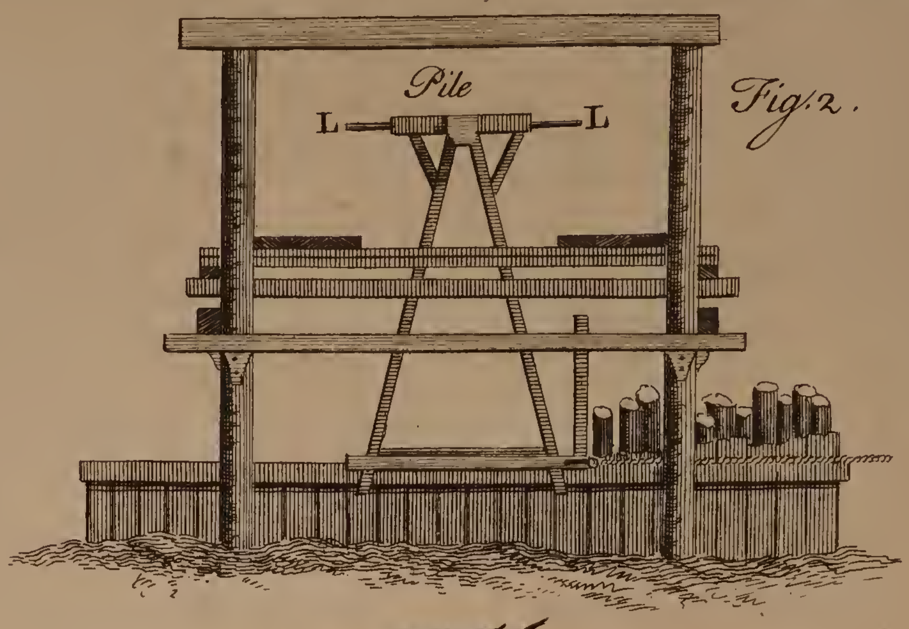


Fig. 2.

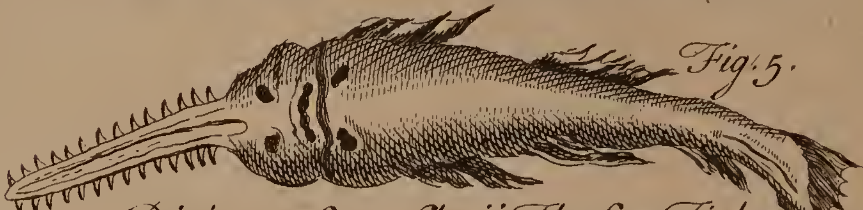


Fig. 5.

Pristis, sive Serra Clusii. The Saw Fish

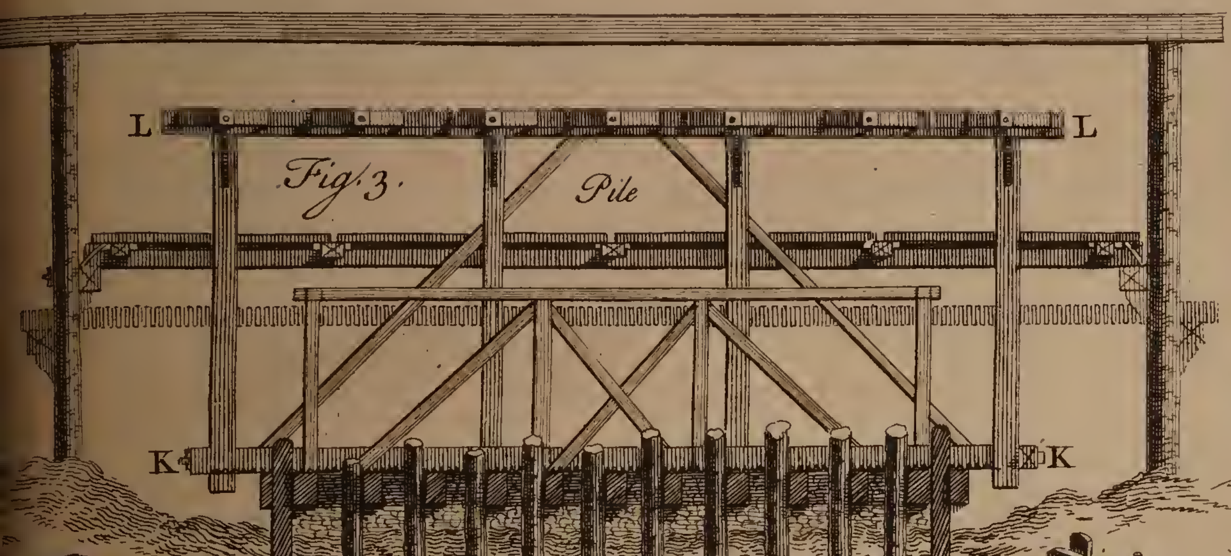


Fig. 3.

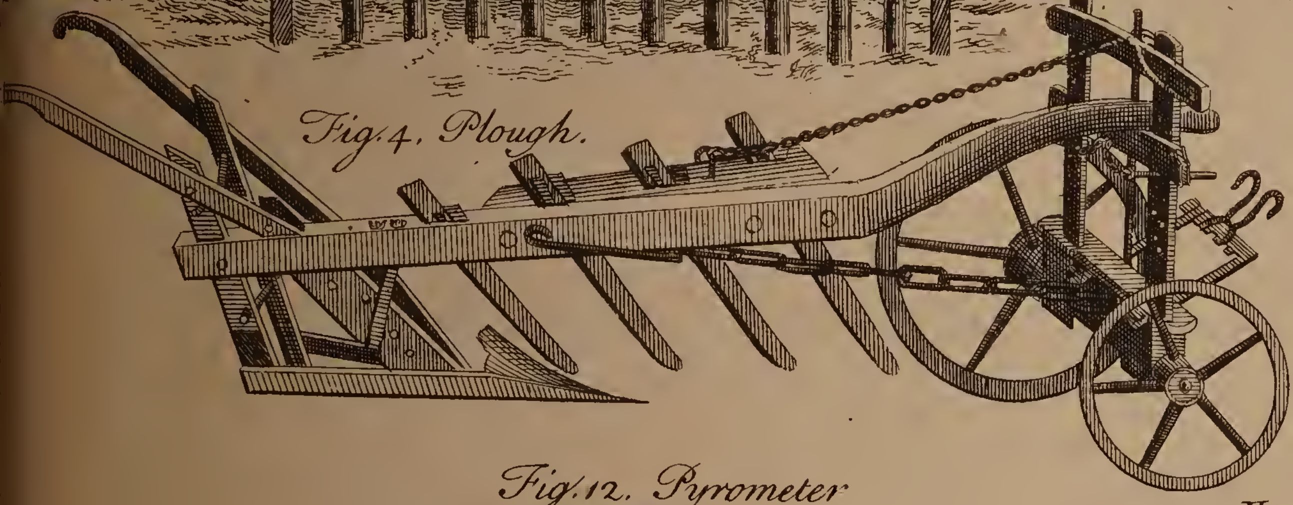


Fig. 4. Plough.

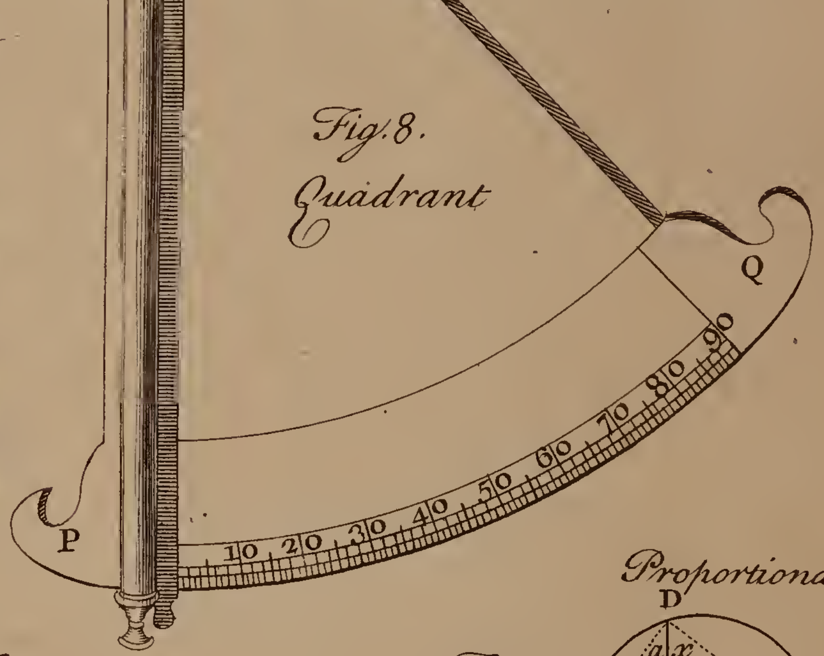


Fig. 8. Quadrant

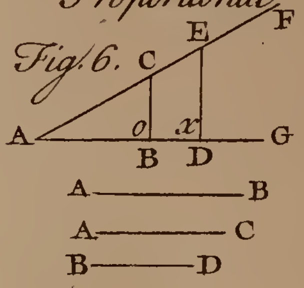
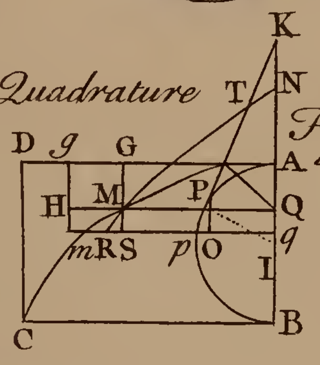


Fig. 6. Proportional



Quadrature Fig. 10

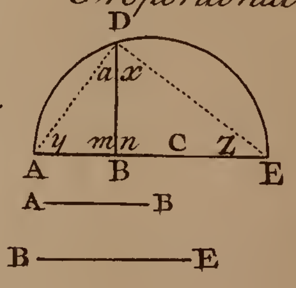
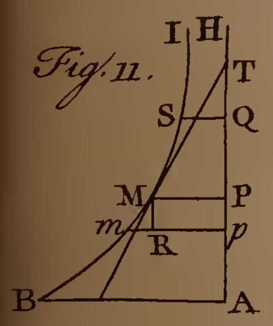


Fig. 7. Proportional



Quadrature Fig. 11.

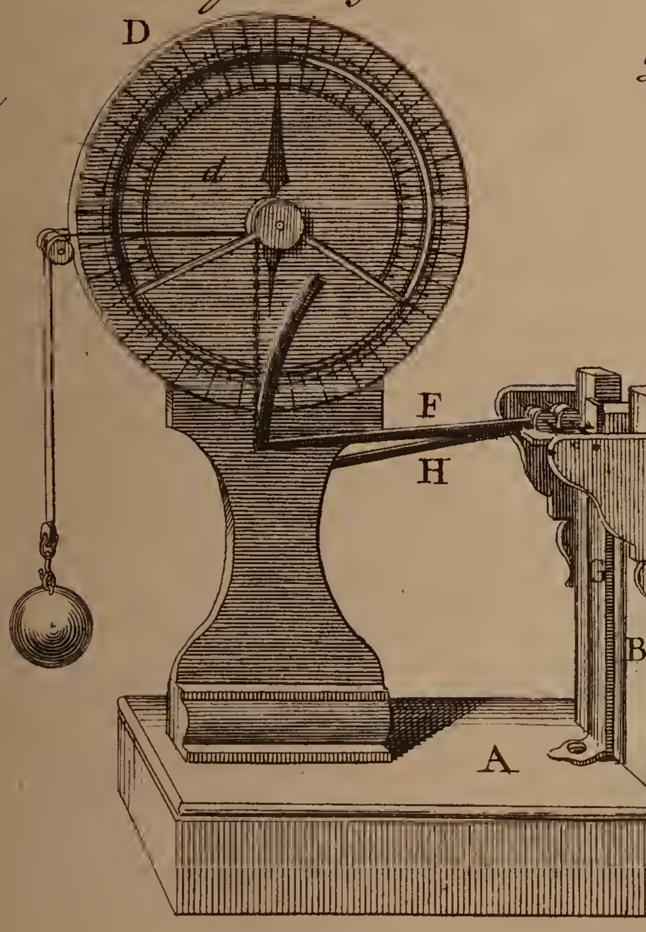
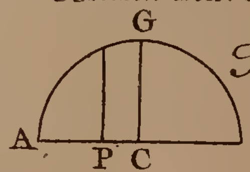


Fig. 12. Pyrometer



Quadrature Fig. 9

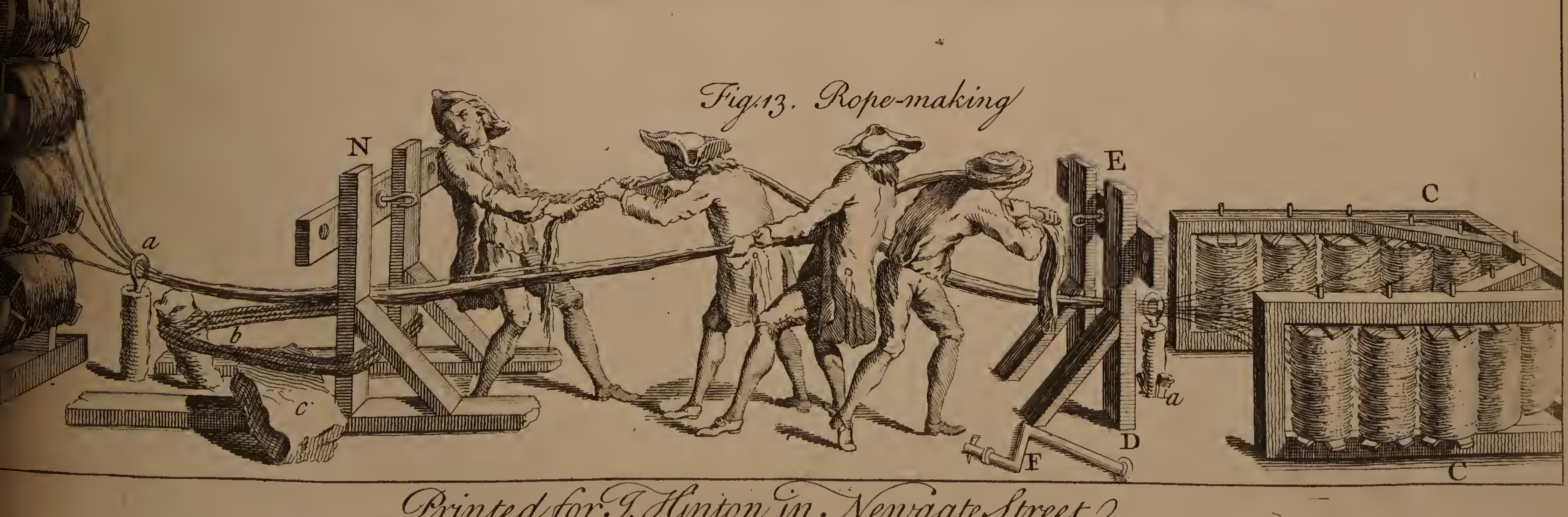


Fig. 13. Rope-making

Printed for J. Hinton in Newgate Street

ing of the ſhare in this, as well as in the common Plough, is the niceſt part, and requires the utmoſt art of the maker; for the well going of the Plough wholly depends upon the placing of this. Suppoſing the axis of the beam, and the left ſide of the ſhare, to be both horizontal, they muſt never be ſet parallel to each other; for, if they are, the tail of the ſhare, bearing againſt the trench as much as the point, would cauſe the point to incline to the right-hand, and it would be carried out of the ground into the furrow. If the point of the ſhare ſhould be ſet ſo, that its ſide ſhould make an angle on the right ſide of the axis of the beam, this inconvenience would be much greater; and if its points ſhould incline much to the left, and make too large an angle on that ſide with the axis of the beam, the Plough would run quite to the left-hand; and, if the holder, to prevent its running quite out of the ground, turns the upper part of his Plough toward the left-hand, the pin of the ſhare will riſe up, and cut the furrow diagonally, leaving it half unplowed. To avoid this and ſeveral other inconveniences, the ſtraight ſide of the ſhare muſt make an angle upon the left ſide of the beam; but that muſt be ſo very acute a one, that the tail of the ſhare may only preſs leſs againſt the ſide of the trench than the point does.

The great thing to be taken care of, is the placing the four coulters; for on this the ſucceſs of the whole depends. Theſe muſt be ſo ſet, that the four imaginary planes deſcribed by their four edges, as the Plough moves forward, may be all parallel to each other, or very nearly ſo; for if any one of them ſhould be very much inclined to, or ſhould recede much from either of the other, then they would not enter the ground together. In order to the placing them thus, the beam muſt be carefully pierced in a proper manner. The ſecond coulter-hole muſt be two inches and an half more on the right-hand than the firſt: the third muſt be as much more to the right of the ſecond, and the fourth the ſame meaſure to the right-hand of the third: and this two inches and an half muſt be carefully meaſured from the center of one hole to the center of the other. Each of theſe holes is a mortiſe of an inch and a quarter wide, and is three inches and an half long at the top, and three inches at the bottom. The two oppoſite ſides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the ſtanding of the coulter, which is wedged tight up to the poll. A perſpective view of this curious Plough the reader will find in *Plate* XXXV. *fig.* 4.

The coulter is two feet eight inches long, before it is worn; the handle takes up ſixteen inches of this length, and is allowed thus long, that the coulter may be driven down as the point wears away. *Tull's Horſe-hoeing Huſbandry.* See COULTER.

PLUM-*tree*, *prunus*, in botany, the name of a large and well known genus of fruit-trees.

All the ſpecies of Plums have within their fruit a hard ſtone, within which there is contained a ſoft and tender kernel: this kernel contains the ſeminal plant, from which would be produced another tree of the ſame kind, if it were ſet in the ground; and it is very natural to ſuppoſe, that the only uſe of the thick ſtone or huſk of this was only to preſerve its tender ſubſtance from rotting too ſoon in the earth, and to give it a proper time for developing its parts, to preſerve its natural oilineſs during that time, and to furniſh from its own ſubſtance a proper nouriſhment to the growing plant; for obſervation ſhews, that it finally breaks into a very fine powder.

There has not been found any ſpecies of Plum which had not its kernel contained in a ſtony coat of this kind, from whatever grafts they have been propagated; nor is there any art known by which the kernel of this ſort of fruit can, while growing, be deprived of its coat.

Mr. Marchand, however, in the year 1735, ſhewed, before the Academy of Sciences at Paris, certain Plums, whoſe kernels had no ſtone or ſhell round them; and found that they grew upon a tree which never had produced any others, and which had been known to produce ſuch for twenty years. The kernel in theſe was covered with a reddiſh ſkin, which was rough to the touch; and, within that, with another which was thinner and white. The kernel had nothing particular in it, except that it carried on one ſide of its outer ſurface, and that always in the ſame place, a little ſtony prominence, more or leſs dented on its convex part: this is uſually a twelfth of an inch broad, and two thirds of an inch long, and has no other appearance but that of a diſtempered part of the kernel, only that all the kernels have it.

The thick wrinkled ſkin which ſurrounds the kernel, ſeems in this caſe to ſupply the place of the ſtone or hard ſhell; and in this alſo it reſembles it, that the pulp of the fruit parts eaſily and readily from it: and the hard oblong body, which is placed on one ſide of the kernel, is by no means proper for this purpoſe. *Mem. Acad. Scienc. Par.* 1735.

All the ſorts of Plums are propagated by budding, or grafting them upon ſtocks of the muſcle-Plum, the white pear Plum, the St. Julian, or the bonum magnum.

Budding is much properer than grafting for theſe trees, as they are apt to throw out a great deal of gum from the wound: and the trees ſhould be no more than one year's growth from the bud, when they are tranſplanted; for, if they are more, they ſeldom ſucceed well, being very ſubject to canker; and, if they eſcape that, they uſually produce only two or three luxuriant branches. The whole management of planting and pruning them is the ſame with that of peaches.

If the walls againſt which they are planted are low, they ſhould be ſet eighteen feet aſunder; if they are higher, then fourteen or ſixteen.

Plums ſhould have a middling ſoil, for they ſeldom ſucceed well in too moiſt or too dry a one; and, when planted againſt walls, ſhould have an eaſt or a ſouth-eaſt proſpect. If they have one at full ſouth, they are apt to ſhrivel up, and become mealy. Plums in general ſucceed very well with proper care on eſpaliers; they will alſo bear very well as ſtandards, but the fruit will be not ſo well taſted. Plums do not only produce their fruit on the laſt year's wood, but alſo on ſpurs that come out of the wood at two or three years old. It is a common error to be too free with the knife in the winter pruning, cutting off the extremities of all the branches; the conſequence of which is, that there is an over quantity of young ſhoots produced, and the fruit is ſmall and poor. *Miller's Gard Dict.*.

PLUMBA'GO, *lead-wort*, in botany, a genus of plants, whoſe characters are:

The root is fibrous, thick, fleſhy, hot, and perennial; the leaves are alternate and entire. The end of the ſhort pedicle unfolds itſelf into a monophyllous, quinquefid, and very hairy calyx, ſhaped like a tube, in whoſe center is ſeated the ovary furniſhed with its proper tube. On the apex of the ovary, grows a monopetalous flower, conſiſting of a long tube, which has its upper part expanded into a circle, ſo as to reſemble the flower of jeſſamin; theſe flowers are diſpoſed in ſpikes. The ſeed is oblong and acuminated.

This is a plant ſeldom or never uſed. It is of an hot and even a cauſtic nature, like pellitory of Spain; and has been made uſe of, like that, for the tooth-ach; it is ſaid, that, even held in the hand, it will cure the pain of the teeth. *Miller's Bot. Off.*

PLUMIE'RIA, in botany, a genus of plants, whoſe characters are:

It has the appearance of the apocynum, and abounds with a lacteous juice. The end of the pedicle paſſes into a lttlie ſhort monophyllous calyx, out of which grows the flower, as in the nerium, but wants the petaloid crown. The ovary, which grows in the bottom of the calyx, becomes a long ſiliquous, double fruit, when opening, likewiſe, and pregnant with a multitude of ſeeds, placed as in the apocynum, but foliated.

This name was given to this beautiful ſpecies of plants, by Dr. Tournefort, in honour to father Plumier, who was botaniſt to the late king of France, and a long time in America, ſearching after new plants; and who has publiſhed a catalogue of the plants, with the new genuſes he conſtituted; and two volumes in folio, with figures and deſcriptions of many of the plants.

Theſe plants grow wild in the Spaniſh Weſt-Indies, from whence ſome of the moſt beautiful kinds were brought into the Engliſh ſettlements in America, and are cultivated in their gardens for ornament. The firſt ſort here mentioned is the moſt common kind, which is preſerved in the gardens of the inhabitants of Jamaica and Barbadoes. The flowers of this kind nearly reſemble thoſe of the red oleander, but are larger, and have an agreeable odour. Theſe are produced in ſmall bunches, at the extremity of the ſhoots, and generally appear in July and Auguſt in this climate, but in the Weſt-Indies they flower a great part of the year.

The milky juice of theſe plants is very cauſtic, and reckoned very poiſonous: in cutting off any of the branches of the plants, if the knife be not immediately cleaned, the juice will corrode it, and turn the blade almoſt black in a very little time, ſo as not to be cleaned off again; and, if dropped on linen, will cauſe it to waſh in holes, equal to aqua fortis.

PLU'MMING, among miners, a term uſed to expreſs the uſing a mine-dial, in order to know the exact place of the work where to ſink down an air-ſhaft, or to bring an adit to the work, or know which way the load inclines, when any flexure happens in it.

It is performed in this manner: a ſkilful perſon with an aſſiſtant, and with pen, ink, and paper, and a long line and a ſun-dial, after his gueſs of the place above ground, deſcends into the adit or work, and there faſtens one end of the line to ſome fixed thing in it; then the incited needle is let to reſt, and the exact point where it reſts is marked with a pen: he then goes farther in, the line ſtill faſtened, and at the next flexure of the adit he makes a mark on the line by a knot or otherwiſe; and then, letting down the dial again, he there likewiſe notes down that point at which the needle ſtands in this ſecond poſition. In this manner he proceeds from turning to turning, marking down the points, and marking the line till he comes to the intended place; this done, he aſcends and begins to work, on the ſurface of the earth, what he did in the adit, bringing the firſt knot in the line to ſuch a place where the mark of the place of the needle will again anſwer its pointing, and continues this till he comes to the deſired place above ground, which is certain to be perpendicularly over the part of the mine into which the air-ſhaft is to be ſunk.

PLUMO'SE *Antennæ*, in natural hiſtory, a term uſed to expreſs the antennæ, or horns of certain moths and butter-flies which are formed in the manner of feathers, being compoſed of a ſtem and fibres, iſſuing on each ſide from it: theſe are jointed and moveable any way, and even the ſmall fibres, at their ſides, are jointed at their bottoms and are moveable, but they move all together. *Reaumur's Hiſt. of Inſects.*

PLY'MOUTH-*marble*, among our artificers, a term uſed for a ſort of marble dug in great plenty about Plymouth and other parts of Devonſhire, where it lies in very thick ſtrata, and whence it is brought in large quantities to us; and, when wrought, looks little leſs beautiful than ſome of the Italian marbles.

It is very hard and firm, and of a beautiful texture; its ground is a bluiſh white, and its variegations are principally a pale red, and in ſmaller quantities brown and yellow: theſe lie in very orderly beds, and often there is a very agreeable glow of a faint red diffuſed through the whole ſubſtance. It is remarkably even in its whole ſtructure, and is therefore capable of a more than ordinarily elegant poliſh.

PO'CKET, in the wool trade, a word uſed to expreſs a large ſort of bag, in which wool is packed up to be ſent from one part of the kingdom to another.

The Pocket contains uſually twenty-five hundred weight of wool.

POD, among botaniſts, a ſpecies of pericarpium, conſiſting of two valves which open from the baſe to the point, and are ſeparated by a membranaceous partition, from which the ſeeds hang by a kind of funiculus umbilicalis.

PODE'RIS, in antiquity, a robe hanging down to the feet; but is chiefly uſed to expreſs a linen garment, a ſurplice, a ſhirt. The Jewiſh prieſts were covered with this kind of long ſurplices, during the time of their attendance in the temple; and this was the proper habit of their order. *Calmet, Dict. Bibl.*

PO'GGE, *or cataphractus*, in zoology, the name of a ſmall ſea-fiſh, caught in the Engliſh and ſome other ſeas.

POINT *of contrary flexure*, (*Dict.*) — The points of contrary flexure and reflexion of curves are uſually determined by ſuppoſing the ſecond fluxion of the ordinate to be nothing or infinite, that is, $\ddot{y} = o$, or $o\,o$, or $d\,d\,y = o$, or $o\,o$. See *L' Hopital Analyſe des Inf. petits.*

But this rule is liable to ſeveral exceptions, as is ſhewn very fully and clearly by Mr. Mac Laurin, in his Treatiſe of Fluxions.

The ordinate y paſſes through a point of contrary flexure, when, the curve being continued on both ſides of the ordinate, $\dot{y}$ is a maximum, or minimum. But this does not always happen when $\ddot{y} = o$, or $o\,o$. Mr. Mac Laurin obſerves in general, that if $\ddot{y}$, $\dddot{y}$, $\ddddot{y}$, &c. vaniſh, the number of theſe fluxions being odd, and the fluxion of the next order to them having a real and infinite value; then y paſſes through a point of contrary flexure; but, if the number of fluxions that vaniſh be even, it cannot be ſaid to paſs through ſuch a point, unleſs it ſhould be allowed that a double infinitely ſmall flexure can be formed at one point. *Lib. cit.*

The curve being ſuppoſed to be continued from the ordinate y, on both ſides, if $\ddot{y}$ be infinite, the extremity of the ordinate is not therefore always a point of contrary flexure, as $\dot{y}$ is not always, in this caſe, a maximum, or minimum, and the curve may have its concavity turned the ſame way on both ſides of the ordinate. But theſe caſes may be diſtinguiſhed by comparing the ſigns of $\ddot{y}$ on the different ſides of the ordinate; for, when theſe ſigns are different, the extremity of y meeting the curve is a point of contrary flexure.

The ſuppoſitions $\dot{y} = o$, or $o\,o$, and of $\ddot{y} = o$, or $o\,o$, ſerve to direct us where we are to ſearch for the maxima and minima, and for points of contrary flexure; but we are not always ſure of finding them. For though an ordinate or fluxion that is poſitive, never becomes negative at once, but increaſing or decreaſing gradually; yet, after it has decreaſed till it vaniſh, it may thereafter increaſe, continuing ſtill poſitive, or, after increaſing till it becomes infinite, it may thereafter decreaſe without changing its ſign.

POINT *of reflexion*, in geometry, is commonly uſed inſtead of Point of retrogradation, or retrogreſſion.

Hop-POLES, the upright pieces of wood that ſerve for the Hops to twiſt round and grow upon.

The number, length, and bigneſs of the Poles are to be regulated according to the bigneſs of the hills, and their diſtance, and the nature of the ground and ſtrength of the plants. If the hills are wide, there muſt be the more Poles, ſometimes four or five to a hill, or more than that; but, if they ſtand near, two may ſerve for every hill. In hot, dry, and hungry ground, the Poles ſhould ſtand nearer than in rich mellow land, where they are more ſubject to grow groſs and heavy.

If the plants are ſtrong, and the ground rich, the Poles muſt be both large and long, or elſe the crop will ſuffer greatly: if the crop be poor, it is beſt to have but few, and thoſe ſmall and ſhort Poles, otherwiſe the hop will eaſily run itſelf out of heart, and the root will be impoveriſhed.

The Poles ſhould never be made over long the firſt year. The propereſt wood for hop-Poles is the aſh or the alder, and, if they have a ſort of fork at the top, they will keep up the hop the better. The Poles are to be diſpoſed between the hills, to be in readineſs; but they muſt not be ſet up till the plants begin to appear, that it may be known where they ought to be placed. This may be continued till the plants are a yard high, but it ought to be finiſhed at that time, becauſe the plants will be ſtinted or injured in their growth, if they have not ſomething to ſupport them, when arrived at that height.

The Poles muſt be placed not in the hill, but near that part of it out of which each plant to be ſupported grows. They muſt be driven far enough into the ground, ſo that they may rather break than be torn up. Their depth is to be judged by the nature of the ground, their own height, and their expoſure to the wind. Let all the Poles lean outward one from another, that they may ſeem to ſtand at an equal diſtance at the top, to prevent the choaking up the plants below: and they ſhould always lean towards the ſouth, that the ſun may the better ſhine in among them. A ſloping Pole is always more ready to bear a quantity of hops than an upright one, and the ſun ſhines on more of the plants at once by means of it. It is always neceſſary to keep ſome ſpare Poles, by way of reſerve, to be ready in caſe of the others breaking; for, in this caſe, the hops are ſoon ſpoiled with lying on the ground. If a Pole be over-burthened with hops, they may be unwound, and wrapped round a ſtronger Pole put in the place of the other.

The largeſt ſort of hop-Poles ſhould be twenty feet long, and nine inches in circumference, for hops at full growth; and they ſhould be polled about fourteen days after the dreſſing in of rich land. An acre of hop ground generally requires about three thouſand poles.

When the hops are grown to three feet high, they are to be conducted to ſuch of the Poles as are neareſt, or have feweſt hops on them; and they are to be wound about theſe Poles according to the courſe of the ſun, and tied to them looſely with ſome ruſhes, or with ſoft yarn: two or three ſtrings are ſufficient to each Pole, and great care is to be taken that the young ſhoots are not broken in the doing this: they are much more brittle in the morning than the heat of the day. During the months of April and May the plants are to be carefully attended, and kept turned round the Poles; and, when out of reach, a fork, ſtick, or ladder are to be uſed to this purpoſe.

About Midſummer they uſually leave running at length, and begin to branch; ſuch as do not, ſhould have the end broke off, to incline them to it, it being much to the advantage of the owner that they ſhould branch out. From the middle of May to the end of ſummer, the ground between the Poles ſhould be dug or turned up with a plough, to kill the weeds; and the earth about the hills raiſed higher, to keep them moiſt. *Mortimer's Huſb.*

POLAEDRA'STYLA, in natural hiſtory, the name of a genus of cryſtals. The word is derived from the Greek πολὺς, many, ἕδρα, ſides, the privative particle α, not, and ϛύλος, a column; and expreſſes a cryſtal compoſed of many planes and having no column.

The bodies of this genus are cryſtals compoſed of two octangular pyramids, joined baſe to baſe, and conſequently the whole body conſiſting of ſixteen planes. Of this genus there are only two known ſpecies: 1. A brown kind with ſhort pyramids, found in conſiderable plenty in Virginia, on the ſides of hills; and, 2. A colourleſs one, with longer pyramids. This has yet been found only in one place, which is the great mine, at Goſſelaer, in Saxony, and there uſually lies at great depths. *Hill's Hiſt. of Foſſ.*

PO'LISHING *of ſhells*. This is an art of no long ſtanding in the world, in its preſent perfection; and as the love of ſea-ſhells is become ſo common among us, it may not be diſagreeable to the reader to find ſome inſtructions in executing ſo pleaſing a method of adding to their natural beauty, and the rules for which are at preſent ſo little known, though the effect of them be ſo much eſteemed.

Among the immenſe variety of ſhells which we are acquainted with, ſome are taken up out of the ſea, or found on its ſhores, in all their perfection and beauty; their colours being all ſpread by nature upon the ſurface, and their natural poliſh ſuperior to any thing art could give. Where nature is in herſelf thus perfect, it were madneſs to attempt to add any thing to her charms; but in others, where the beauties are latent, and covered with a coarſer outer ſkin, art is to be called in, and, the outer veil being taken off, all the internal beauties appear.

Among the ſhells which are found naturally poliſhed are the porcelanes, the caſſanders, the dolia, or conchæ globoſæ, the buccinums, the cornets, and the cylinders, or, as they are generally, though improperly called, the rhombi; excepting only two or three, as the tiara, the plume, and the butter-tub rhombus; where there is an unpromiſing film on the ſurface, hiding a very great ſhare of beauty within.

Though the generality of the ſhells of theſe genera are taken out of the ſea in all their beauty, and in their utmoſt natural poliſh, there are ſeveral other genera in which all or moſt of the ſpecies are taken up naturally rough and foul, and covered with an epidermis, or coarſe outer ſkin, which is in many rough and downy or hairy. The tellinæ, the muſcles, the cochleæ, and many others are of this kind. The more nice collectors, as naturaliſts, inſiſt upon having all their ſhells in their native and genuine appearance, as they are found, when living, at ſea; but the ladies who make collections, hate the diſagreeable outſides, and will have all ſuch poliſhed: it would be very adviſable, however, for both kinds of collectors to have the ſame ſhells in different ſpecimens, both rough and poliſhed; the naturaliſt would by this means, beſides knowing the outſide of the ſhell, be better acquainted with its internal characters than he otherwiſe could be, and the lady would have a pleaſure in comparing the beauties of the ſhell, in its wrought ſtate, to its coarſe appearance as nature gives it. How many elegances in this part of the creation muſt be wholly loſt to us, if it were not for the aſſiſtance of an art of this kind! many ſhells in their native ſtate are like rough diamonds, and we can form no juſt idea of their beauties till they have been poliſhed and wrought into form.

Though the art of Poliſhing ſhells is a very valuable one, yet it is very dangerous to the ſhells; for, without the utmoſt care, the means uſed to poliſh and beautify a ſhell will often wholly deſtroy it. When a ſhell is to be poliſhed, the firſt thing to be examined is, whether it have naturally a ſmooth ſurface, or be covered with tubercles or prominences.

A ſhell which has a ſmooth ſurface, and a natural dull poliſh, need only be rubbed with the hand, or with a piece of chamoy leather, with ſome tripoli or fine rotten-ſtone, and it will become of a perfectly bright and fine poliſh. Emery is not to be uſed on this occaſion, becauſe it wears away too much of the ſhell. This operation requires the hand of an experienced perſon, that knows how ſuperficial the work muſt be, and where he is to ſtop; for, in many of the ſhells, the lines are only on the ſurface, and the wearing away ever ſo little of the ſhell defaces them. A ſhell that is rough, foul, and cruſty, or covered with a tartarous coat, muſt be left a whole day ſteeping in hot water: when it has imbibed a large quantity of this, it is to be rubbed with rough emery on a ſtick, or with the blade of a knife, in order to get off the coat. After this, it may be dipped in diluted aqua-fortis, ſpirit of ſalt, or any other acid; and, after remaining a few moments in it, be again plunged into common water. This will greatly add to the ſpeed of the work. After this it is to be well rubbed with linen cloths, impregnated with common ſoap; and, when by theſe ſeveral means it is made perfectly clean, the poliſhing is to be finiſhed with fine emery and a hair bruſh. If after this the ſhell, when dry, appears not to have ſo good a poliſh as was deſired, it muſt be rubbed over with a ſolution of gum-arabic; and this will add greatly to its gloſs, without doing it any ſort of injury. The gum-water muſt not be too thick, and then it gives no ſenſible coat, only heightening the colours. The white of an egg anſwers this purpoſe alſo very well; but it is ſubject to turn yellow. If the ſhell has an epidermis which will by no means admit the Poliſhing of it, it is to be dipped ſeveral times in diluted aqua-fortis, that this may be eaten off; and then the ſhell is to be poliſhed in the uſual way with putty, fine emery, or tripoli, on the hair of a fine bruſh. When it is only a pellicle that hides the colours, the ſhells muſt be ſteeped in hot water, and after that the ſkin worked off by degrees with an old file. This is the caſe with ſeveral of the cylinders, which have not the natural poliſh of the reſt.

When a ſhell is covered with a thick and fatty epidermis, as is the caſe with ſeveral of the muſcles and tellinæ: in this caſe aqua-fortis will do no ſervice, as it will not touch the ſkin; then a rough bruſh and coarſe emery are to be uſed; and, if this does not ſucceed, ſeal ſkin, or as the workmen call it fiſh-ſkin and pumice-ſtone, are to be taken in to aſſiſt.

When a ſhell has a thick cruſt, which will not give way to any of theſe means, the only way left is to plunge it ſeveral times into ſtrong aqua-fortis, till the ſtubborn cruſt is wholly eroded. The limpets, auris marina, the helmet-ſhells, and ſeveral other ſpecies are of this kind, and muſt have this ſort of management; but as the deſign is to ſhew the hidden beauties under the cruſt, and not to deſtroy the natural beauty and poliſh of the inſide of the ſhell; the method of uſing the aqua-fortis muſt be this: a long piece of wax muſt be provided, and one end of it made perfectly to cover the whole mouth of the ſhell; the other end will then ſerve as a handle, and, the mouth being ſtopped by the wax, the liquor cannot get in to the inſide to ſpoil it; then there muſt be placed on a table a veſſel full of aqua-fortis, and another full of common water.

The ſhell is to be plunged into the aqua-fortis, and, after remaining a few minutes in it, is to be taken out and plunged into the common water. The progreſs the aqua-fortis makes in eroding the ſurface is thus to be carefully obſerved every time it is taken out: the point of the ſhell, and any other tender parts, are to be covered with wax, to prevent the aqua-fortis from eating of them away; and, if there be any worm holes, they alſo muſt be ſtopped up with wax, otherwiſe the aqua-fortis would ſoon eat through in thoſe places. When the repeated dippings into the aqua-fortis ſhew that the coat is ſufficiently eaten away, then the ſhell is to be wrought carefully with fine emery and a bruſh; and, when it is poliſhed as high as can be by this means, it muſt be wiped clean and rubbed over with gum-water, or the white of an egg. In this ſort of work the operator muſt always have the caution to wear gloves, otherwiſe the leaſt touch of the aqua-fortis will burn the fingers, and turn them yellow; and often, if it be not regarded, will eat the ſkin and the nails.

Theſe are the methods to be uſed with ſhells, which require but a moderate quantity of the ſurface to be taken off; but there are others which require to have a larger quantity taken off, and to be uncovered deeper; this is called entirely ſcaling a ſhell. This is done by means of an horizontal wheel of lead or tin, impregnated with rough emery; and the ſhell is wrought down in the ſame manner in which ſtones are wrought by the lapidary. Nothing is more difficult, however, than the performing this work with nicety: very often ſhells are cut down too far by it, and wholly ſpoiled; and, to avoid this, a coarſe vein muſt be often left ſtanding in ſome place, and taken down afterwards with the file, when the cutting it down at the wheel would have ſpoiled the adjacent parts.

After the ſhell is thus cut down to a proper degree, it is to be poliſhed with fine emery, tripoli, or rotten ſtone, with a wooden wheel turned by the ſame machine as the leaden one, or by the common method of working with the hand with the ſame ingredients, when a ſhell is full of tubercles, or protuberances, which muſt be preſerved. It is then impoſſible to uſe the wheel; and, if the common way of dipping into aqua-fortis be attempted, the tubercles, being harder than the reſt of the ſhell, will be eat through before the reſt is ſufficiently ſcaled, and the ſhell will be ſpoiled: in this caſe, induſtry and patience are the only means of effecting a poliſh. A camel's hair pencil muſt be dipped in aqua-fortis, and with this the intermediate parts of the ſhell muſt be wetted, leaving the protuberances dry: this is to be often repeated, and, after a few moments, the ſhell is always to be plunged into water to ſtop the eroſion of the acid, which would otherwiſe eat too deep, and deſtroy the beauty of the ſhell. When this has ſufficiently taken off the foulneſs of the ſhell, it is to be poliſhed with emery of the fineſt kind, or with tripoli, by means of a ſmall ſtick; or the common Poliſhing-ſtone uſed by the gold-ſmiths may be uſed.

This is a very tedious and troubleſome thing, eſpecially when the echinated oyſters and murexes, and ſome other ſuch ſhells, are to be wrought; and what is worſt of all is, that, when all this pains has been taken, the buſineſs is not well done; for there ſtill remain ſeveral places which could not be reached by any inſtrument; ſo that the ſhell muſt neceſſarily be rubbed over with gum-water, or the white of an egg afterwards, in order to bring out the colours and give a gloſs; in ſome caſes it is even neceſſary to give a coat of varniſh.

Theſe are the means uſed by artiſts to brighten the colours, and add to the beauty of ſhells; and the changes produced by Poliſhing in this manner are ſo great, that the ſhell is often not to be known afterwards for the ſame it was; and hence we hear of new ſhells in the cabinets of collectors, which have no real exiſtence as ſeparate ſpecies, but are the poliſhed appearance of others well known. To caution the reader againſt errors of this kind, it may be proper to add the moſt remarkable ſpecies thus uſually altered.

The onyx-ſhell, which in its natural ſtate is of a ſimple pale brown, when it is wrought ſlightly, or poliſhed with juſt the ſuperficies taken off, is of a fine bright yellow; and when it is eat away deeper, it appears of a fine milk-white with the lower part bluiſh: it is in this ſtate that it is called the onyx-ſhell; and it is preſerved in many cabinets in its rough ſtate, and in its yellow appearance, as different ſpecies of ſhells. The violet ſhell, ſo common among the curious, is a ſpecies of porcelane, which does not appear in that elegance till it has been poliſhed; and the common auris marina ſhews itſelf in two or three different forms, as it is more or leſs deeply wrought. In its rough ſtate it is duſky and coarſe, of a pale brown on the outſide and pearly within; when it is eaten down a little way below the ſurface, it ſhews variegations of black and green, and, when ſtill farther eroded, it appears of a fine pearly hue within and without. The nautilus, when it is poliſhed down, appears all over of a fine pearly colour; but, when it is eaten away but to a ſmall depth, it appears of a fine yellowiſh colour with duſky hairs. The burgau, when entirely cleared of its coat, is of the moſt beautiful pearl-colour; but, when only ſlightly eroded, it appears of a variegated mixture of green and red; whence it has been called the parroquet-ſhell. The common helmet-ſhell, when wrought, is of the colour of the fineſt agate: and the muſcles in general, though very plain ſhells, in their common appearance, become very beautiful when poliſhed, and ſhew large veins of the moſt elegant colours. The Perſian ſhell in its natural ſtate is all over white, and covered with tubercles; but when it has been ground down on a wheel, and poliſhed, it appears of a very grey-colour with ſpots, and veins of a very bright and highly poliſhed white. The limpets in general become very different when poliſhed, moſt of them ſhewing very elegant colours; amongſt theſe the tortoiſe-ſhell-limpet is the principal; it does not appear at all of that colour or tranſparency till it has been wrought.

The elegant ſpecies of ſhell called the junquil-chama, which has deceived ſo many judges of theſe things into an opinion of its being a new ſpecies, is only a white chama with a reticulated ſurface; but, when this is poliſhed, it loſes at once its reticular work and its colour, and becomes perfectly ſmooth, and of a fine bright yellow: and the violet-coloured chama of New England, when worked down and poliſhed, is of a fine milk-white, with a great number of blue veins diſpoſed like the variegations in agates.

The aſſes-ear-ſhell, when poliſhed, after working it down with the file, becomes extremely gloſſy, and obtains a fine roſe-colour all about the mouth. Theſe are ſome of the moſt frequent among an endleſs variety of changes wrought on ſhells by Poliſhing; and we find there are many of the very greateſt beauties of this part of the creation which muſt have been loſt, but for this method of ſearching deep in the ſubſtance of the ſhell for them.

The Dutch are very fond of ſhells, and are very nice in their manner of working them: they are under no reſtraint, however, in their works, but uſe the moſt violent methods, ſo as often to deſtroy all the beauty of the ſhell. They file them down on all ſides, and often take them to the wheel, when it muſt deſtroy the very characters of the ſpecies; nor do they ſtop at this, but, determined to have beauty at any rate, they are for improving upon nature, and frequently add ſome lines and colours with a pencil, afterwards covering them with a fine coat of varniſh; ſo that they ſeem the natural lineations of the ſhell: the Dutch cabinets are by this means made very beautiful, but they are by no means to be regarded as inſtructors in natural hiſtory. There are ſome artificers of this nation who have a way of colouring ſhells all over with a different tinge from that which nature gives them; and the curious are often deceived by theſe tricks into the purchaſing them as new ſpecies.

There is another kind of work beſtowed on certain ſpecies of ſhells, particularly the nautilus; this is the engraving on it lines and circles, and figures of ſtars, and other things: this is too obvious a work of art to ſuffer any one to ſuppoſe it natural. Bonani has figured ſeveral of theſe wrought ſhells at the end of his work, but it is miſerably throwing away labour to do them; the ſhells are ſpoiled as objects of natural hiſtory by it, and the engravings ſeldom worth any thing. They are principally done in the Eaſt-Indies.

Shells are ſubject to ſeveral imperfections; ſome of theſe are natural, and others accidental: the natural ones are the effect of age, or ſickneſs in the fiſh. The greateſt miſchief happens to ſhells by the fiſh dying in them. The curious in theſe things pretend to be always able to diſtinguiſh a ſhell taken up with the fiſh alive, from one found on the ſhores: they call the firſt a living, the ſecond a dead ſhell, and ſay that the colours are always much the fainteſt in the dead ſhells. When the ſhells have lain long dead on the ſhores, they are ſubject to many injuries, of which the being eaten by ſea worms is not the leaſt: age renders the fineſt ſhells livid or dead in their colours.

The fineſt ſhells are thoſe which are fiſhed up at ſea, not found on the ſhores. The other natural defects of ſhells are their having morbid cavities, or protuberances, in parts where their ſhould be none. When the ſhell is valuable, theſe faults may be hid, and much added to the beauty of the ſpecimen, without at all injuring it as an object of natural hiſtory, which ſhould always be the great end of collecting theſe things. The cavities may be filled up with maſtic, diſſolved in ſpirit of wine, or with iſinglaſs; theſe ſubſtances muſt be either coloured to the tinge of the ſhell, or elſe a pencil dipped in water-colours muſt finiſh them up to the reſemblance of the reſt, and then, the whole ſhell being rubbed over with gum-water, or with the white of an egg, ſcarce any eye can perceive the artifice: the ſame ſubſtances may alſo be uſed to prepare the battered edge of a ſhell, provided the pieces chipped off be not too large. And, when the excreſcences of a ſhell are faulty, they are to be taken down with a fine file. If the lip of a ſhell be ſo battered that it will not admit of repairing by any cement, the whole muſt be filed down to an evenneſs, or ground on the wheel.

POLLI'CIPES, *the toe-ſhell*, in natural hiſtory, the name of a genus of ſhells, the characters of which are theſe: they are multivalve flat ſhells, of a triangular figure, each being compoſed of ſeveral laminæ, which end in a ſharp point. They ſtand upon pedicles, and are furniſhed with a great number of hairs. We have only one known ſpecies of this genus, and this always found in large cluſters.

PO'LVERINE, the calcined aſhes of a plant; a ſubſtance of the nature of our pot-aſhes, or pearl-aſhes.

It is brought from the Levant and Syria; but in the glaſs trade, though it be of the nature of the other aſhes they uſe, it is always to be preferred to any other. The barillia, or pot-aſhes of Spain, yield more pure ſalt than the Polverine of the Levant, but the glaſs made with it has always ſome tinge of bluiſhneſs: that made with the Polverine is ever perfectly white, and this is the ſubſtance that ought always to be uſed for the fineſt cryſtal.

The method of procuring the pure ſalt from theſe aſhes, is to ſift them and throw them in a proper quantity into a large copper of boiling water, continuing the boiling till all the ſalt of the aſhes be diſſolved by the water, and adding to the water, before the Polverine is put in, about ten pounds of tartar calcined to a blackneſs. The lee or water, thus impregnated with the ſalt, muſt ſtand a conſiderable time to ſettle; and, when perfectly clear, muſt be evaporated till it thicken, and begin to ſhew a white dry ſalt about its edges: then the fire muſt be kept very ſlow, and, a ſkimmer full of holes being ſunk into the bottom of the copper, the ſalt will gather and harden upon it; and this muſt be taken out every now and then, and the ſalt taken off and dried for uſe. Three hundred pounds of Polverine thus yield eighty or ninety pounds of clear ſalt. When this is dried, it muſt be ſlightly calcined in the glaſs furnace, and then powdered and ſifted through a coarſe ſieve, and kept dry. *Neri's Art of Glaſs.*

POLYADE'LPHIA *, in botany, a claſs of plants, whoſe ſtamina are formed into three or more ſeparate bodies.

* The word is derived from the Greek πολὺς, many, and ἀδελφὰ, communiter. Among the plants of this claſs are orange-trees, St. John's wort, &c.

POLYA'NDRIA *, in botany, a claſs of plants, with hermaphrodite flowers, and a large number of ſtamina, or male parts, in each.

* The word is derived from the Greek πολὺς, many, and ἀνὴρ, male. The hermaphrodite flowers of this claſs have a large number of ſtamina on each, always more than twelve, and thoſe growing to the receptacle of the future ſeeds.

Of this claſs are the water-lily, poppy, celandine, &c.

POLYA'NTHUS (*Dict.*) — A great number of plants, called Polyanthus, are found in our gardens; they are all ſpecies of a genus called primula. See PRIMULA.

The ſeveral varieties of Polyanthus's are produced by ſowing of ſeeds, which ſhould be ſaved from ſuch flowers as have large upright ſtems, producing many flowers upon a ſtalk, the flowers large, beautifully ſtriped, and that open flat: from the ſeeds of ſuch flowers, there is room to hope for a great variety of good ſorts.

Theſe ſeeds ſhould be ſown in boxes filled with light earth, in December, being very careful not to bury the ſeed too deep; for, if it be only covered with light earth, it will be ſufficient: theſe boxes ſhould be placed where they may receive the benefit of the morning-ſun until ten of the clock; but muſt by no means be expoſed to the heat of the day, eſpecially when the plants begin to appear; for at that time one whole day's ſun will intirely deſtroy them: in the ſpring, if the ſeaſon ſhould prove dry, you muſt often refreſh them with water; and, as the heat increaſes, you ſhould remove the boxes more in the ſhade; for the heat is very injurious to them.

In May, theſe plants will be ſtrong enough to plant out; at which time you ſhould prepare ſome ſhady borders, which ſhould be made rich; upon which you muſt ſet the plants about four inches aſunder, obſerving to water them until they have taken root; after which they will require no farther care but to keep them clean from weeds, until the latter end of Auguſt following; when you ſhould prepare ſome borders, which are expoſed to the eaſt, with a good light rich earth, into which you muſt tranſplant your Polyanthus's, placing them ſix inches aſunder equally in rows, obſerving, if the ſeaſon proves dry, to water them until they have taken root. In theſe borders your plants will flower the ſucceeding ſpring; at which time you muſt obſerve to mark ſuch of them as are fine, to preſerve; and the reſt may be tranſplanted into wilderneſſes, and other ſhady places in the garden; where, though they are not very valuable flowers, they will afford an agreeable variety.

Thoſe which you intend to preſerve, may be removed ſoon after they have done flowering (provided you do not intend to ſave ſeeds from them) and may be then parted and tranſplanted into a freſh border of the like rich earth, allowing them the ſame diſtance as before; obſerving alſo to water them until they have taken root, after which they will require no farther care, but only to keep them clean from weeds; and the following ſpring they will produce ſtrong flowers; and, if the kinds are good, will be little inferior to a ſhew of auricula's. Theſe roots ſhould be conſtantly removed and parted every year, and the earth of the border changed, otherwiſe they will degenerate, and loſe the greateſt part of their beauty.

If you intend to ſave ſeeds, which is the method to obtain great variety, you muſt mark ſuch of them, which, as I ſaid before, have good properties: theſe ſhould be, if poſſible, ſeparated from all ordinary flowers; for, if they ſtand ſurrounded with plain-coloured flowers, they will impregnate each other; whereby the ſeeds of the valuable flowers will not be near ſo good, as if the plants had been in a ſeparate border where no ordinary flowers grew; therefore, the beſt way is to take out the roots of ſuch as you do not eſteem, as ſoon as the flowers open, and plant them in another place, that there may be none left in the border, but ſuch as you would chuſe for ſeeds.

The flowers of theſe ſhould not be gathered, except ſuch as are produced ſingly upon pedicles, leaving all ſuch as grow in large bunches; and, if the ſeaſon ſhould prove dry, you muſt now and then refreſh them with water, which will cauſe their ſeeds to be larger, and in greater quantity, than if they were intirely neglected.

Towards the latter-end of May, the ſeed will be ripe, which may be eaſily known by the pods changing brown, and opening; ſo that you ſhould at that time look over it three times a week, gathering each time ſuch of it as is ripe, which ſhould be laid upon a paper to dry, and may then be put up until the ſeaſon of ſowing. *Miller's Gard. Dict.*

POLYCRO'TA, in the naval architecture of the ancients, a word uſed to expreſs ſuch of their gallies as had three, four, five, or more tires of rowers, ſeated out different heights; they were diſtinguiſhed by this term from the monocrota, or thoſe which had only ſingle rows of oars.

POLYGA'LA, *milkwort*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the perſonated kind, conſiſting of one leaf, not perforated behind, and divided before into two lips; the upper lip is bifid, and the lower one elegantly fimbriated. The piſtil ariſes from the lower part of the flower, and ripens at length into a fruit or capſule of a compreſſed figure, divided into two cells, and full of oblong ſeeds. The fruit is uſually found ſurrounded with the cup of the flower, which conſiſts of five leaves, two large and three ſmall ones, which claſp round the ſeed veſſel in the manner of ſo many wings.

Dr. Tennent gives his rattle-ſnake-root, or Virginian Polygala, in the doſe of thirty-five grains in ſubſtance, or in three or four ounces of a ſtrong infuſion, or in a yet ſtronger, in a proportionably ſmaller doſe. The effects of this root being found very great, it was ſuppoſed that its place might poſſibly be ſupplied by this ſpecies of our own growth. It is very certain, that the place of growth may, in ſome plants, make a very great alteration in their virtues; and that the different ſpecies of the ſame genus may, in other inſtances, produce different effects in the human body, ſome ſpecies of plants agreeing in their external forms and generical characters, while they differ in their virtues and qualities.

There appeared on trial a conſiderable difference to the taſte between the American and the European Polygala roots, that of Virginia being very aromatic, acrid, and bitter, and the European only ſlightly acrid, with a very feeble bitterneſs. Another thing that gave great ſuſpicion as to the parallel virtues of the roots of theſe two ſpecies was, that Geſner was found, in his account of virtues of the European Polygala, to call it a very briſk cathartic; a quality which might render its uſe very improper in many of the diſeaſes in which Mr. Lemery and Juſſieu found the Virginian kind to prove a ſerviceable medicine. This laſt was found always very ſpeedily to allay fevers of the pleuritic kind, without increaſing in any great degree the diſcharges by ſtool.

The roots of the European Polygama, being very ſmall and ſlender, gave alſo ſome trouble as to the procuring them in ſufficient quantity; and in hopes it might become a general medicine, it was determined to try the effects of the whole plant, root, leaf, and branch, in the diſeaſe in which the Virginian kind had been given with the greateſt ſucceſs, that is, in pleuriſies; and this was accordingly fairly tried.

The principal inſtances of their trials were two; the firſt to a woman of twenty-two years old, who had a violent fever, with a ſizy blood, and pain in the ſide. She was twice blooded, and had immediate, but not laſting relief from it, and was ordered the common ptiſans given on theſe occaſions. The malady increaſed, and the expectoration was but ſmall, and that of a thick yellow matter: a third bleeding finally was judged neceſſary, but was of no more ſervice than the others; and after this ſhe had the ſame ptiſan continued, but with the addition of a large quantity of the common European Polygala, ſtalk, root, and leaf. This took place in two or three hours, the expectoration became vaſtly plentiful, and the matter thin and white, from being thick and yellow. The woman, in fine, was cured, and the medicine was not obſerved to occaſion any nauſea, nor did it prove, as ſuppoſed, a violent purge.

The ſecond inſtance was in a man of a ſtout robuſt habit, and of twenty-five years of age. He was violently attacked with a pleuriſy; he was bled ſeven times, and was brought into one of the hoſpitals delirious, and ſeemingly very near death: he was there blooded in the foot, which reſtored his ſenſes; and he took a large quantity of the decoction of the Polygala, which cauſed him to expectorate in great abundance. The matter was firſt blackiſh, then reddiſh, and finally white, and the patient was perfectly cured. *Mem. Acad. Scienc. Par.* 1739.

Theſe are ſuch remarkable inſtances of the good effect of an herb to be had every-where in our own country, that they ſeemed very worthy to be recorded. The plant grows with us on dry grounds and heaths, and is about four inches long, not erect, but trailing upon the ground: the leaves are long and narrow, of a pale green, and the flowers are large and look beautiful: they ſtand in ſpikes, and are uſually blue; but very often white, and ſometimes red. The herb ſhould be pulled up root and all for drying.

POLYGLO'TTA *avis*, in zoology, the name of a bird deſcribed by Nieremberg, and which, he ſays, he ſaw and heard with admiration, ſinging in all tones. It is of the ſize of our ſtarling.

Its back is brown, and its breaſt and belly white; and near the neck and tail it is variegated with ſpots and ſtreaks of white. Its head has a ſtreak of white, which repreſents a ſort of crown of ſilver. It is mightily eſteemed, and kept in cages by the Spaniards, as infinitely ſuperior to all other birds in melody. It feeds on almoſt any thing that is given it, and is moſt fond of the warmer climates; but endures the more temperate ones without harm. *Ray's Ornithology.*

POLYGA'MIA *, in botany, a claſs of plants, which have a diverſity of combinations of male and female parts of their flowers, and many ways of fructification in the ſame ſpecies; ſome having male flowers, others female, each diſtinct and perfect in its kind; and others mixed, or hermaphrodite, with both male and female organs of fructification in each. See *Plate* XXXVI. *fig.* 6.

* The word is derived from the Greek πολὺς, many, and γάμος, marriage.

Among the plants of this claſs are the orach, pellitory of the wall, the aſh, &c.

POLYGON, *in fortification* (*Dict.*)—In order to ſhew the method of fortifying regular Polygons, it will be neceſſary to give a table ſhewing the meaſures of the principal lines and angles, in all regular works of this kind from four to twelve ſides incluſive.

A table of Polygons, ſhewing the meaſure of their lines, angles, &c.

Dodecagon	Undecagon	Decagon	Nonagon	Octagon	Heptagon	Hexagon	Pentagon	Square	Names of the Polygons.
360	360	360	360	360	360	360	360	360	The exterior ſide in yards.
695,46	638,78	582,50	526,28	470,36	414,82	360,00	306,24	254,56	Radius of exterior ſide in yards.
200,20	292,60	288,52	285,86	280,06	272,44	261,26	247,90	231,00	Interior ſide in yards.
572,14	519,36	466,90	417,86	365,96	313,96	261,26	210,90	163,34	Radius of interior ſide in yards.
123,32	119,42	115,60	108,42	104,40	100,96	98,68	95,34	91,22	Capital in yards.
86	82	78	72	68	64	60	54	45	Normal in yards.
138,68	142,90	147,34	149,40	150,54	151,80	152,80	154,22	156,06	Curtin in yards.
76,18	73,96	71,66	65,92	62,12	58,32	54,54	48,92	49,54	Flank in yards.
104	102	100	100	100	100	100	100	100	Face in yards.
276,34	276,30	276,46	274,32	272,86	271,62	270,28	268,42	265,96	Line of defence in yards.
78,76	74,84	70,58	68,21	64,76	60,32	54,26	46,84	37,48	Demigorge in yards.
30° 00′	32° 44′	36° 00′	40° 00′	45° 00′	51° 26′	60° 00′	72° 00′	90° 00′	Angle of the center.
150 00	147 16	144 00	140 00	135 00	128 34	120 00	108 00	90 00	Angle of the Polygon.
102 46	102 15	101 43	100 54	100 21	99 47	99 13	98 21	97 01	Angle of the curtin.
128 18	126 45	125 09	122 42	121 03	119 21	117 39	115 03	111 03	Angle of the ſhoulder.
98 56	98 16	97 08	96 24	93 36	89 26	83 08	74 36	61 56	Angle of baſtion, or flanked angle.
25 32	24 30	23 26	21 48	20 42	19 34	18 26	16 42	14 02	Diminiſhed angle.
128 56	131 00	133 08	136 24	138 36	140 52	143 08	146 36	151 56	Exterior flanked angle.
46 yds.	44 yds.	42 yds.	40 yds.	40 yds.	40 yds.	36 yds.	33 yds.	30 yds.	Breadth of the foſs, in yards.

By the help of this table, every thing relative to the maſter line of any of theſe fortreſſes are readily conſtructed.

1. To deſcribe any of the Polygons in the table.

Firſt. To conſtruct a Polygon in a circle. *Plate* XXXIII. *fig.* 10.

1. With the exterior radius of the given Polygon deſcribe a circle.

2. Apply the exterior ſide equal to 360 yards within the circumference of that circle, from A to B, B to C, C to D, &c. as many times as the propoſed Polygon has ſides.

3. Draw the lines AB, BC, CD, &c. and the Polygon will be conſtructed.

Secondly. To conſtruct a Polygon upon the exterior ſide. *Plate* XXXIII. *fig.* 11.

1. Draw the exterior ſide AB equal to 360 yards.

2. At the ends A, B, make angles equal to the angle of the Polygon, and in that poſition draw the lines A E, B C, each of the length of A B.

3. At the points E, C, make angles as before, and in thoſe poſitions draw the lines E D, C D, each of the ſame length as A B.

And thus proceed until the Polygon is conſtructed.

Note, The two laſt lines may be found by deſcribing interſecting arcs D, with the radius A B, from the centers E and C.

2. To fortify any regular Polygon in the table.

Or, To draw the maſter line of a regular fortreſs.

Firſt. From the exterior ſide. *Plate* VI. *fig.* 13.

1. Make the exterior ſide A B equal to 360 yards, and find its middle C.

2. Draw C D at right angles to A B, and make C D equal to the normal.

3. Through D draw the lines of defence A D H, B D G.

4. Make the faces A E, B F, each of their proper lengths.

5. Transfer the diſtance F E from F to G, and from E to H.

6. Draw the curtin G H, and the flanks E G, F H.

This work being done for every front or ſide, the maſter line of the fortreſs will be deſcribed.

This method is moſt fit, when the maſter line is to be laid down on a place where there were no works before.

Secondly. To fortify from the curtin.

1. Make the curtin G H of its proper length, for the given Polygon.

2. Make the angles of the curtin H G E, G H F, as per table.

3. In the lines G E, H F, take the flanks G E, H F, of their proper length.

4. Make the angles of the ſhoulders G E A, H F B, as per table.

5. Make the faces F B, E A, of their proper lengths.

This method is proper to be uſed when a piece of an old fortification is to ſerve for a curtin, to ſave expence.

Thirdly. To fortify from the interior ſide.

1. Make the interior ſide I K of the length given in the table for the propoſed Polygon.

2. From each end ſet off its proper demigorge K H and G I.

3. On K and I as centers, with the extent of the capital, as per table, deſcribe arcs at B and A.

4. On H and G as centers, with the length of the line of defence, as per table, cut the former arcs in A and B.

5. Draw the lines A H, B G; in which take the faces A E, B F, and draw the flanks E G, F H.

This method is uſeful when modern ramparts and baſtions are to be annexed to ſimple walls ſurrounding a place.

In either of the above methods, the work here deſcribed for one front is to be applied to every front of the Polygon; and it is recommended to the learner, that he applies the precepts given for one front to a complete Polygon; and, ſhould a frequent repetition of theſe operations to a whole Polygon become diſagreeable, they may be done only on two fronts, which may be thus drawn.

Draw a capital line A L; make the angles L A B, L A A, each equal to half the angle of the Polygon; and make the ſides A B, A A, each equal to 360 yards.

POLYGONA'TUM, *Solomon's ſeal*, in botany, a genus of plants, whoſe characters are:

The flower conſiſts of one leaf, is tubulous, and expands at the top in ſhape of a bell, and is divided into ſeveral ſegments: the ovary, which is ſituated in the center of the flower, becomes a ſoft globular fruit, containing roundiſh ſeeds.

Theſe plants are eaſily propagated by parting of their roots in the ſpring, before they begin to ſhoot, obſerving always to preſerve a bud to each off-ſet: they ſhould be planted in a freſh light earth, where they will thrive exceedingly; but, if it be over rich, it will deſtroy their roots.

POLY'GONUM, *common knot-graſs*, in botany, a genus of plants, whoſe characters are:

The root is creeping, and very fibrous; the ſtalks and branches are very full of joints; the calyx is deeply cut into five ſegments, which in their lower part, are herbaceous; but, above, of a floſculous colour; when ripe, the calyx becomes a capſule of ſeed. The flowers are produced at the wings of the leaves, and are concealed in their firſt riſe under a very thin membrane; the ſeed is exactly triangular.

Knot-graſs is cooling, drying, and binding, a good vulnerary, and helpful againſt all kinds of bleedings either external or internal, as againſt fluxes; and outwardly applied, is good for blood-ſhot inflamed eyes. *Miller's Bot. Off.*

This plant has an herby glutinous taſte, and a little acid; it gives a deep tincture of red to the blue paper; it is likely, that the ſalt of knot-graſs reſembles alum, but is mixed in this plant with a little ſal ammoniac and a great deal of ſulphur. For, by the chemical analyſis, it yields a great deal of acid, earth, and oil, a little volatile, concrete, and very lixivial fixed ſalt.

Knot-graſs is very vulnerary and aſtringent; the juice ptiſan, or infuſion of it in wine, is given to drink for the dyſentery, piles, ſpitting of blood, and all ſorts of hæmorrhages; the extract has the ſame virtues; the leaves, bruiſed, cure wounds. *Mart. Tournefort.*

PO'LYPE, or **POLYPUS**, in zoology, a ſmall freſh water inſect, which, when cut into a number of ſeparate pieces, becomes in a day or two ſo many diſtinct and ſeparate animals; each piece having the ſurpriſing property of producing a head and tail, and the other organs neceſſary for life, and all the animal functions. See *Plate* XXXIV. *fig.* 8, 9, 10, 11, 12.*

The firſt diſcovery of this animal was owing to Mr. Leuwenhoek, who, in the year 1703, preſented to the royal ſociety of London a deſcription of it, and an account of its uncommon way of producing its young: but the diſcovery of its amazing property of reproducing the ſeveral organs from its various pieces, was not made till the year 1739, by Mr. Trembley, at the Hague.

The production of its young is, indeed, different from the common courſe of nature in other animals; for the young one iſſues out from the ſide of its parent, in form of a ſmall pimple or protuberance, which lengthening and enlarging every hour, becomes, in about two days, a perfect animal, and drops from off its parent to ſhift for itſelf: but before it does this, it has often another growing from its ſide; and ſometimes a third from it, even before the firſt is ſeparated from its parent. They breed quicker in hot than in cold weather; and what is very extraordinary is, that there never has yet been diſcovered among them any diſtinction of ſex, or appearance of copulation; every individual of the whole ſpecies being prolific, and that as much if kept ſeparate, as if ſuffered to live among others.

If the method of this little animal's producing its young be very amazing, its production of the ſeveral parts, when cut off, is much more ſo. The diſcovery of this was perfectly accidental; for Mr. Trembley, who had often met with the creature in the water, and from its fixed reſidence in one place, and ſome other obſervations, not being able to determine whether it were an animal or a vegetable, made the trial by cutting it aſunder, when, to his amazement, he found, that in a few days each of theſe pieces was become a perfect animal, the head part having ſhot forth a tail, and the tail a head. A thouſand other trials, by cutting the animal in different manners, firſt by Mr. Trembley, and afterwards, at his requeſt, by Monſ. Reaumur at Paris, and Mr. Folkes, Mr. Baker, and the other naturaliſts in England, were the reſult of this; and all ſucceeded in the ſame manner, by whoever they were tried.

It is not eaſy to ſay what is the ſize of this creature; for it can contract or extend its body at pleaſure from the length of an inch or more, and the thickneſs of a hog's briſtle, to the ſhortneſs of a ſingle line, with a proportionable increaſe of thickneſs. Its body is round and tubular, at one end of which is the head, ſurrounded with ſix, eight, ten, or more arms, with which it catches its prey; and at the other, the anus and tail, by which it fixes itſelf to any thing it pleaſes.

There have been many different ſpecies of it diſcovered, the moſt elegant of which, the Polype a pannache, or plumed Polype, of Mr. Trembley, ſeems much to reſemble the wheel-animal, ſo called from having the appearance of two wheels in its head, which Mr. Leuwenhoek diſcovered living in a ſheath or caſe, and affixed to the roots of duckweed.

All the ſpecies are found in clear and ſlowly running waters, adhering by the tail to ſticks, ſtones, and water-plants, and live on ſmall inſects. They are eaſily kept alive a long time in glaſſes, often changing the water, keeping the glaſſes clean, and feeding them with a ſmall red worm, common in the mud of the Thames, or with other ſmall inſects.

The creature has its name from the Greek πολὺς, many, and πȣ̀ς, a foot, ſignifying an animal with many feet; but a more appoſite one might eaſily have been invented, ſince it has in reality no feet at all. What were originally taken for feet, are what have ſince been called its horns, and of late more properly its arms, their office being to catch its prey.

The ſeveral ſtrange properties recorded of this animal, though very ſurpriſing, are, however, none of them peculiar to it alone. The Surinam toad is well known to produce its young not in the ordinary way, but in cells upon its back. Mr. Sherwood has very lately diſcovered the ſmall eels in four paſte to be each, without exception, full of living young ones. And as to the moſt amazing of all its properties, the reproduction of its parts, we know the crab and lobſter, if a leg be broken off, always produce a new one: and Mr. Bonet, Mr. Lyonet, Monſ. de Reaumur, and Mr. Folkes, have all found on experiment, that ſeveral earth and water worms have the ſame property, ſome of them even when cut into thirty pieces. The *urtica marina*, or ſea-nettle, has been alſo found to have the ſame: and the ſea-ſtar-fiſh, of which the Polype is truly a ſpecies, though it had long eſcaped the ſearches of the naturaliſts, was always well known by the fiſhermen to have it alſo.

Cluſter **POLYPE**, the name of a ſpecies of ſmall inſect of the Polype kind, called by the French naturaliſts Polype a bouquet.

There is found on ſeveral of the water-plants, and on other ſubſtances, as ſticks, boards, and the like, accidentally fallen into the water, a whitiſh ſubſtance that at firſt ſight appears to be only a ſort of mouldineſs ; but if the bodies on which this is found, be put into a veſſel of clear water, and the matter examined with a magnifying glaſs, it is ſoon ſeen that this whitiſh ſubſtance is really a vaſt number of ſmall animals, which are almoſt continually in motion. When this is brought before the microſcope, the form and ſtructure of the creatures is very evidently diſtinguiſhed, and they are found to be minute roundiſh creatures, ſeverally affixed to the end of a ſort of ſtem or tail ; and many of the ſtems are ſo interwoven and united together, that they form cluſters, which have occaſioned the name of the cluſter-Polype to be given to the animal, though in itſelf it is really and properly ſingle from the beginning. There are ſeveral ſpecies of Polype of this minute kind, that cluſter themſelves in this manner together ; and according to theſe and other circumſtances, the cluſters are found larger or ſmaller, and more or leſs complex. *Phil. Tranſ.* N°. 474.

The ſmaller cluſters ſhould always be choſen for obſervation, as in the larger the bodies of the ſeveral animals that compoſe them are apt to hide and obſcure one another ; but the moſt beautiful and accurate of all obſervations is to be formed when they are ſingle, as they are ſometimes found ; and this is the only opportunity of ſeeing diſtinctly in what manner the cluſters are formed.

One of theſe ſingle animals is not in length above the 240th part of an inch, and is of a ſhape nearly reſembling that of a bell : the anterior part of this generally appears open when it preſents itſelf properly ; and the poſterior part is fixed to the ſtem or pedicle, by the other extremity of which the creature faſtens itſelf to any ſolid body that it meets with. The body is of a browniſh colour, except at the ſmaller end, which, as well as the tail, is whitiſh and tranſparent ; and, when the anterior part is open, there may always be perceived about its edges a very lively motion ; and, when the creature preſents itſelf in a better manner, there may be ſeen, on either ſide of the edges of the anterior part, ſomewhat reſembling the wheels of a mill, continually moving with great velocity.

Theſe creatures are able to contract their bodies, and often do it very ſuddenly, eſpecially if any thing diſturb the ſubſtance on which they are fixed : when they are thus contracted, the edges of their anterior parts are drawn juſt into their bodies ; and, when the fright is over, it is a very agreeable ſight to behold theſe edges turning out again, and putting themſelves in motion as before. If the edges of the anterior parts of the bodies of theſe animals be ſtrictly obſerved while in motion, the water about them will be found to be full of extremely minute round bodies, which are brought together by means of that motion, and ſerve the creature for its food : theſe may be often ſeen going down into the cavities of the body of the Polype, and that very ſuddenly, as if forcibly driven down ; and, when ſwallowed too voraciouſly, are often thrown up again. Theſe obſervations are beſt made when a ſmall cluſter of the Polypes are examined together.

If theſe Polypes are kept ſome time in the rain-water, they by degrees loſe their brown colour, and become white and tranſparent throughout, except that a few ſpots of a duſky colour remain in their bodies ; but if after this they are removed into other water of the ſame kind with the firſt, but newly taken out of the ditch, they in a little time recover their brown colour. When they become white, they plainly appear to be in a ſickly condition, and ceaſe to multiply ; but, when they have freſh water and recover their colour, they immediately begin to multiply again.

Theſe creatures are not abſolutely and immoveably fixed to the bodies on which they are placed, but they can at pleaſure quit them and ſwim about : in this ſwimming ſtate they are always found ſingle, and not in cluſters ; and they do not then appear in the ſame form as when they are fixed and open at their anterior ends. When they have ſwam about as long as they pleaſe, they either return to their cluſters from which they ſeparated themſelves, or affix each ſingly to any thing they meet with : and this is a circumſtance that merits to be carefully watched, becauſe it is by means of this that we ſee in what manner the creature multiplies itſelf, and the cluſters are formed.

As ſoon as a ſingle animal of this kind is fixed to a ſtick, a ſtone, or any other ſubſtance, it begins to lengthen its ſtem or tail, which, though very ſhort while ſwimming, and when firſt fixed, very ſoon becomes of its priſtine length while in the cluſter ; and after this the creature begins immediately to multiply by the moſt amazing means in the world ; that is, by ſplitting itſelf to pieces lengthways. The firſt motion towards this operation is the drawing in the lips or edges ; this is ſoon done, and the body then loſes its bell-like ſhape, and becomes round ; the motion which was before perceived at the edges ceaſes, and there is only a ſlight tremulation to be ſeen within the body ; after this the anterior part of the body becomes flat and broad, and the whole body ſhortens in proportion ; and ſoon after this the whole body gradually ſplits itſelf regularly into two, from the center of the anterior part to the center of the hinder end, where it joins the tail or pedicle, and there ſoon appear two round and perfect bodies joined to that pedicle which before ſupported only one. The anterior parts of the two bodies ſoon begin to open, and gradually ſhew their edges, which perform the ſame motion the ſingle one did before. The motion is at firſt very ſlow, but it grows quicker by degrees as they open ; and, when they are perfectly expanded, it is as quick as it was in the original ſingle body : it is at this time that the two bodies may be eſteemed quite perfect. They are at firſt indeed leſs than the original Polype, from which they were formed, but they grow to the ſame ſize in a very little time : the whole operation of dividing itſelf takes up the creature about an hour ; but, to form a true idea of the manner in which it is performed, there muſt be many obſervations made, and the creatures muſt be examined in all views and lights while about it.

The lips of theſe Polypes, when cloſely examined, appear to be compoſed of four or five tranſparent bands, all which have an undulatory motion. And, when the newly divided Polype is but ſlow in its motions, it is eaſy to diſcover that what afterwards appear to be like the wheels of a mill, are, in reality, only four or five oblong bodies, reſembling a ſort of fingers which alternately bend down, and extend themſelves every inſtant. Theſe are faſtened to the band of the lips on each ſide of the mouth ; and, when they are put into ſwift motion in the time of the full growth and vigour of the animal, they are not to be diſtinguiſhed, as to form, nor can their motion be otherwiſe diſcovered than by its ſwiftneſs, which makes it reſemble the quick turning of a wheel.

When the ſeparation of the body of a ſingle Polype of this kind is complete, one ſees two regular and perfect bodies adhering ſide by ſide to the ſame pedicle, but ſoon after each of the new formed bodies begins to ſhew a pedicle of its own ; theſe grow in a day's time to a moderate length, and unite at their bottoms to the end of what was the original ſingle pedicle of the body while but one ; they grow to this in the manner of the branches growing to the trunk of a tree. Twenty-four hours after the ſeparation of the original body into two, theſe two begin to ſeparate themſelves in the ſame manner, each into two again ; and theſe after a like time again ſeparate : each of theſe ſeparated animals has its own tail formed in a like period of time with the firſt ; and the conſequence is, that the firſt ſeparation producing two, the ſecond gives four, the third eight, and ſo the ſixth ſixty-four, the ſeventh 128, and ſo on ; by which means a ſingle animal, in a very few days, forms out of itſelf an immenſe cluſter ; each animal of which is perfect in itſelf, and independent of all the reſt, and can, when it pleaſes, ſwim away and form a new cluſter. They will multiply as faſt in glaſs jars, as in their native free ſtate in the waters ; and cluſters of them, begun near one another, will often join in ſuch a manner as to form one complex cluſter of an inch diameter : from theſe ſeveral cluſters there detach themſelves ſingle Polypes from time to time, which go off, and faſtening themſelves to other bodies, become the authors of new progenies. *Phil. Tranſ.* N°. 474.

The original branch or ſtem of the firſt Polype remains always in the center of the cluſter ; but it is of no uſe, never afterwards having any body fixed to it.

There are, beſides this ſpecies here deſcribed, four other known kinds of Polype, which divide themſelves in the ſame manner by ſplitting into two lengthwiſe : thoſe which come neareſt to the firſt are ſlenderer, and their ſtems are more tranſparent. They are of a bluiſh colour, when many of them are ſeen together, and their ſtems or tails very aptly reſemble ſpun glaſs. When this ſpecies is perfectly formed, the motion of its lips is leſs diſtinct than in the other ; but it may be diſcovered in the ſame manner while they are newly ſeparated and are but growing toward perfection, when it gradually becomes leſs and leſs diſtinct.

Another ſpecies of theſe Polypes is ſmaller than the laſt, but more open at the mouth, and deeper hollowed ; and theſe are particularly diſtinguiſhed from all the others, by having a motion in their ſtems and branches, which all the others want. The ſtems draw themſelves up, and ſhorten all at once into the appearance of a ſpiral ſcrew, and in a moment can dart themſelves ſtraight out to their full length again. All theſe multiply very ſpeedily, but they have all enemies that deſtroy them in a very terrible manner, whole cluſters making but ſingle mouthfuls. The funnel Polypes are nearly allied to theſe creatures. *Phil. Tranſ.* N°. 474.

Funnel POLYPE, a name given by naturaliſts to a ſmall water inſect, in ſome reſpects approaching to the nature of the cluſter Polype.

The funnel Polype nearly reſembles a funnel, from which it has its name. It is long and hollow, and very wide at the anterior end. Theſe little animals are of three ſpecies, a green, a blue, and a white one : they are all too minute for the obſervation of the naked eye, and muſt be viewed with great caution, and in ſeveral different directions and attitudes, before their true form can be diſcovered ; and their anterior end, parcularly, when carefully obſerved, is of a much more compound ſtructure than might at firſt be imagined ; there may be always be obſerved, round the edges of this part, a ſenſible motion, reſembling that of an indented wheel, or rather that of a ſcrew turned nimbly about. Theſe, though they approach to the ſhape of the cluſter Polypes, and reſemble them in their having this motion about their mouths, yet never have any tendency to form cluſters, but are ever found looſe and ſingle. There are always a number of little round bodies, which ſeem to be animals of a very minute ſize ſwimming about in the water in which theſe Polypes live, and theſe are continually drawn into the mouths of the Polypes, and ſerve them for food.

The manner of theſe creatures propagating themſelves is very amazing; they do it by dividing their own body into two; but this is not done longitudinally, as in the cluſter Polypes, nor tranſverſly, but diagonally from the edge of the head to the oppoſite edge of the tail; ſo that, of the two thus formed out of one, the one has a head and no tail, the other a tail and no head; but theſe deficiencies are ſoon made up, and the head ſoon grows out of one, and the tail out of the other. Mr. Trembley, in his account of this inſect, calls that of the two which has the old head, the ſuperior Polype; that which has the old tail the inferior. The firſt particulars obſervable in a funnel Polype that is going to divide, are the lips of the inferior Polype, or thoſe tranſparent edges that are ſo very conſpicuous in the creature when perfectly formed. Theſe new lips firſt diſcover themſelves upon the Polype that is going to divide, from a little below the old lips to about two thirds of the length of the Polype, reckoning from the head: but theſe new lips are not diſpoſed in a ſtraight line, according to the length of the Polype, but run ſloping near half-way round about. Theſe lips are diſtinguiſhed by their motion; but it is to be obſerved, that this motion is at firſt very ſlow, and requires an attentive eye and good glaſſes to diſcover it. *Phil. Tranſ.* N°. 474.

POLYTRI'CHUM, in botany, the name of a genus of moſſes, the characters of which are theſe: the ſtalks are not much branched, and the capſules have calyptræ to cover them till mature. This calyptra is always hairy, and in many of the ſpecies is compoſed merely of long hairs, ranged lengthwiſe together, without any membrane; the others have membranaceous calyptræ, but covered with erect hairs. The leaves of thoſe kinds are rigid, and have a membranaceous appendage, by which they touch the ſtalks and ſurround them; thoſe of the others are ſofter, and have not this appendage. The baſis of the pedicle which ſupports the head, is alſo in theſe ſurrounded by a ſort of tube, round which there ſtand a number of membranaceous leaves; this is more viſible in the larger than in the ſmaller ſpecies. The capſules in ſome of theſe moſſes are ſquare, in others they are roundiſh; and the ſquare ones have uſually an apophyſis, by which they are joined to the pedicle, which the round ones never have, or at leaſt very ſeldom.

POMGRA'NATE (*Dict.*)—Theſe plants may be eaſily propagated by laying down their branches in the ſpring, which in one year's time will take good root; and may then be tranſplanted where they are deſigned to remain. The beſt ſeaſon for tranſplanting of theſe trees is in the ſpring, juſt before they begin to ſhoot: they ſhould have a ſtrong rich ſoil, in which they flower much better, and produce more fruit, than if planted on a dry poor earth: but, in order to obtain theſe in plenty, there ſhould be care taken in the pruning of the trees; for want of which, we often ſee theſe trees very full of ſmall ſhoots, but do not find many flowers produced upon them; therefore, I ſhall ſet down directions for pruning of theſe trees, ſo as to obtain a great quantity of flowers and fruit.

The flowers of this tree always proceed from the extremity of the branches which were produced the ſame year: this therefore directs, that all weak branches of the former year ſhould be cut out, and that the ſtronger ſhould be ſhortened in proportion to their ſtrength, in order to obtain new ſhoots, in every part of the tree: theſe branches may be laid in againſt the wall about four or five inches aſunder; for, as their leaves are ſmall, there is not a neceſſity of allowing them a greater diſtance. The beſt time for this work is about Michaelmas, or a little later, according to the mildneſs of the ſeaſon: but, if they are left until ſpring before they are pruned, they ſeldom put out their ſhoots ſo early; and, the earlier they come out, the ſooner will the flowers appear, which is of great conſequence where fruit is deſired. In ſummer, they will require no other dreſſing, but to cut off very vigorous ſhoots, which grow from the wall, and never produce flowers (for they are the middling ſhoots only which are fruitful;) and, when the fruit is formed, the branches on which they grow ſhould be faſtened to the wall to ſupport them, otherwiſe the weight of the fruit, when grown large, will be apt to break them down. See (*plate* XXXVI. *fig.* 7.) where *a* is the flower, *b* the fruit, and *c* the fruit open.

Though, as I ſaid before, the fruit of this tree ſeldom arrives to any perfection in this country, ſo as to render it valuable; yet, for the beauty of its ſcarlet-coloured flowers, together with the variety of its fruit, there ſhould be one tree planted in every good garden, ſince the culture is not great which they require: the chief care is, to plant them upon a rich ſtrong ſoil, and in a warm ſituation. Upon ſome trees which had theſe advantages, I have obtained a great quantity of fruit which have arrived to their full magnitude; but I cannot ſay they were well flavoured; however, they made a very handſome appearance upon the trees. *Miller's Gard. Dict.*

PO'MUM, *the apple.* See APPLE.

POPE (*Dict.*)—The ſpiritual monarchy of Rome ſprung up ſoon after the declenſion of the Roman empire; and one great, though remote, inſtrument in promoting the increaſe of this monarchy, ſo pernicious to the ſupreme civil power, was the barbarity and ignorance, which from that time ſpread itſelf over the weſtern parts.

Rome was choſen for the place of reſidence of the eccleſiaſtical monarchy, becauſe this city had the particular prerogative of being the capital city of the Roman empire, where the Chriſtian religion had its firſt riſe and increaſe. For what is related concerning St. Peter's chair, is nothing but a vain pretence. So that here are no footſteps of divine inſtitution to be found, the Papal power being purely human, and an uſurpation upon the rights of other ſees.

The biſhops of Rome did not extend their power over the weſtern parts all at once; but it was introduced from time to time, by degrees, by various artifices, and under various pretences. What chiefly contributed to its growth, was, firſt, the emperors chuſing other places of reſidence beſides Rome; for by their conſtant preſence there they might eaſily have kept under the ambitious deſigns of the biſhops. In the next place, the weſtern empire was divided into ſeveral new kingdoms, erected by the ſeveral barbarous and pagan nations; and theſe, having been converted to the Chriſtian faith by the direction of the Romiſh church, thought themſelves obliged to pay her the profoundeſt reſpect.

The ſpiritual monarchy of Rome could not have been eſtabliſhed, had its biſhops continued dependent on any temporal prince; and therefore the Popes took their opportunity to exempt themſelves from the juriſdiction of the Greek emperors, whoſe authority was greatly decayed in Italy.

The Pope, having freed himſelf from the authority of the emperors of Conſtantinople, and being in danger from the Lombards, who endeavoured to make themſelves maſters of Italy, had recourſe for protection to the kings of France. Pepin, and afterwards Charles the Great, having entirely ſubdued the Lombards, theſe princes gave to the papal chair all that tract of land, which had been formerly ſubject to the Greek emperors. When the Romans mutinied againſt Leo III, he was forced to ſeek for aſſiſtance from Charles the Great, who reſtored the Pope. On the other hand, the Pope and people of Rome proclaimed Charles emperor; whereby he was put in poſſeſſion of the ſovereignty of that part of Italy, which formerly belonged to the governors of Ravenna, and the other remnants of the weſtern empire; ſo that the Popes afterwards enjoyed theſe countries under the ſovereign juriſdiction of the emperor, who therefore uſed to be called the patron and defender of the church, till the reign of the emperor Henry IV.

The Popes at length began to grow weary of the imperial protection, becauſe the emperors conſent was required in the election of a Pope, and, if they were mutinous, the emperors uſed to check them, and ſometimes turn them out of the chair. The Popes, therefore, for a long time employed various artifices, to exempt themſelves from the power of the emperors; which being at length effected, the Pope, not ſatisfied with this degree of grandeur, quickly ſet on foot a pretenſion of far greater conſequence. For now he pretended to an authority over princes themſelves, to command a truce among ſuch as were at war together, to take cognizance of their differences, to put their kingdoms under an interdict, and, if they refuſed ſubmiſſion to the ſee of Rome, to abſolve their ſubjects from their allegiance, and to deprive them of their crowns. This has been attempted againſt many crowned heads, and put in execution againſt ſome of them. And for this abominable pretenſion they plead their fictitious decretals, which grant to the Popes an unlimited power over all Chriſtians whatever. Pope Boniface VIII. gave the world clearly to underſtand his meaning, at the jubilee kept in the year 1300, when he appeared ſometimes in the habit of an emperor, and ſometimes in that of a Pope, and had two ſwords carried before him, as the enſigns of the eccleſiaſtical and civil power.

But the Popes could not long enjoy this intolerable uſurpation in quiet: for it was often called in queſtion, till they were obliged to deſiſt in part from their pretenſions.

But, when the eccleſiaſtical monarchy ſeemed to be come to the pinnacle of its grandeur, when all the weſtern parts were either in communion with, or in obedience to the church of Rome; there happened a revolt from the papal chair, which, though firſt ſtarted from a trifling occaſion, came to ſuch a head, that a great part of Europe withdrew itſelf from the obedience to the Pope, who was thereby put in danger of loſing all. We mean the defection of Luther, which gave riſe to the proteſtants.

The popiſh ſovereignty, however, has pretty much recovered itſelf ſince this grand defection. As to thoſe things, which Luther upbraided the church of Rome with, they are either quite aboliſhed, or at leaſt are tranſacted in a more decent manner: 'Si non caſte, tamen caute.' Nor do the Popes now-a-days inſult with ſo much haughtineſs over princes; neither has the papal chair, of late years, been filled with ſuch debauchees as Alexander VI, or ſuch martial popes as Julius II.

In point of power, the Pope is able to ſend 50,000 men into the field, in caſe of neceſſity, beſides his naval ſtrength in gallies. We read how Paul III. ſent Charles III. 12,000 foot and 500 horſe; Pius V. ſent a greater aid to Charles IX. and for riches,

PLATE XXXVI. *Engraved for the Supplement.* *Facing* Pomgranate

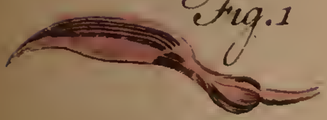


Fig. 1

Monopetalus

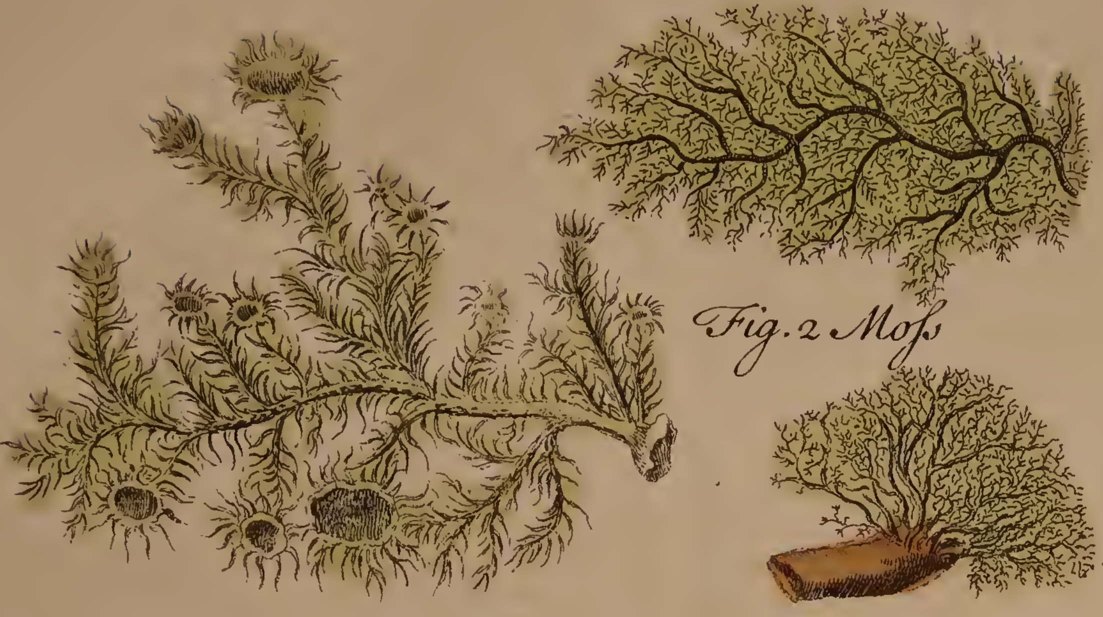


Fig. 2 Moſs

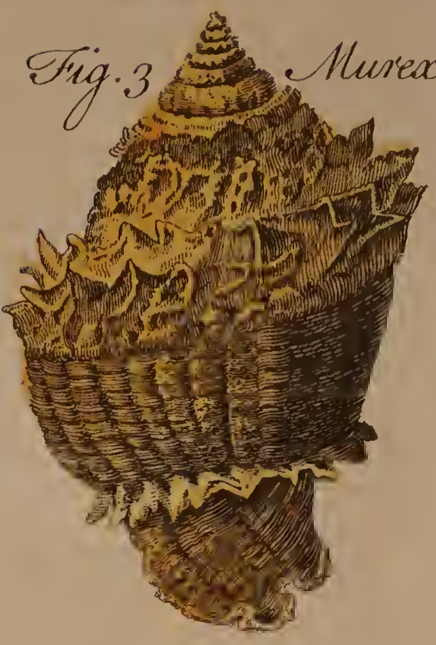


Fig. 3 Murex

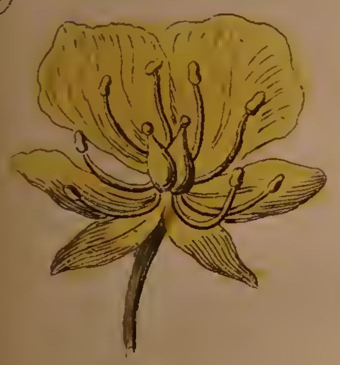


Fig. 4. Octandria

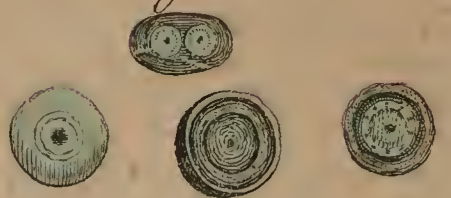


Fig. 5

Oculus Beli

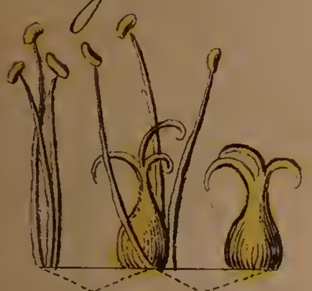
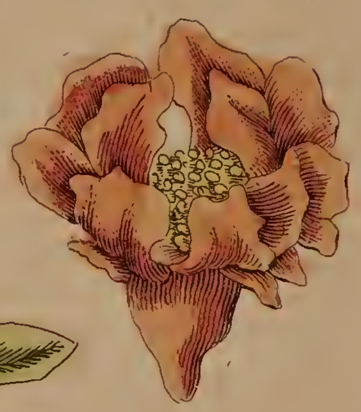
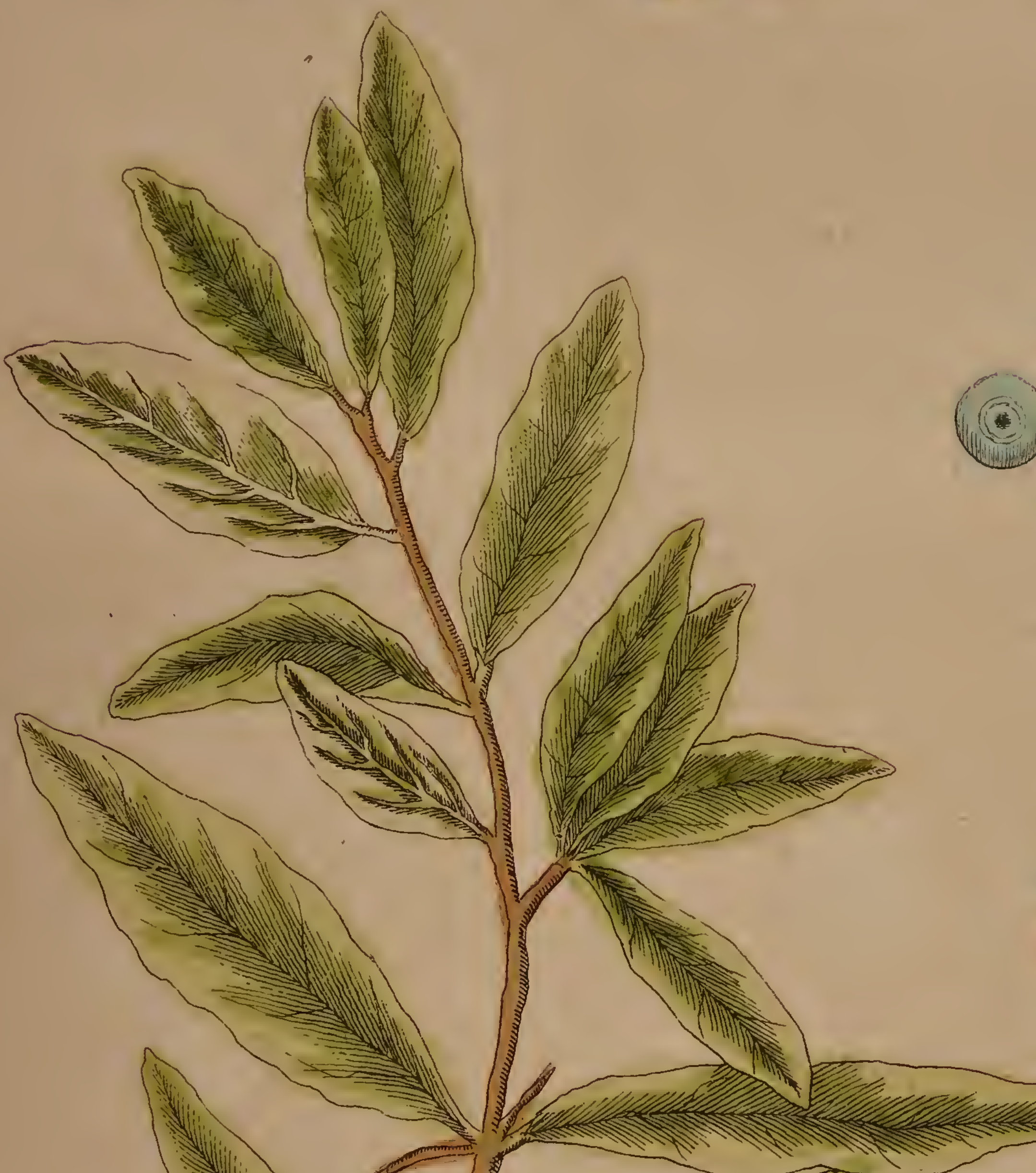


Fig. 6

Polygamia





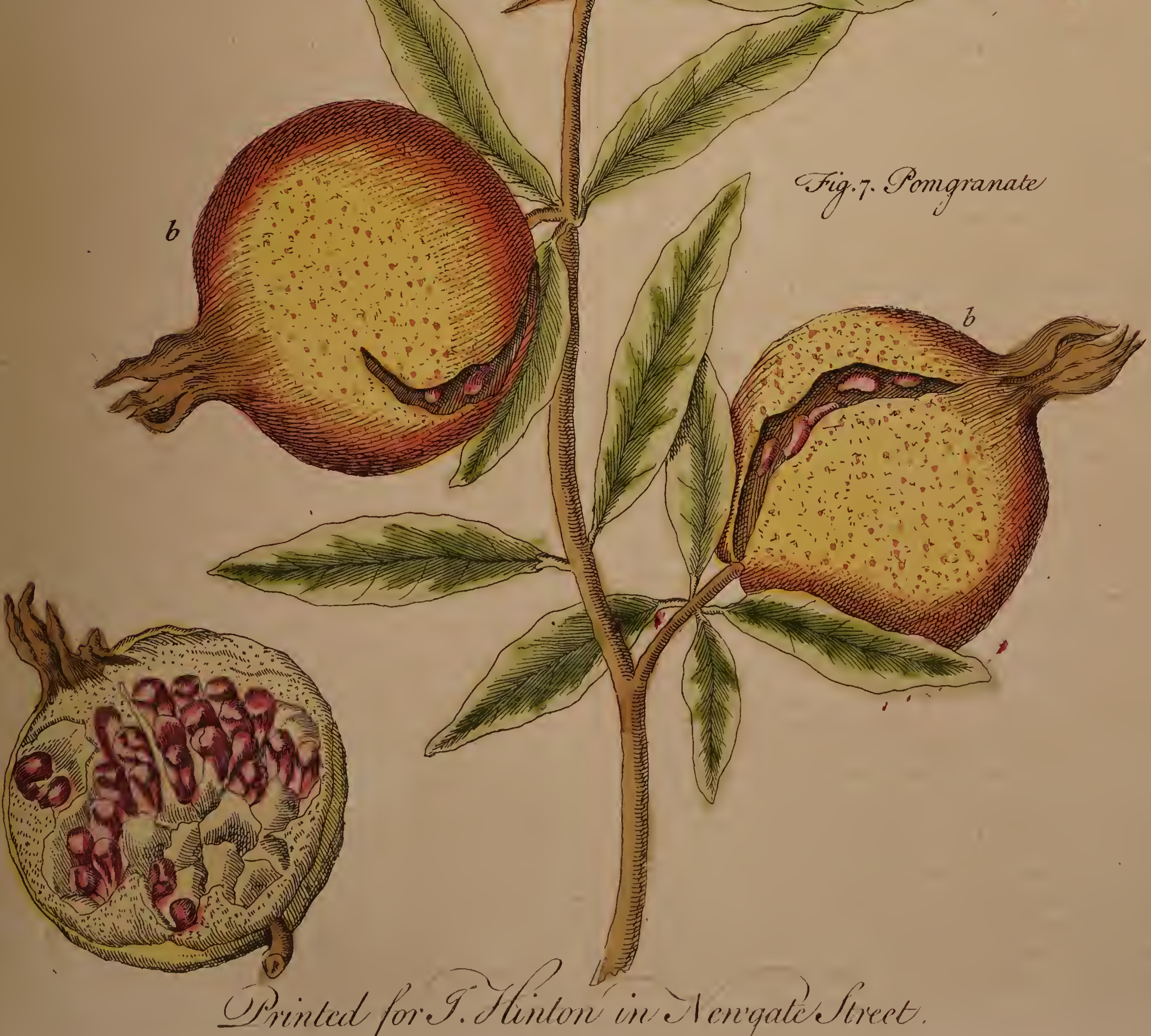


Fig. 7. Pomgranate

Printed for J. Hinton in Newgate Street.

beſides his temporal dominions, which are extended above 300 miles in length, and 200 in breadth, he has the datary or diſpatching of bulls. The triennial ſubſidies, annates, and other eccleſiaſtic rights, amount to an unknown ſum; and it is a common ſaying at Rome, that, whilſt the Pope can finger a penny, he can want no pence.

Policy exacts all her arts, and ſets every ſpring ſhe has in motion at the election of a Pope; nor do they always wait for the death of the preſent chief or head of the church, to begin thoſe cabals and intrigues which are proper for advancing him, whom they eſteem a fit perſon to fill the pontifical throne: And although the college unanimouſly invoke the aſſiſtance and aid of the Holy Ghoſt, to direct them in the choice of a vicar of Jeſus Chriſt, yet their eminencies uſe all the artful precautions imaginable, one would think, to prevent him from being any way concerned in the election. There are ſeveral ways of electing a Pope, viz. by ſcrutiny, acceſs, adoration, inſpiration, and compromiſe. The election by ſcrutiny is the only way that has been uſed for a long while, and contains all the formality that appears moſt eſſential for the making the election of a Pope canonical. And yet the ſcrutiny is no more than a mere ceremony, ſince the ſeveral factions of the cardinals muſt unite before-hand in the choice of the perſon. This harmony and agreement is brought about by the moſt refined and delicate ſtrokes of policy, and for the moſt part comes on after their eminencies have found out, by ſeveral ſcrutinies, the diſpoſition of the ſacred college. Then, if the votes for any of the candidates come near the number required, it is a very common practice for the other factions to fall off, and ſwim down the ſtream, and thereby contribute to the Pope's election, fearing to draw on them his hatred by a fruitleſs and unſeaſonable oppoſition. Theſe are the policies which the common people aſcribe to the Holy Ghoſt, at the election by ſcrutiny.

Each cardinal writes the name of him, whom he votes for, in a ſcroll of five pages. On the firſt is written (by one of his ſervants, that the cardinal may not be diſcovered by his hand) 'Ego eligo in ſummum pontificem reverendum dominum meum cardinalem.'— On this fold two others are doubled down, and ſealed with a private ſeal. On the fourth the cardinal writes his own name, and covers it with the fifth folding. Then ſitting in order on benches in the chapel, with their ſcrolls in their hands, they go up to the altar by turns, and, after a ſhort prayer on their knees, throw the ſcroll into a chalice upon the table, the firſt cardinal biſhop ſitting on the right hand, and the firſt cardinal deacon on the left. The cardinals being returned to their places, the cardinal biſhop turns out the ſcrolls into a plate, which he holds in his left hand, and gives them one by one to the cardinal deacon, who reads them with an audible voice, while the cardinals note down how many voices each perſon has; and then the maſter of the ceremonies burns the ſcrolls in a chafing-diſh, that it may not be known for whom any one gives his voice. If two thirds of the number preſent agree, the election is finiſhed, and he, on whom the two thirds fall, is declared Pope.

If the votes do not riſe to a ſufficient number, billets are taken in order to chuſe the pope by way of acceſſus: and indeed there ſcarcely ever is a ſcrutiny without this acceſſus; it being ſcarce known that the holy father ſhould be choſen by the former way alone. The acceſſus therefore is to correct the ſcrutiny. In this they give their votes by other billets, on which is written Accedo domino, &c. when they join their firſt vote to another's; or Accedo nemini, when they keep to their firſt vote. This practice is derived from the ancient method of debating in the Roman ſenate; when one ſenator was of another's opinion, he roſe up and went over to his collegue, which was called pedibus ire in ſententiam: when they kept their places, they ſaid Accedo ad ſententiam. The Pope is elected by compromiſe, when the cardinals, diſagreeing in their choice, engage by mutual compromiſe to refer it to ſome particular cardinals of probity, and to acknowledge him whom they ſhall nominate, as duly elected. The election by way of inſpiration is in ſome meaſure riotous and tumultuary. A ſelect number of cardinals of different factions, who have determined to put every thing to the laſt puſh, begin to cry out, Such a one is Pope, as it were, by inſpiration. They make their attempt this way, when they think they are ſtrong enough to carry it. Adoration is the ſame as inſpiration, which is, when two thirds of the conclave, being agreed in the perſon, go in a body, and adore and acknowledge the Pope they approve of, as head of the church. The elections by way of compromiſe, and inſpiration, but ſeldom happen. The ſcrutiny and acceſs are the methods generally obſerved.

When one of the cardinals is choſen Pope, the maſter of the ceremonies comes to his cell, to acquaint him with the news of his promotion. Whereupon he is conducted to the chapel, and clad in the pontifical habit, and there receives the adoration, or the reſpects paid by the cardinals to the Popes. Then, all the gates of the conclave being opened, the new Pope ſhews himſelf to the people, and bleſſes them, the firſt cardinal-deacon proclaiming aloud theſe words: 'Annuntio vobis gaudium magnum, papam habemus. Reverendiſſimus dominus cardinalis—electus eſt in ſummum pontificem, & elegit ſibi nomen.'—After this, he is carried to St. Peter's church, and placed upon the altar of the holy apoſtles, where the cardinals come a ſecond time to the adoration. Some days after is performed the ceremony of his coronation, before the door of St. Peter's church, where is erected a throne, upon which the new Pope aſcends, has his mitre taken off, and a crown put upon his head, in the preſence of all the people. Afterwards is a grand cavalcade from St. Peter's church to St. John's de Lateran, where the archbiſhop of that church preſents the new Pope with two keys, one of gold, the other of ſilver; one of which is a ſign of the power he has of giving abſolution, and opening the gates of heaven to all believers; and the other of excommunicating ſinners, and dooming them to purgatory. The firſt coronation, which is mentioned in the hiſtory of the Popes, was that of Damaſcus II. in 1048. In former times the Pope was crowned before the baſilica of St. Peter. The reader may ſee all the ceremonies of the Pope's coronation particularly deſcribed in the Relig. Cerem. Vol. I. of which the above account is an abſtract.

It is a general maxim, in the choice of a Pope, to elect an Italian; which is done, not only becauſe they chuſe rather to beſtow this dignity on a native of Italy, than on a foreigner, but alſo becauſe the ſecurity and preſervation of the papal chair depends in a great meaſure on the balance which is to be kept between France and Spain; but this is not to be expected from a French or Spaniſh Pope, who would quickly turn the ſcale, and, by granting too great privileges to his countrymen, endeavour to exclude others from the papal chair. It is alſo a ſort of maxim to chuſe a Pope who is pretty far advanced in years, that there may be the quicker ſucceſſion, and that it may not be in the power of a Pope, during a long reign, to alter their cuſtoms, or, by making his family too powerful, to entail, as it were, the papal chair upon his houſe. They alſo take care that he be not too near a kin to the deceaſed Pope, that the vacant church benefices may not be engroſſed by one family. It often happens, that one is choſen Pope, of whom no body thought before; and this comes to paſs, when the cardinals are tired out by ſo many intrigues, and are glad to get out of the conclave.

Ever ſince the time of Pope Sixtus IV, that is, ſince the year 1471, the Popes have made it their buſineſs to enrich their families out of the church revenues, of which there are very remarkable inſtances: for it is related, that Sixtus V, during a reign of five years, beſtowed upon his family above three millions of ducats. The houſe of the Barbarini's, at the death of Urban VIII, was poſſeſſed of 227 offices and church-benefices, whereby they amaſſed thirty millions of ſcbudi's.

Sergius III or IV, who was before called os porci, i. e. ſwine's face, is ſaid to have been the firſt Pope, who changed his name upon his exaltation to the pontificate. This example has been followed by all the Popes ſince his time, and they aſſume the names of Innocent, Benedict, Clement, &c.

When a Pope is elected, they put on him a caſſock of white wool, ſhoes of red cloth, on which is embroidered a gold croſs, a mantle of red velvet, the rochet, the white linnen albe, and a ſtole ſet with pearls. At home, his habit is a white ſilk caſſock, rochet, and ſcarlet mantle.

The Pope's tiara, or crown, is a kind of conic cap, with three coronets, riſing one above the other, and adorned with jewels. Paul II. was the firſt who added the ornament of precious ſtones to this crown. The jewels of Clement VIII's crown were ſaid to be valued at 500,000 pieces of gold.

The Pope has two ſeals; one is called the fiſherman's ring, and is the impreſſion of St. Peter holding a line with a bait to it in the water: it is uſed for theſe briefs that are ſealed with red wax. The other ſeal is uſed for the bulls, which are ſealed with lead, and bears the figures of St. Peter and St. Paul, with a croſs on one ſide, and a buſt, with the name of the reigning Pope, on the other. Upon the deceaſe of a Pope, theſe ſeals are defaced and broken by the cardinal Camerlengo, in the preſence of three cardinals.

The cuſtom of kiſſing the Pope's feet is very ancient; to juſtify which practice, it is alledged, that the Pope's ſlipper has the figure of the croſs upon the upper-leather; ſo that it is not the Pope's foot, but the croſs of Chriſt, which is thus ſaluted.

There are but few inſtances of the papal power, in England, before the Norman conqueſt: but the Pope, having been favoured and ſupported by William I, in his invaſion of this kingdom, made that a handle for enlarging his incroachments, and, in that king's reign, began to ſend legates hither. Afterwards, he prevailed with king Henry I. to part with the right of nominating to biſhoprics; and, in the reign of king Stephen, gained the prerogative of appeals. In the reign of Henry II, he exempted all clerks from the ſecular power. This king, at firſt, ſtrenuouſly oppoſed this innovation: but, after the death of Becket, who, for having violently oppoſed the king, was ſlain by ſome of his ſervants, the Pope got ſuch an advantage over the king, that he was never able to execute the laws he made. Not long after this, by a general excommunication of the king and people, for ſeveral years, king John was reduced to ſuch ſtreights, that he ſurrendered his kingdoms to the Pope, to receive them again, and hold them of him under a rent of a thouſand marks. In the following reign of Henry III, partly from the profits of our beſt church benefices, and partly from the taxes impoſed by the Pope, there went yearly out of the kingdom ſeventy thouſand pounds ſterling. But, in the reign of Edward I, it was declared by the parliament, that the Pope's taking upon him to diſpoſe of Engliſh benefices to foreigners was an incroachment not to be endured; and this was followed by the ſtatute of proviſors againſt popiſh bulls, and diſturbing any patron, in preſenting to a benefice.

But the Pope's power received a mortal blow, in England, by the reformation in religion, begun in the reign of Henry VIII; ſince which time, to maintain the Pope's authority here, by writing, preaching, &c. is made a premunire upon the firſt conviction, and high-treaſon upon the ſecond.

PO'PLAR, *populus*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the amentaceous kind, being compoſed of a number of ſmall leaves, furniſhed with a great quantity of apices; but theſe are barren. The embryo fruits are produced on thoſe trees which produce none of theſe flowers; theſe are ſpiked, and conſiſt of many leaves, under which there lies a ſort of bell, which contains the embryo ſeed veſſel, which finally becomes a membranaceous pod of a compreſſed figure. Theſe are diſpoſed in a ſpiked form, and open into two parts, containing ſeeds winged with down. To this it is to be added, that the Poplar has a peculiar and appropriated general appearance, by which it is obviouſly diſtinguiſhed from the willow.

The ſpecies of Poplar, enumerated by M. Tournefort, are theſe: Firſt, the common white Poplar, with large leaves. Secondly, the common white Poplar, with ſmaller leaves. Thirdly, the common black Poplar. And, fourthly, the Poplar with trembling leaves, called the aſpen-tree. *Tourn. Inſt.*

The Poplar, whether black or white, may be eaſily propagated, either by layers, cuttings, or ſuckers, of which the white kind always produces a great many from the root. The beſt ſeaſon for the tranſplanting theſe ſuckers is in October, when the leaves begin to decay; and they ſhould be removed into a nurſery for two or three years, at the end of which time they will have got ſtrength enough to be tranſplanted into the places where they are to remain.

When they are to be propagated by cuttings, it is beſt to do that in February, cutting off large truncheons of eight or ten feet long; which, being thruſt down a foot deep in the ground, will take root very quickly, and, if the ſoil be moiſt, will grow to a conſiderable ſize in a few years.

The black Poplar is not ſo eaſily raiſed from theſe large truncheons, but ſhould be planted in cuttings, of about a foot and a half long, planting them a foot deep in the ground. This will grow on almoſt any ſoil, but does much better on a moiſt one than on any other. They are the fitteſt of all trees for raiſing a ſhade quickly, as they will grow fourteen feet in height ſometimes in one ſeaſon, and in four or five years will be large trees.

A conſiderable advantage may be obtained by planting theſe trees upon moiſt boggy ſoils, where few other trees will thrive: many ſuch places there are in England, which do not, at preſent, bring in much money to their owners; whereas, if they were planted with theſe trees, they would, in a very few years, over-purchaſe the ground, clear of all expence: but there are many perſons in England, who think nothing, except corn, worth cultivating: or, if they plant timber, it muſt be oak, aſh, or elm; and, if their land be not proper for either of theſe, it is deemed little worth; whereas, if the nature of the ſoil was examined, and proper ſorts of plants adapted to it, there might be very great advantage made of ſeveral large tracts of lands, which at this time lie neglected.

The wood of theſe trees, eſpecially of the white, is very good to lay for floors, where it will laſt many years; and, for its exceeding whiteneſs, is, by many perſons, preferred to oak; but, being of a ſoft contexture, is very ſubject to take the impreſſion of nails, &c. which renders it leſs proper for this purpoſe: it is alſo very proper for wainſcotting of rooms, being leſs ſubject to ſwell or ſhrink, than moſt other ſorts of wood: but, for turnery ware, there is no wood equal to this for its exceeding whiteneſs, ſo that trays, bowls, and many other utenſils, are made of it; and the bellows-makers prefer it for their uſe; as do alſo the ſhoe-makers, not only for heels, but alſo for the ſoles of ſhoes: it is alſo very good to make light carts; the poles are very proper to ſupport vines, hops, &c. and the lopping will afford good fuel, which, in many countries, is much wanted.—For the method of making the ointment from the buds of the Poplar, ſee POPULEUM in the Dictionary.

Poplar-*Galls*. The black Poplar is famous among naturaliſts for producing a ſort of galls, or protuberances, of various ſhapes and ſizes, on its leaves and branches, which have been uſually miſtaken for the lodgment of worms hatched from the eggs of an ichneumon fly; but they are in reality produced by the operation of a viviparous inſect, called the puceron, for the bringing up of its off-ſpring. See PUCERON.

PO'PPY (*Dict.*)—We have many ſpecies of this plant cultivated in gardens for the beauty of the flowers. They are all eaſily propagated by ſowing the ſeeds in autumn. When the young plants come up, they are to be cleared from weeds, and thinned to a proper diſtance by pulling ſome up, where they ſtand too thick; for they never thrive well, if they are to be tranſplanted. They are to be left, according to their ſizes, at ſix, eight, or ten inches diſtance.

They are very ſhowy flowers, and make a ſplendid appearance in gardens; but they are but of a ſhort duration, and are of an offenſive ſmell, which makes them leſs valued at preſent than they have been.

Some ſow theſe plants in ſpring, but it is not ſo well; becauſe they then have not time to get ſtrength before autumn, when they are to flower; and, for that reaſon, thoſe ſown in ſpring uſually flower weakly. *Miller's Gard. Dict.*

Red Poppy.— The common wild red Poppy is one of the moſt miſchievous weeds the farmers are plagued with among their corn, and it is the moſt difficult to thoroughly deſtroy of almoſt any other. Its ſeed will lie a long time in land unploughed, without ever ſhooting; but they will be ſure to grow with every crop of corn. Mr. Tull gives an inſtance of the ſeeds of this plant being buried four and twenty years in a field of ſaint-foin, and at the end of that time, the land being ploughed for wheat, they all grew up among the corn, though, they had lain dormant ſo long before. *Tull's Horſe-hoeing Huſbandry.*

Yellow Poppy.— The yellow horned Poppy, called by authors papaver corniculatum luteum, is one of thoſe vegetable poiſons of our own growth, which may be very miſchievous by their not being generally known, or ſuſpected to be ſo. We have an account of the effects of this plant in the Philoſophical Tranſactions, in an inſtance of a family in Cornwall, who eat of a pye made of the roots of this inſtead of eryngo, or ſea holly, which it is the cuſtom of the poorer people there to make into a coarſe ſort of pye for their food.

The man of the houſe, on eating of this pye while hot, was ſeized immediately with a violent delirium, one effect of which was his thinking every thing he ſaw was of a yellow colour, and taking every utenſil of the houſe to be made of gold. The man and maid-ſervant eat after their maſter, and were ſoon after as mad as he, coming into the room where his friends were attending him, ſtripped naked and danced together. Theſe people alſo took every thing they ſaw to be gold; and a child in the cradle, to whom a ſmall piece of the pye had been given, was thrown into a drowſy diſorder, and convulſed about the mouth; but, after a few days, it recovered.

The grown people were all ſeized with moſt violent purgings, and by that means eſcaped, after being miſerably worn down by this complaint.

The ſymptom of ſuppoſing every thing gold, which ran thro' the whole family, and went even ſo far as to the ſuppoſing their ſtools gold, and ordering them to be ſaved, may poſſibly be in ſome meaſure owing to the idea they had of the plant whoſe roots they had been poiſoned by; its flowers being as large as a roſe, and of a fine yellow, and the juice of the whole plant being alſo yellow. *Philoſ. Tranſ.* N°. 242.

POPULA'GO, *marſh marigold*, in botany, a genus of plants, whoſe characters are:

The flower conſiſts of ſeveral leaves, which are placed circularly, and expand in form of a roſe; in the middle of which riſes the pointal, which afterwards becomes a membranaceous fruit; in which there are ſeveral cells, which are, for the moſt part, bent downwards, collected into little heads, and are full of oblong ſeeds.

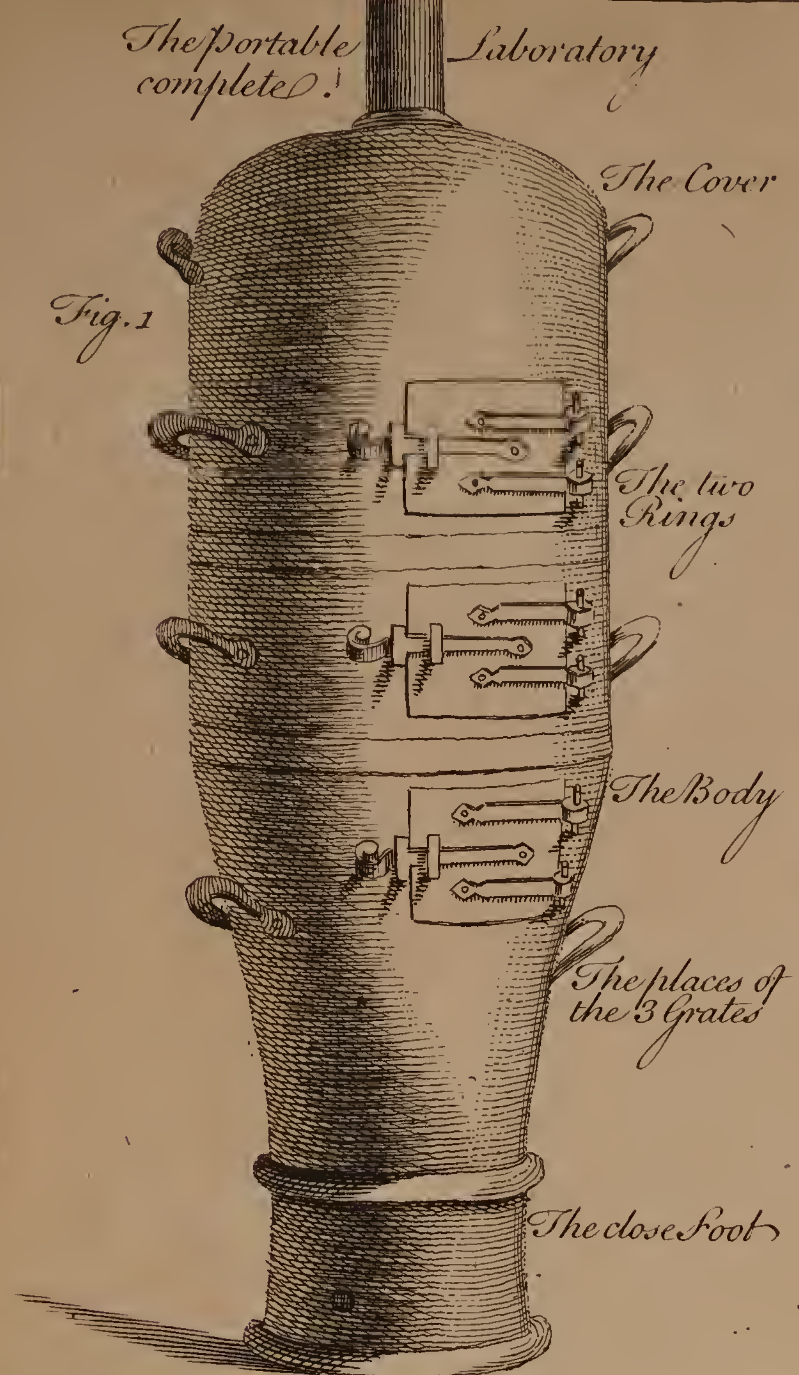
This plant is ſaid to be of a refrigerating quality, like the nymphæa; but it is really of a very cauſtic nature, ſo that cattle avoid it, though in the greateſt want of graſs; but, if they happen to eat it, they are firſt ſeized with an inflammation of the fauces, œſophagus, and ſtomach, and at laſt die. Hence, it appears to be a very acrimonious herb, and of the nature of hellebore. *Hiſt. Plant. adſcript. Boerhaave.*

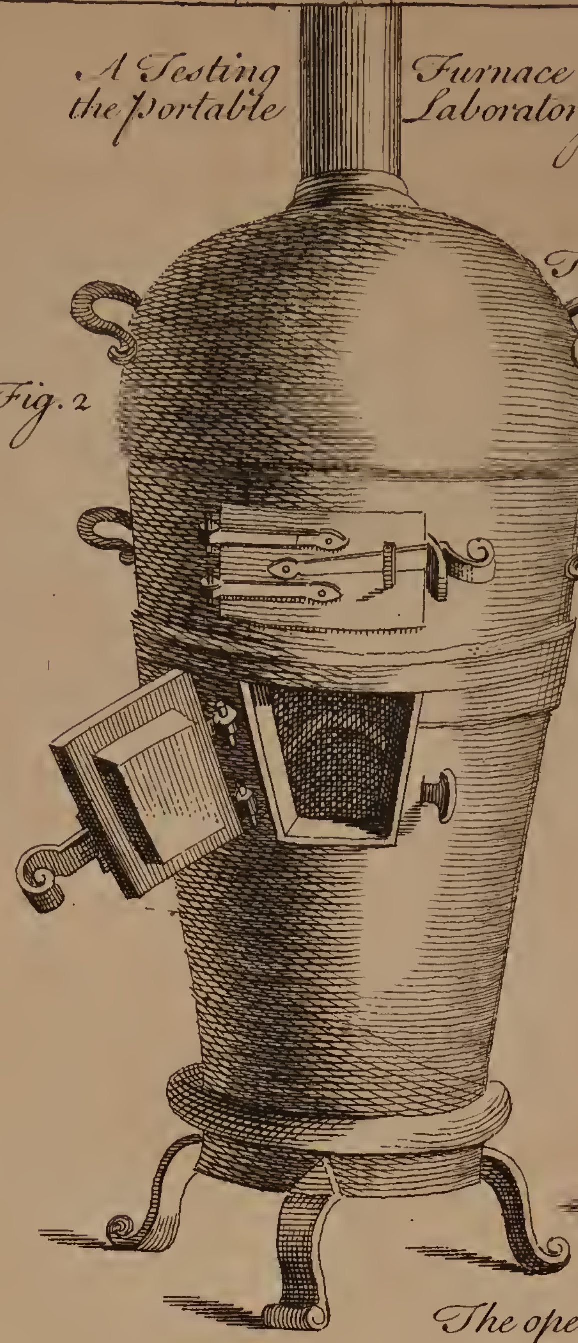
PO'RCELAIN (*Dict.*)—The moſt juſt and regular idea we can form of the Porcelain or China ware is, that it is an half vitrified ſubſtance or manufacture, in the middle ſtate between the common baked earthen-ware of our vulgar manufactures and true glaſs. This is the eſſential and diſtinctive character of Porcelain, and it is only by conſidering it in this light, that we are to hope to arrive at the perfect art of imitating it in Europe.

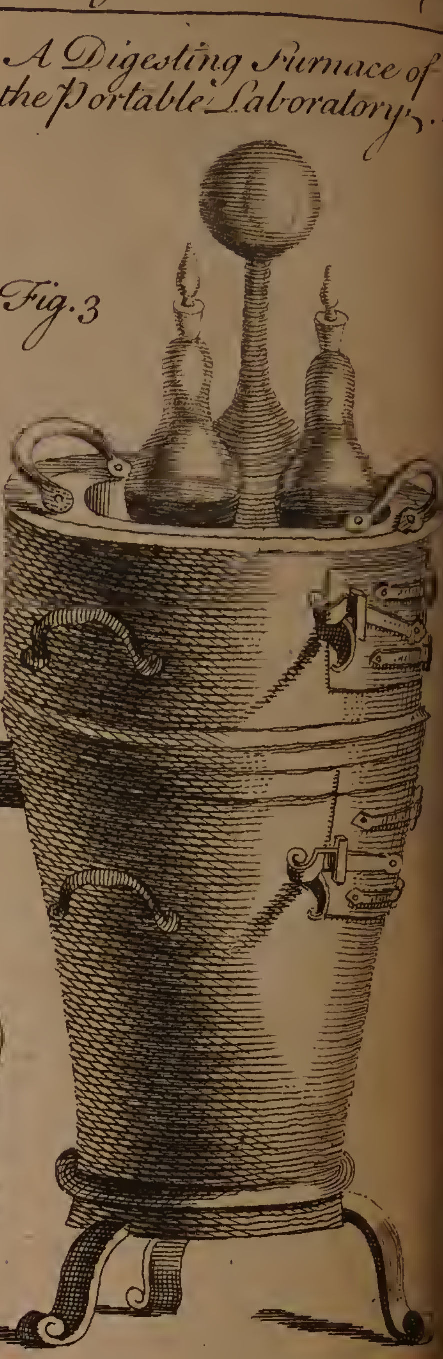
This attempt is to be made on theſe principles in two different manners: the one by finding ſome appropriated matter on which fire acts with more than ordinary ſtrength in the time of its paſſing from the common baked ſtate of earthen-ware into that of glaſs. The other is, to compoſe a paſte of two ſubſtances reduced to powder; the one of which ſhall be of force to reſiſt a violent fire, ſo as not to become vitrified in it; and the other a matter very eaſily vitrifiable. In the firſt caſe, the matter is to be taken out of the fire at the time when it is imperfectly vitrified; and, in the other, the compound maſs is to remain in the furnace till the one ſubſtance, which is the more eaſily vitrifiable, is truly vitrified; and being then taken out, the whole will be what Porcelain is, a ſubſtance in part vitrified, but not wholly ſo.

The firſt method is that by which the European Porcelain has generally been made, and, though that of St. Cloud, and ſome other places, has been very beautiful, yet it is always eaſy to diſtinguiſh even the fineſt of it from the China ware, and the nature of the two ſubſtances appears evidently different: theſe

owing




A Testing Furnace of the Portable Laboratory
The Cover
Fig. 2
One of the Rings


A Digesting Furnace of the Portable Laboratory
Fig. 3

The close Foot

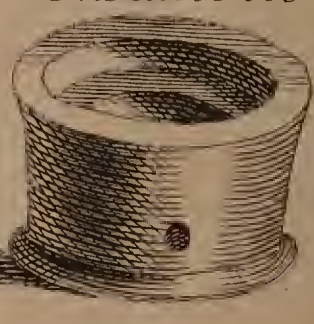


Fig. 6

The open Foot

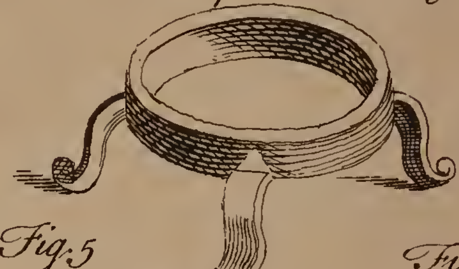


Fig. 5

One of the Rings

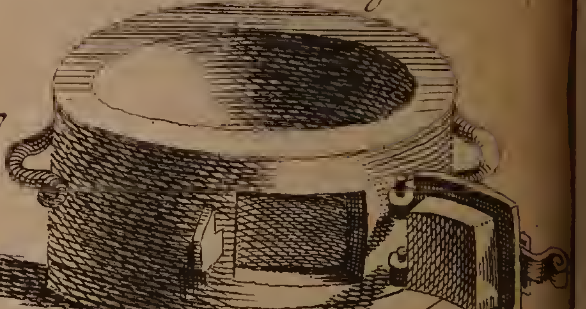


Fig. 7

A Distilling Furnace of the Portable Laboratory

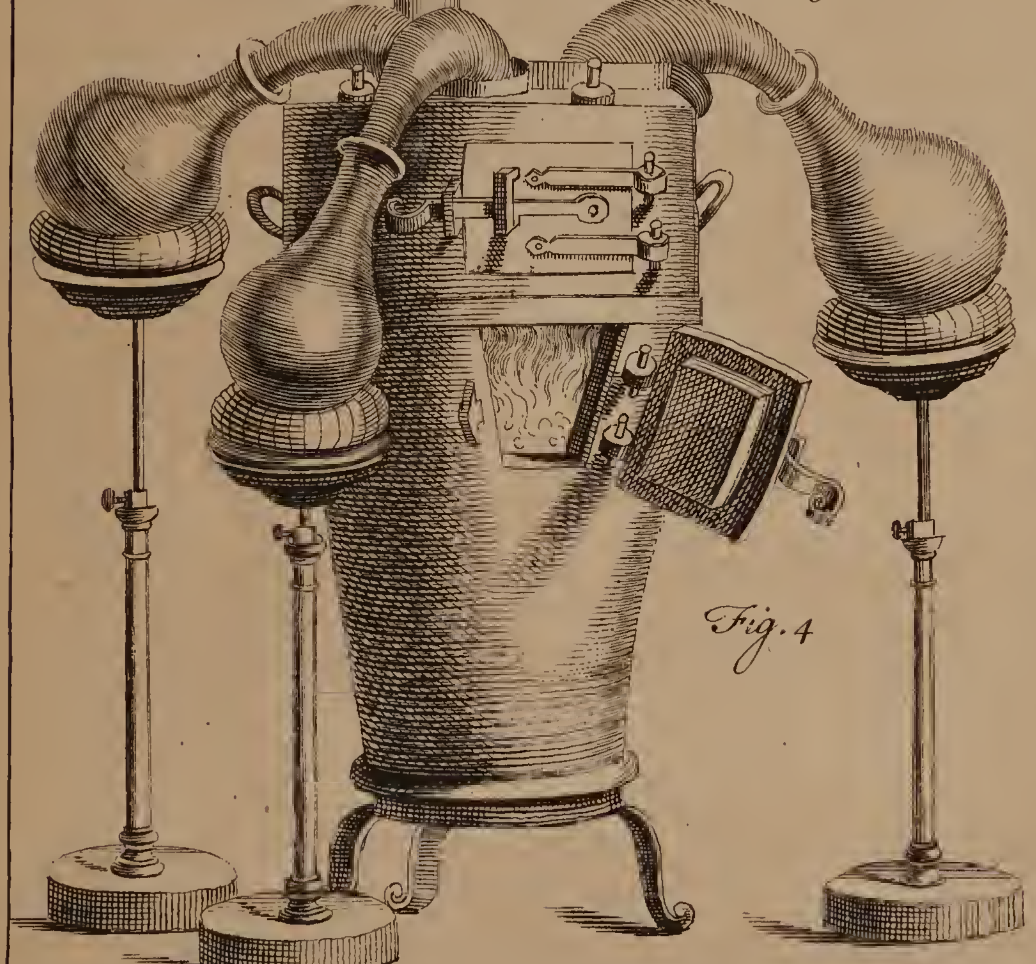


Fig. 4

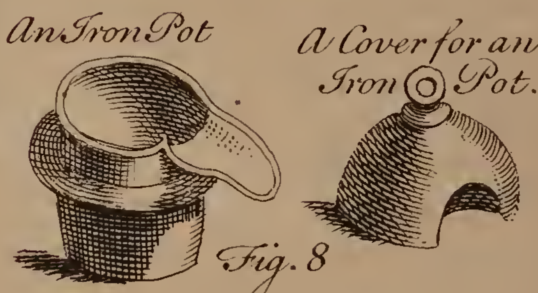
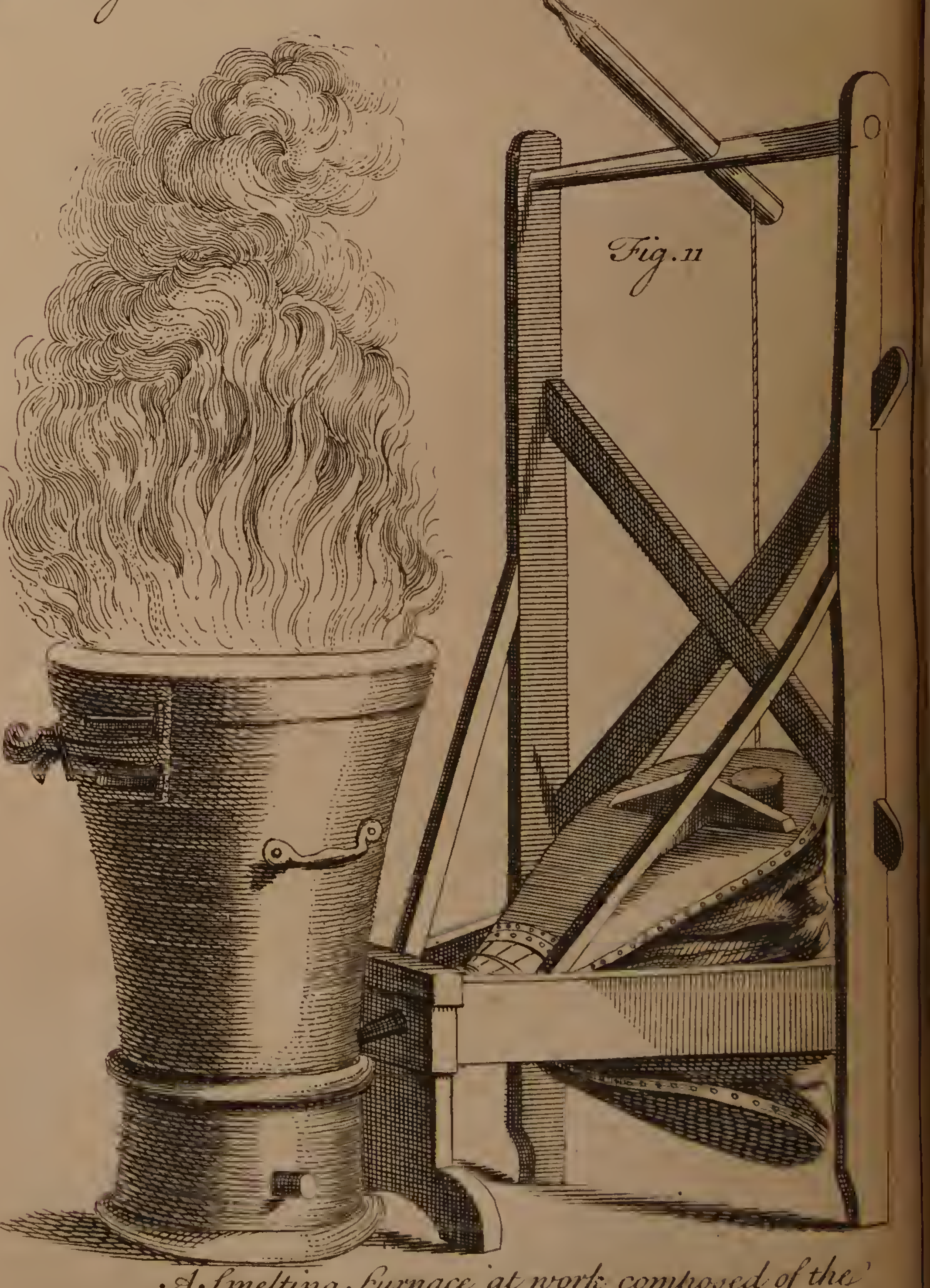

An Iron Pot
A Cover for an Iron Pot.

Fig. 8



A Smelting Furnace at work composed of the Body and Close Foot without a Grate.

The Body of the Portable Laboratory

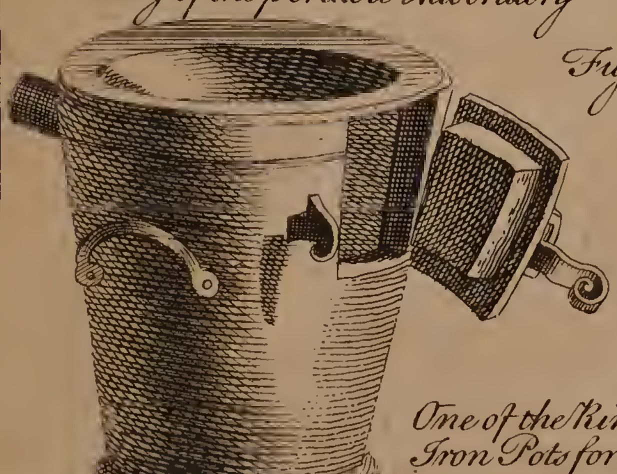


Fig. 9

The Cover of the Portable Laboratory

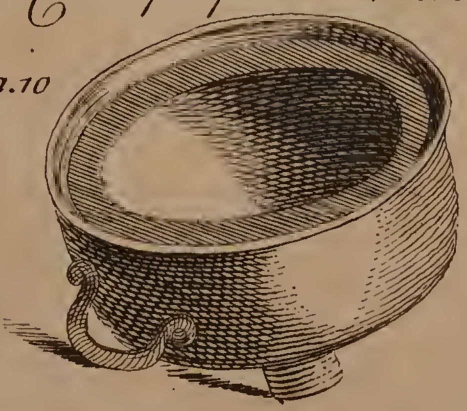


Fig. 10

One of the Rings furnish'd with three Iron Pots for distilling in Capella Vacua.

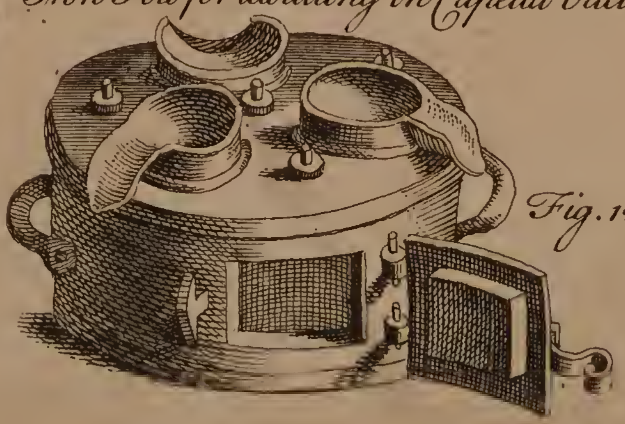


Fig. 12

owing all their beauty to their near approach to vitrification, are made to endure a long and violent fire, and are taken from it at a time when a very little longer continuance would have made them perfect glaſs; on the contrary, the China ware being made of paſte, part of which is made of a ſubſtance in itſelf ſcarce poſſible to be vitrified, bears the fire in a yet much more intenſe degree than ours, and is in no danger of running wholly into glaſs from it.

The two ſubſtances uſed by the Chineſe are well known by the names of petuntſe and kaolin, and on examining theſe it appears very evident, that we have in Europe the very ſubſtances, or at leaſt ſubſtances of the very ſame nature, and capable of being wrought into a Porcelain equally beautiful and fine. *Mem. Acad. Scienc. Par.* 1739. See the articles KAOLIN and PETUNTSE.

Theſe are the two different ſemi-vitrifications, on one or other of which all the European manufactures, by which of the two proceſſes it is eaſy from the knowledge of theſe principles to determine, on breaking a piece of china of our manufactures, by which of the two proceſſes it is made. If it is made by ſeizing the half vitrified maſs of a ſubſtance which would ſoon after have been wholly vitrified, then the putting it in a crucible, into an equal degree of fire, will ſoon turn it wholly into glaſs. This is the caſe of moſt of our European Porcelain; but, if it be made of two ingredients, the one of which is not vitrifiable, or at leaſt not by ſuch fires, then the matter will melt, but will not vitrify: this is the caſe with the Chineſe Porcelain, which, if kept in fuſion a long time, yet when cold is China-ware ſtill; ſo that this is evidently made of two ſuch different ingredients.

Beſides theſe methods, there is yet another, of late invention, which makes a very beautiful china; and which, if it does not afford veſſels equal to thoſe of china, yet will afford them nearly approaching to theſe, and at a conſiderably ſmaller price. This method conſiſts in reducing glaſs to china. See the article GLASS *Porcelain.*

The fine deep blue of the old Porcelain ware of China is much valued by the curious; and it is much lamented, that the ſame colour is not uſed at this time. The art ſeems at preſent to be loſt; but perhaps it might be recovered by trials. It is certain, that the Chineſe have cobalt among them, and very probably they uſed a blue colour prepared from this before they had any commerce with us: notwithſtanding all the conjectures about their materials for colouring, this ſeems the moſt probable ſubſtance; and there is a way of preparing a colour from this, much ſuperior to that now in uſe, which we call ſmalt.

Cobalt is a mineral containing arſenic and a blue vitrifiable earth. The common way of preparing ſmalt is, by roaſting the cobalt in a reverberatory fire. This diſpoſes it to vitrify, and drives off the arſenic it contains in fumes, which collecting at the top, form true flowers of arſenic. It is very certain, however, from experiments, that, if this arſenic could be preſerved in the cobalt, the ſmalt would be of a much finer colour; for there are ſome kinds of cobalt which yield ſmalt without previous roaſting; and as the arſenic is in a great meaſure contained in theſe, the ſmalt are much finer coloured. Arſenic added to ſmalt, while in fuſion, greatly exalts its colour alſo; and there is a way of procuring ſmalt from cobalt, without fire, only by diſſolving it in an acid, and precipitating that ſolution with oil of tartar. The ſmalt, thus precipitated to the bottom, is of a much finer colour than any prepared by fire; but it is much more expenſive, and prepared in leſs quantity. It is very poſſible, that the Chineſe might have the art of making this kind of ſmalt before they knew us, and that to this was owing the fine blue of their Porcelain ware: but, when we traded with them, and they purchaſed ſmalt ſo much cheaper of us than they could make it themſelves, they naturally diſcontinued the manufacture of their own finer kind, without conſidering how greatly inferior the colour was which the other yielded. If this be the caſe, it will be eaſy to revive this art, and the adding the true old china blue to an European manufactures, in imitation of Porcelain, may give them a value which they have not at preſent.

The Chineſe had once a method of painting the figures of fiſhes and other things on the inſides of their veſſels, in ſuch a manner that they did not appear till the veſſels were filled with water, or ſome other clear liquor. This ſort of China-ware was called kiatiſm, that is the concealed blue china. The art is now in a great meaſure loſt; but there may be ſome gueſs made as to the manner in which it might be done at this time. The veſſels which are to be made, muſt be very thin: the colours muſt be laid on in form of the fiſh, or other animals or figures, on the inſide, after the veſſel has been once baked. After this colour has had time to dry, the inſide of the veſſel muſt have a ſecond coat of the ſame earth, or ſtone ware, of which the veſſel is made; and over this a varniſh of the common kind. The conſequence of this will be, that the figures of the fiſh, in a very ſtrong colour, will be buried between two coats of the ware, which together form a complete veſſel. The outſide is then to be ground down almoſt to the figures, and, when they begin to appear, a new coat of the varniſh is to be laid over this. The figures will then be obſcured, and ſcarce, if at all perceivable; but, on filling the veſſel with water, the tranſparence of the ſides will be taken off, and the liquor will make a ſort of foil behind, which will throw out the figures of the fiſh. This might be done in any ware tolerably clear and tranſparent. The Porcelain of china would ſucceed beſt with it; but the pains and nicety required are too great, and all the attempts lately made by them have miſcarried. See the article STAINING *of Porcelain.*

The Chineſe make a great variety of figures on the ſurfaces of the vaſes of white China ware, and there is one kind of this greatly in eſteem among them, in which there are flowers and other figures; yet, the ſurface is quite ſmooth, and the ſubſtance extremely thin. The manner of making it is this: they firſt form the veſſel of the fineſt materials, as thin as they can; then, when they have poliſhed it inſide and out at the wheel, they put into it a ſtamp of its own ſhape, but cut with all theſe figures: they preſs this down ſo firmly on the yet moiſt veſſel, that the impreſſion is received in a very perfect manner; and, if the ſhape of the veſſel be at all hurt, they take it to the wheel again to reſtore it. They then finiſh it with the knife and ſciſſars; and, when they have made it as perfect as can be, they cover it with the fine white varniſh within and without. This fills up all the cavities of the impreſſion, and gives a perfectly ſmooth and even ſurface; yet the thickneſs of this varniſh in the traces of the figures gives it a different white, and the whole figures are as finely and accurately ſeen, as if painted on the outſide. This is an artifice that might eaſily be brought to bear among us, and ſeveral of our finer wares would make a pretty figure with it.

There is a current opinion among the Chineſe themſelves, that the Porcelain ware of former times was greatly ſuperior to that which they make at preſent; and that the burying china in the earth, for a long time, adds to its beauty; but all this is founded on error. The truth is, that our merchants beat down the price of the ware, and thereby compel them to make a worſe kind in general; but they are as able to do as fine things now as ever. What gave birth to the opinion, that burying Porcelain made it good, was, that finer pieces than ordinary are ſometimes found buried. Theſe are all precious vaſes, which the poſſeſſors buried, by way of ſecurity, in the times of civil war; and it is no wonder, that there are none but of the fineſt kind found buried on theſe occaſions. *Obſerv. ſur les Coutum. de l'Aſie.*

PORCELLA'NA, in natural hiſtory, the porcelain ſhell, or concha venerea, the name of a genus of ſhell-fiſh, the characters of which are theſe: they are of the univalve kind, and have for their mouth a long narrow ſlit, dentated on each ſide, and are of a conglobated, oblong, gibboſe, or umbonated form.

PO'RCUPINE, *hyſtrix*, in zoology, a creature of the ſize of the larger monkies, and is covered all over, except its noſe, the lower part of its legs, and the extremity of the tail, with ſpines of two or three inches long, and has no other hair but theſe. Theſe are yellowiſh for that half next the body, whence they are of a deep blackiſh brown, and at the very extremity they are white: they are hollow in the manner of quills; and Hernandez affirms, that the creature has a power of throwing them from its body to a conſiderable diſtance. The body is about a foot long, the tail ſomewhat longer than that, and its farther half covered thinly with hairs much reſembling hog's briſtles. The ears are ſmall, and are hid by the ſpines which cover the head. It has two long teeth in each jaw before; the noſtrils are very wide, the eyes round, prominent, and very bright and ſparkling, the feet are like thoſe of the monkey kind, and divided into four toes.

It climbs trees, but ſlowly and with difficulty, for want of a heel or hinder toe. It uſually twiſts its tail about a bough, to keep it ſafe from falling. It makes a grunting like that of a hog. It feeds on poultry, and its fleſh is very well taſted. *Ray's Syn. Quad.*

PORE'LLA, in botany, the name of a genus of moſſes, the characters of which are theſe:

The capſules contain a powder like thoſe of the other moſſes; and they have neither operculum, calyptra, nor pedicle; and their manner of ſhedding their powder is not by ſeparating into two parts, like thoſe of the ſelago and lycopodium, but by opening into ſeveral holes on all ſides.—It is not uſed at all in medicine.

POR'PESSE, an Engliſh name given indiſcriminately to two different fiſhes, the phocæna and the dolphin.

Artedi, who has been very careful in bringing together the ſynonyma of authors, tells us, that this is properly the Engliſh name only of that ſpecies of the dolphin, the character of which, according to this ſyſtem, is, that the body is almoſt of a conic form, the back broad, and the body ſubacute. This ſpecies is the phocæna of Ariſtotle, and the tirſio or turſio of Pliny and Rondeletius. Schoneveldt calls it the ſmall northern or oriental dolphin, and the Swedes the marſuin. See the article DELPHINUS.

POR'PHYRY-*ſhell*, in natural hiſtory, a name given by authors to a ſpecies of ſea-ſhell of the purpura kind, with a ſhort clavicle and beak.

PO'RTABLE *Laboratory*.—Dr. Shaw, who has taken great pains to bring the ſtudy of chemiſtry more into uſe in England than it has hitherto been, has explained the eaſineſs of its operation in general, and attempted a means of making its practice leſs expenſive, by introducing, in the place of that vaſt number of furnaces, and other contrivances, figured and deſcribed by the generality of authors on that ſubject, a Portable laboratory, by means of which alone all the chemical operations may be commodiouſly performed. This laboratory, fitted for its ſeveral purpoſes, is figured on *Plate* XXXVII. *fig.* 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Its contrivance is ſuch, that not only complete courſes of chemical experiments and operations may be commodiouſly performed by its means, but all the medicines may be prepared, in ſuch quantities, as to ſupply not only the demands of a family, but of an apothecary's ſhop, in moderate buſineſs. The firſt perſon who planned out this ſort of furnace was Beecher, and the ſcheme executed by Dr. Shaw is an improvement on that attempt.

The furnace has four principal parts: 1. The cover. 2. The ring. 3. The body, and 4. The foot. The general office and uſe of the cover is to check, ſuppreſs, and throw back the heat and flame, that the fuel may not waſte itſelf too faſt, as it otherwiſe would do to very little purpoſe in in many of the operations; for, the action of the fire being not momentary but ſucceſſive, the more it is kept in, and directed upon the ſubject, the more it is able to perform its effect, and that with the leſs expence or deſtruction of it. In order to increaſe the draught to the fire, and ſqueeſe the air more forcibly through the body of the fuel, there is a moveable funnel or chimney, which may occaſionally be fixed to the orifice, in the top of the cover left for that and many other uſes. See the *Figure*, *ubi ſupra*.

The ring is the place or ſeat of many operations. The body to be worked upon by the fire is frequently lodged in it; and, in other caſes, it helps to enlarge the furnace, and renders it capable of operations it could not otherwiſe perform. The body of the furnace ſerves to contain the fuel, and is the common ſeat of the operations by the fire, in the running metals from their ores; and, in theſe and many other the like caſes, it performs the office of crucible as well as fire-place, and contains the ſubject mixed along with the fuel, as is practiſed at the ſmelting-houſes. To this body there belong three ſeveral grates, which may be placed at different heights therein, according to the nature of operation, and the diſtance required between the ſubject and the fire. Laſtly, the foot is of two kinds, and is not only of uſe in ſupporting the reſt of the parts, but it receives the aſhes of the fuel, and the melted matter that may, in any of the operations, run down from the ores of the metals, or on other the like occaſions, when the fire liquates any thing above. The more immediate appurtenances of this furnace are fuel and bellows. The general fuel is to be charcoal; or, as there is a contrivance for a vent or flue in the body of the furnace, common ſea-coal may be employed, and the ſmoak directed up the chimney of the room, in which the furnace is to ſtand. The ſtructure of this furnace is alſo very well fitted for a lamp, which is a ſort of heat, highly convenient for ſome curious digeſtions and calcinations; and by this means theſe operations, which would otherwiſe require an athanor, may be conveniently performed, and that in the moſt accurate manner.

The number of chemical proceſſes that may be performed by this furnace is not eaſily reckoned up; but it may not be improper to add an account of the ſeveral ſtates, into which it is to be put for the performing them.

The moſt ſimple ſtate of the furnace is a combination of its two lower parts, the body and the foot. When theſe are put together, it is fit for fuſion by the naked fire, where the matter to be melted is to be mixed among the fuel; as, for inſtance, in the running the ores of lead, tin, or iron, which may thus, in the quantity of many pounds at a time, be ſeparated from their droſs, and purged for uſe, as exactly as at the mine works, or ſmelting-houſes, either with the aſſiſtance of the bellows, or without, as the nature of the ore requires. By barely placing a grate in the middle of the body, the inſtrument becomes a melting furnace for a crucible, wherein all the operations that require a fire of fuſion, animated either by the air, or bellows, are performable with ſuch advantages as cannot be had in the common wind or blaſt furnaces made for this purpoſe. When only the body of the furnace with its middle grate is ſet upon the foot, it anſwers all the purpoſes of a ſhop furnace uſed by the apothecaries for decoction, inſpiſſation, extraction, and the like purpoſes, where a naked fire only is required, and certain diſtillations and ſublimations may alſo be performed conveniently by it.

It may in this ſtate alſo be conveniently made to ſerve the purpoſes of a balneum mariæ, an aſh heat, a ſand heat, or a ſtill ſtronger one for digeſtion and ſublimation, by only ſetting on it in this ſtate a veſſel of water, or one filled with aſhes, ſand, or iron-filings; and thus ſeveral operations requiring the ſame kind of heat may be carried on at the ſame time. If inſtead of a common pan or veſſel to hold water, ſand, &c. the ring or third part of the furnace, be ſet on furniſhed with its ſet of pots, the whole is then a furnace fitted for that ſort of diſtillation called diſtillation in capella vacua, where the retorts are contained in the cavity of the pots, and locked down therein without any viſible medium between. By this means many operations may be performed in the diſtillation and ſeparation of bodies, that could not be worked upon to ſo much advantage by any other method. Particularly the rectification of the ſtrongeſt acid ſpirits is very eaſily and conveniently performed, this way, at very little expence.

If an iron pan be placed in the room of the ring juſt mentioned, the inſtrument is then a calcining furnace, where ores of metals may be roaſted, and lead, antimony, and the like bodies may be conveniently reduced to aſhes.

If the loweſt grate be uſed inſtead of the middle one, then either a cold ſtill, or, as it is generally called, a hot one, may be put into the body, and worked in the common manner with its head and refrigeratory. Thus all the cordial waters may be made, ſpirits may be rectified, and the eſſential oils diſtilled by the ſame means, as well as by the common fixed ſtills.

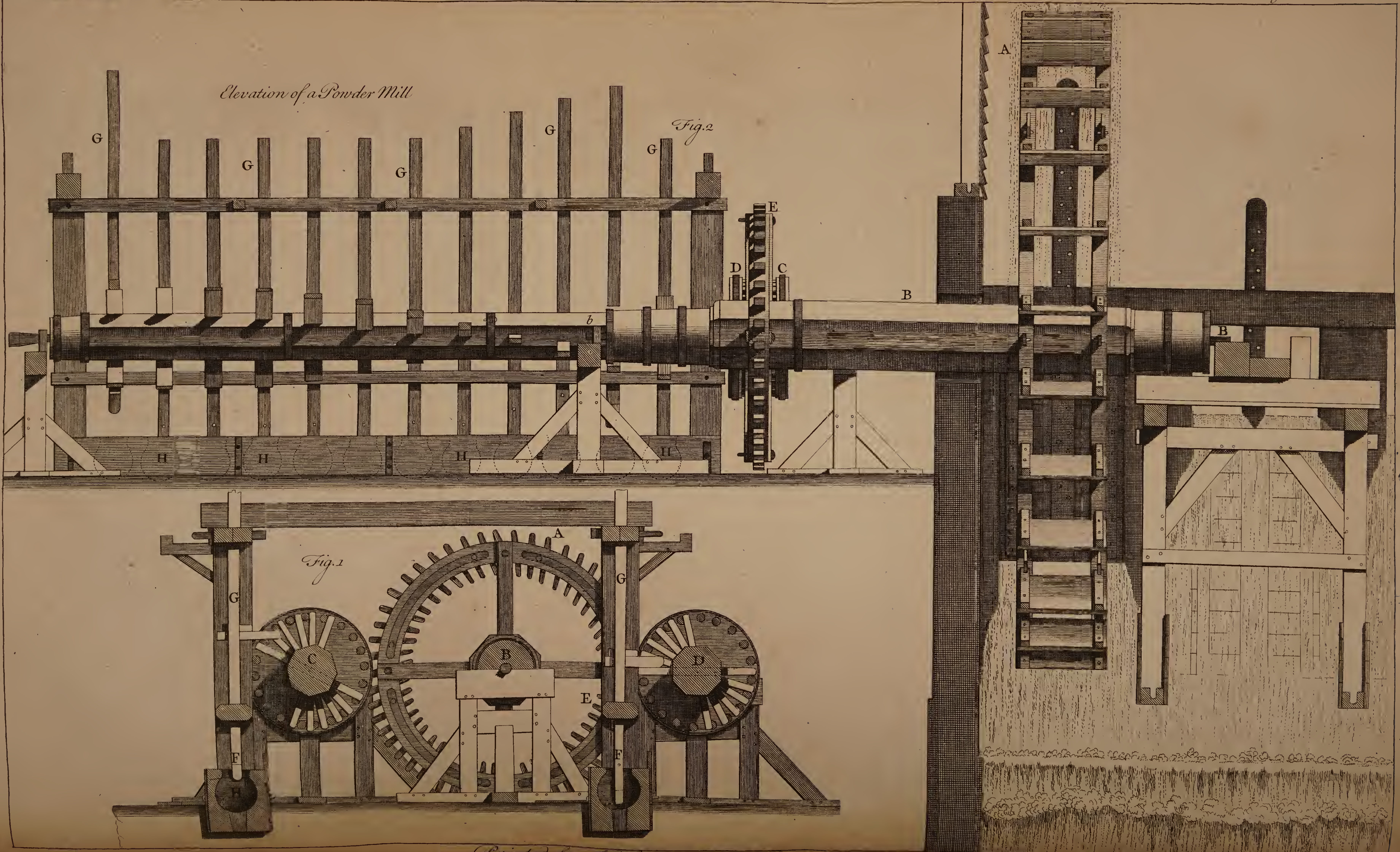
The laſt part, or cover of the furnace, may ſometimes be applied to the ring, ſometimes only to the body of the furnace without the ring. The inſtrument in this caſe becomes a proper reverberatory furnace, and is uſeful for cementation, cupellation, and the eſſaying of ores, and for diſtilling with a fire of ſuppreſſion, that is, where the fire is placed above as well as below the ſubject, and the veſſel that contains it.

A furnace of this nature has numerous advantages, not only over all the chemical furnaces in common uſe, but even over thoſe of the moſt celebrated ſtructure and contrivance, deſcribed by authors on particular occaſions, not excepting thoſe of Glauber and Vigani. Thoſe nicely contrived furnaces are generally adapted to ſome few particular purpoſes, and yet this eaſy kind anſwers in experiment thoſe very purpoſes better; and at the ſame time is of general uſe on all the other occaſions of chemiſtry. Experience has ſhewn, that it is better for the various uſes of Glauber's philoſophical furnaces, than thoſe very furnaces themſelves, though made for theſe very purpoſes; and for the higher operations as they are called of metallurgical chemiſtry. For example, to obtain a pure ſpirit of ſalt in plenty, Glauber orders the ſalt to be thrown upon the fire, and has contrivances to catch the riſing vapour; but this is a tedious way, and turns to very little account in practice; nor is the matter much improved by quenching the coals in a brine of ſea-ſalt, and afterwards burning them for their fume; but all that can be expected from theſe aukward contrivances, may be had commodiouſly from the furnace here deſcribed, where the fire, being animated by bellows, cauſes the fire to burn more free, and the fuel to yield the ſpirit it was impregnated with, much more quickly and eaſily than in the furnace contrived by that author for the purpoſe, while the fuel is ſupplied by the door without any diſturbance to the operation. *Shaw's Eſſ. on a Portable Laboratory.*

There are many other curious philoſophical experiments, which can be no way ſo well done as with this kind of furnace, and many ſcarce at all without it; it is excellently fitted alſo for enamelling, making of paſtes, ſtaining of glaſs, and making the artificial gems. And, beſides theſe and a number of other curious uſes, it is extremely well fitted for all the common purpoſes of fires. Any artizan who requires fire in whatever manner in his buſineſs, may contrive to apply it in this manner as he will; the offices of a common ſtove in a kitchen may alſo be very well ſupplied by it, and the warming a room, or vault, is as well done by it as by any of the common contrivances of ſtoves, ovens, and other things, made purpoſely for that uſe.

The outer caſe of the furnace is to be made of good plate iron of a conſiderable thickneſs, formed in ſeparate pieces of the figures expreſſed in the plate, and its ſize may be ſuch as the operator chuſes; obſerving only a due proportion in its ſeveral parts. The inner ſides of all the parts muſt be lined at leaſt an inch thick with a proper luting, which muſt be carefully laid on and gently dried, the cracks, which happen in the drying, being filled up with more of the ſame luting. Windſor loam alone may be uſed to this purpoſe, but the author himſelf recommends the following mixture: take a buſhel of Windſor loam, four quarts of brick-duſt, two quarts of powdered green glaſs, two quarts of iron filings, four handfuls of cow hair, and eight handfuls of horſe dung; theſe are all to be beat together, and a ſufficient quantity of bullocks blood added, to make the whole into a ſtiff and uniform paſte, which is to be carefully ſpread over every part of the furnace that the fire can touch.

PO'RUS *cervinus*, in natural hiſtory, a name given by authors to a ſpecies of ſea plant, found among the rocks in the coral fiſheries, and in other places. It grows at different depths, and ſeems to adhere to the rocks by a ſimple baſe, having no root, nor any thing in the place of one. It is branched in ſuch a manner, that, with the help of a little imagination, it has been forced into the reſemblance of a ſtag's horn. Its height is about an inch an half, often leſs when newly taken out of the ſea; it is of a fine ſnow white colour, but, when it has lain ſome time to dry, it becomes of a duſky yellow. It is very thin, perfectly tranſparent, and ſeems compoſed of ſeveral fine membranes. When examined by the microſcope, an admirable ſtructure is diſcovered in it; the whole being compoſed of a membranous matter, in which are an infinite number of holes, and all theſe arranged into regular lines.



Elevation of a Powder Mill

Fig.2

Fig.1

Printed for J. Hinton in Newcastle Street

POSI'DIUM, Ποσειδονια, in chronology, the ſeventh month of the Athenian year. It conſiſted of thirty days, and anſwered to the latter part of our December and the beginning of January.

PO'T-ASH (*Dict.*)—The art of reducing vegetables to this ſtate is a very valuable one; the ſoap-maker, fuller, ſcowerer, dyer, and glaſsman, as well as the chemiſt and apothecary, depending greatly on it in many particulars.

The authors who are farther to be conſulted in this caſe, are Glauber, in his Proſperity of Germany; but the chemical foundation of the whole appears in Boerhaave's Chemiſtry, and the papers of Stahl on this ſubject.

This ſalt has been made in New England in conſiderable quantities from rotten wood. What gave the occaſion of knowing it, was, that a white oak in that province decayed, and a third part of its ſubſtance became rotten. This rotten part was tried to burn, and was found to turn almoſt wholly into a fine alkali ſalt, or Pot-aſh, much ſtronger than that which is made in the uſual way. What was moſt obſervable in the making of this ſalt was, that, while the wood was burning, it would melt of itſelf, and run down into hard lumps of ſalt; and this none of the wood of the ſame tree, which was ſound, would do, but only the rotten part: and what was moſt rotten of all, yielded the greateſt quantity of ſalt, and that the moſt readily; whereas all the common alkali ſalts of wood, made by incineration, are blackiſh at firſt; and the lixivium made of them, although often filtred, will ſtill be of a brown colour, occaſioned by ſome of the charcoal of the wood ſo cloſely united to the ſalt as not to be eaſily ſeparated from it. This alkali made from rotten wood was very white, even before ſolution; and the lixivium made with it was not at all tinged with brown, but clean like pure water, only a very ſmall quantity of aſhes ſubſided to the bottom. The lixivium was eaſily decanted from this, without the trouble of filtration, and, when evaporated to a drineſs, left the ſalt perfectly fine and pure. In the making this ſalt, as the fire grows more intenſe, the wood is ſeen to run together into great lumps, and bubble with a hiſſing noiſe.

The weight of the Pot-aſh prepared in the common way is very conſiderable, in proportion to the wood uſed; but, in this, the ſalt nearly equals the whole weight of the wood. In the common way of making the Pot-aſh, the ſalt is never diſtinguiſhed by the eye among the aſhes, nor even cauſes them to run into lumps; but in this caſe the ſalt always runs into large lumps, and is as eaſily diſtinguiſhed from the reſt of the aſhes, though white, as ſalt of tartar of the pureſt kind would be.

It is very certain, that rotten wood in many places has been found, on trial, to yield much leſs ſalt than ſound wood; but the ſound wood of this tree, being tried, was found to yield no more ſalt than other wood, and conſequently much leſs than the rotten part of it. On examining this tree on the ſpot, it was thought by good judges, that it had been at ſome diſtance of time ſtruck with lightning, it being evidently torn from the top to the bottom: on that ſide where the decayed part ſeparated from the ſound, there had been a channel of about five inches wide all the way down; but this was cloſed over by ſucceeding bark, and ſhewed no trace of the accident till on examining underneath, where the tree was found black for ſuch a ſpace, and the bark not of a piece with the reſt.

From this it may be conjectured, that the wood, having been for ſo long a time, as till the growth of this bark, expoſed to the wind and weather, naturally became rotten from the wet it received; and that the lightning, having penetrated the wood, had ſo altered and diſpoſed the parts and pores of it, that they attracted and retained the nitrous ſalts of the air in great abundance, even as ſalt of tartar, and other the like ſalts, do; which, as Glauber obſerves, will be reduced, in continuance of time, to an abſolutely nitrous ſalt, and the quantity alſo conſiderably increaſed,

The parts of this rotten wood were of a very different ſtructure from thoſe of ordinary wood in this condition; and, though the lightning had not calcined it into a ſalt, yet it had, as appears, ſufficiently altered it to give that tendency to imbibe, and a power to retain the nitrous particles from the air, as well as the alkalies of vegetables perfectly calcined will do. If it ſhould be objected, that nitre alone will not calcine into an alkali, it is eaſily anſwered, that nitre with charcoal will; and the remaining wood might very well ſerve as charcoal in this proceſs. *Phil. Tranſ.* N°. 366.

POTA'TOE. The moſt advantageous way of propagating Potatoes is, the planting them at large diſtances, and digging or horſe-hoeing the ground ſeveral times between them.

Mr. Tull gives an example of this, in which the hoeing ſucceeded much better than dung, and without the expence of it. A piece of ground was planted with Potatoes, the greater part of it in the common way; but in one part, worſe than the reſt, they had been ſet at a yard diſtance every way. The reſt of the ground was dunged; this poor part had no dung, but was ploughed deep at ſeveral times four different ways, ſo that the ground was ſtirred and broken thoroughly every-where about the Potatoes. The conſequence was, that though no dung was uſed here, and though the plants appeared much weaker than in the dung part, yet the crop was greatly better than that of the other part of the field. The roots here were all large, and in the other parts of the field, where the dung had been uſed without ploughing, they were ſo ſmall, that the crop was ſcarce worth taking up.

This is one of many inſtances of the no great uſe in dunging land, without properly ſtirring it up, and ſerves to prove; what the crops of corn and every thing elſe confirm upon trial, that the ſtirring the earth ſufficiently, without any farther trouble, will anſwer better without any other manure, than all the manure in the world without it. *Tull's Horſe-hoeing Huſbandry.*

PO'WDER-*flaſks*, in artillery, are moſt commonly made of horn, of any convenient ſize and figure, to carry powder for priming of cannon: this is their chief uſe in armies.

Sometimes they are ſo made as to have a meaſure for the charge of the piece at top, but this is of more uſe to gentlemen in fowling, &c. than to ſoldiers, who have the charges of their piece put into cartridges, which they bite off, and firſt prime, and then load.

Powder-*room*, in a ſhip, that part of the hold wherein the Powder is ſtowed.

Powder-*mill*, a mill for pounding, mixing, &c. the ingredients of which gunpowder is compoſed.

Gunpowder is compoſed of ſalt-petre, ſulphur, and charcoal. The ſulphur muſt be well purified. Salt-petre is a ſalt extracted by different liminations from ſeveral ſorts of broken ſtones, pieces of old and dry plaiſter, or rubbiſh of old buildings, eſpecially cellars, and generally all earths which have been long in ſheep-folds, ſtables, pigeon-houſes, and other places where are gathered, either by a regular courſe or tranſpiration, the drainings of dunghills, manufactures, urines, and all ſalts proceeding from animals. Theſe three matters, pulveriſed ſeparately, are incorporated afterwards into one maſs of a fixed weight, whereof the ſalt-petre makes three quarters, the ſulphur half a quarter, and the charcoal the other half quarter. The ſulphur ſerves to inflame the whole. The charcoal hinders its too ſudden extinction. The ſalt-petre makes its ſtrength, by the great dilatation it receives from the fire, and hardneſs of the parts it ſhoots. What we can diſcover in the terrible action of gun-powder is extremely confined, though we have learned by ſeveral Experiments to make it and manage it. See the article GUNPOWDER, in the Dictionary. The ingredients, which enter its compoſition, are harmleſs, while they remain ſeparate; and it could be wiſhed, for the repoſe of ſailors, and thoſe who have gun-powder in their neighbouthood, that all thoſe matters could be exported, or kept ſeparate, till a preſent occaſion ſhould require to join them together. This would be an important ſervice to ſociety: I aſk it of them who want nothing elſe for the formation of the world but matter and motion. But, till they be pleaſed to favour us with it, we will continue to make the incorporation of the three matters gun-powder is compoſed of, in the mortars of the mill, with the aſſiſtance of the peſtles and ſprinkling. The mortar is a piece of wood made to receive twenty pounds of paſte of the compoſition abovementioned.

There are twenty-four mortars in each mill; where are made at once, and in one day, four hundred and eighty pounds of gun-powder, by ſprinkling each mortar with two pounds of water, taking care to repeat the ſprinkling, from time to time, leſt the matter ſhould take fire. The paſte having been pounded during three hours ſucceſſively, it paſſes from one mortar into another. The mortar is pierced at bottom, and ſtopped with a cork or piece of wood in the form of a cone, to receive the ſtrokes of the peſtles, and reſerve the mortar. The peſtle is a piece of wood ten feet high, and four inches and a half broad, armed at bottom with a round piece of metal. The peſtle weighs ſixty-five pounds. The inſpection of the pieces will make us conceive the effect thereof.

Plate XXXVIII. *fig.* 1. The profile of the wheel and cog-wheel.

A. The wheel.

B *b*. The arbor of the great wheel. It places one trunnion in *b*, and the other in B. See *fig.* 2.

C. The arbor of the trundle-head C ſeen beyond the cog-wheel.

E. The cog-wheel, from before which the trundle-head D has been taken off here.

F. The peſtles.

G. The tails of the peſtles; which are two pieces of wood, pierced with as many holes as there are peſtles, to keep them even in the ſame row, while they go up and down.

H. The outſide of the mortars.

Fig. 2. The plan of the whole machine.

A. The wheel.

B. The arbor.

C D. The two trundle-heads, each with its proper arbor, called here canting-wheel. The axis which makes the trundle-head turn is called canting-wheel, being environed with twelve ſmall pieces of wood jutting out; theſe pieces are called lifts, becauſe they are deſigned to raiſe the peſtles; they catch them by the meeting of another piece of wood faſtened laterally to each peſtle. Theſe faſtenings are called ſtays.

E. The cog-wheel.

G. The tails of the peſtles.

H. The bottom of the mortars.

If water be given to the wheel, the cog-wheel muſt march and drive contrary ways the two trundle-heads and their canting-wheels. Each, lift turning with the canting-wheel, meets at its return with the ſtay of a peſtle, and lets it fall into its mortar. Theſe twelve lifts are diſpoſed in ſuch a manner that there are always four of them up, and four peſtles unequally ready to fall. There is but one of them that falls at a time. From that diſpoſition of the peſtles depends the equality of the trituration of the peſtle. Which ſucceeds ſtill better, by making it paſs through the twenty-four mortars at regular times.

PO′WER (*Dict.*) — We find in ourſelves a Power to begin or forbear, continue or end, ſeveral actions of our minds, and motions of our bodies, barely by a thought or preference of the mind. This Power which the mind has thus to order the conſideration of any idea, or the forbearing to conſider it, or to prefer the motion of any part of the body to its reſt, and vice verſa, in any particular inſtance, is what we call the will.—And the actual exerciſe of that Power, is that which we call volition, or willing.

The forbearance or performance of that action, conſequent to ſuch order or command of the mind, is called voluntary: and whatſoever action is performed without ſuch a thought of the mind is called involuntary.

The Power of perception is what we call the underſtanding.

Perception, which we make the act of the underſtanding, is of three ſorts: the perception of ideas in our minds; the perception of the ſignification of ſigns; and the perception of the agreement or diſagreement of any diſtinct ideas.

Theſe Powers of the mind, viz. of perceiving and preferring, are uſually called by another name; and the ordinary way of ſpeaking is, that the underſtanding and will are two faculties or powers of the mind. A word proper enough, if uſed ſo as not to breed any confuſion in men's thoughts, by being ſuppoſed (as there is room to ſuſpect it has been) for ſome real beings in the ſoul, that perform thoſe actions of underſtanding and volition. From the conſideration of the extent of the Power of the mind over the actions of the man, which every one finds in himſelf, ariſe the ideas of liberty and neceſſity. So far a man has a Power to think, or not to think; to move or not to move, according to the preference or direction of his own mind; ſo far is a man free.

Wherever any performance or forbearance are not equally in a man's Power; wherever doing or not doing will not equally follow upon the preference of his mind; there he is not free, though perhaps the action may be voluntary.

So that the idea of liberty is the idea of a Power in any agent to do or forbear any action, according to the determination or thought of the mind, whereby either of them is preferred to the other: where either of them is not in the Power of the agent to be produced by him according to his volition, there he is not at liberty: that agent is under neceſſity. So that liberty cannot be where there is no thought, no volition, no will: but there may be thought, there may be will, there may be volition, where there is no liberty. Thus a tennis-ball, whether in motion by the ſtroke of a racket, or lying ſtill at reſt, is not by any one taken to be a free agent; becauſe we conceive not a tennis-ball to think, and conſequently not to have any volition, or preference of motion to reſt, or vice verſa. So a man ſtriking himſelf or his friend by a convulſive motion of his arm, which is not in his Power by volition, or the direction of his mind, to ſtop or forbear; nobody thinks, he has liberty in this; every one pities him, as acting by neceſſity and conſtraint. Again, ſuppoſe a man be carried, whilſt faſt aſleep, into a room, where there is a perſon he longs to ſee, and be there locked faſt in, beyond his Power to get out; he awakes, and is glad to ſee himſelf in ſo deſirable company, which he ſtays willingly in; that is, he prefers his ſtaying to going away: is not this ſtay voluntary? Nobody will doubt it; and yet, being locked faſt in, he is not at liberty to ſtay, he has not freedom to be gone.

Liberty, therefore, is not an idea belonging to volition, or preferring; but to the perſon having the Power of doing, or forbearing to do, according as the mind ſhall chuſe or direct. As it is in the motions of the body, ſo it is in the thoughts of our minds, where any one is ſuch, that we have Power to take it up, or lay it by, according to the preference of the mind, there we are at liberty.

A waking man is not at liberty to think, or not to think, no more than he is at liberty, whether his body ſhall touch any other or no: but whether he will remove his contemplation from one idea to another, is many times in his choice; and then he is, in reſpect of his ideas, as much at liberty, as he is in reſpect of bodies he reſts on. He can at pleaſure remove himſelf from one to another.

Yet ſome ideas to the mind, like ſome motions to the body, are ſuch, as in certain circumſtances it cannot avoid, nor obtain their abſence, by the utmoſt effort it can uſe: thus a man on the rack is not at liberty to lay by the idea of pain, and entertain other contemplations.

Wherever thought is wholly wanting, or the Power to act or forbear according to the direction of thought, there neceſſity takes place. This, in an agent capable of volition, when the beginning or continuation of any action is contrary to the preference of his mind, is called compulſion; when the hindering or ſtopping any action is contrary to his volition, it is called reſtraint. Agents that have no thought, no volition at all, are in every thing neceſſary agents.

POWER, in algebra.—If any Power of a quantity be divided by a greater power of the ſame quantity, the quotient muſt be negative. For the rule for dividing any Power of a quantity by another Power of the ſame, is to ſubtract the exponent of the diviſor from the exponent of the dividend, and make the difference the exponent of the quotient.

For inſtance, $\frac{a^6}{a^4} = a^{6-4} = a^2$ and $\frac{a^m}{a^p} = a^{m-p}$. Hence if p be greater than m, the exponent $m-p$ muſt be negative.

Thus if $p = m + n$, then $\frac{a^n}{a^p} = \frac{a^m}{am+n} = a^{-n}$.

It is obvious that $\frac{a}{a} = a^{1-1} = a^0$. But $\frac{a}{a} = 1$; and therefore $a^0 = 1$. In like manner $\frac{1}{a} = \frac{a^0}{a^1} = a^{-1}$; $\frac{1}{a\,a} = \frac{a^0}{a^2} = a^{0-2} = a^{-2}$; $\frac{1}{a\,a\,a} = a^{0-3} = a^{-3}$, ſo that the quantities a, 1, $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, $\frac{1}{a^4}$, &c. may be expreſſed thus, a^1, a^0, a^{-1}, a^{-2}, a^{-3}, a^{-4}, &c.

This change of expreſſion is often of great uſe in the computation of fluxions and infinite ſeries.

When the quantity to be raiſed to any power is poſitive, all its powers muſt be poſitive. And, when the radical quantity is negative, yet all its Powers, whoſe exponents are even numbers, muſt be poſitive. For $- \times -$ gives $+$.

The Power then can only be negative, when the exponent is an odd number. Thus the Powers of $-a$ are $-a$, $+a^2$, $-a^3$, $+a^4$, $-a^5$, &c. Thoſe whoſe exponents are 2, 4, 6, &c. are poſitive, but thoſe whoſe exponents are 1, 3, 5, 7, &c. are negative. *Mac Laur. Algebr.*

Hence, if a Power have a negative ſign, no root of it, denominated by an even number, can be aſſigned; ſince no quantity multiplied into itſelf an even number of times can give a negative product. Thus the ſquare root of $-a\,a$ or $\sqrt{-a\,a}$ cannot be aſſigned, and is what mathematicians call an impoſſible, or imaginary quantity or root. See ROOT.

Obſerve, that every Power has as many roots, real and imaginary, as there are units in the exponent of the Power. This holds true of unity itſelf. *Mac Laur. Algebr.*

Imperfect POWER, in algebra, is uſed for a Power that has a fractional experiment; thus $a^{\frac{1}{2}}\, a^{\frac{2}{3}}\, a^{\frac{3}{5}}\, a^{\frac{7}{8}}$, &c. are imperfect Powers. *Mac Laur. Algebr.*

Theſe are otherwiſe expreſſed by placing the given Power within the radical ſign $\surd$, and placing above the radical ſign the number that denominates what kind of root is required.

Thus, $a^{\frac{3}{2}} = \sqrt[2]{a^3}$; $a^{\frac{5}{3}} = \sqrt[3]{a^5}$; $a^{\frac{m}{n}} = \sqrt[n]{a^m}$.

Theſe imperfect Powers are alſo called ſurds.

POW′TER, *or Engliſh Powter*, the name of a peculiar ſpecies of pigeon, called, by Moore, the columba gutturoſa Anglica. It was firſt bred in England, and is a mixed breed, between what is called the horſeman and the cropper. It is a very beautiful ſpecies, and is valued for its length of legs and body, neatneſs of crop, and ſlenderneſs in girth, added to the beauty of its feathers. This ſpecies is often eighteen, ſometimes twenty inches long from the end of the bill to the extremity of the tail. Its legs, from the upper joint of the thigh to the toe nail, is ſometimes ſeven inches; the crop is large and round, eſpecially towards the beak, filling alſo behind, and making almoſt a perfectly orbicular figure. They are either blue-pied, black-pied, red-pied, or yellow-pied; the laſt colour is moſt valued. *Moore's Columbarium.*

Pariſian POWTER, a ſpecies of pigeon called, by Moore, columba gutturoſa Pariſiorum.

It was firſt bred at Paris, and thence ſent to Bruſſels, whence it was afterwards brought into England. It reſembles the Engliſh Powter, but is ſhort-bodied, ſhort-legged, thick in the girth, and long-cropped. It is admired for the beauty of its feathers, which is peculiar to itſelf; it reſembles in this a fine piece of that ſort of needle-work which the ladies call the Iriſh ſtich, being chequered with various colours in every feather, except the flight, which is white. It has generally a good deal of red intermixed with other colours, and, the more it has of this, the more it is eſteemed.

Horſeman POW′TING, a name given to a mixed breed of pigeons, produced between thoſe two kinds known by the names of the cropper and the horſeman, according to the number of times that the young are bred over from the cropper. They are diſtinguiſhed by the names of the firſt, ſecond, or third breed.

Small POX. See SMALL *Pox*, *Dictionary and Supplement.*

PRA′MNION, in natural hiſtory, the name of one of the ſemipellucid gems, ſo diſtinct from all the others as to make properly a peculiar genus of foſſils. It is called by many of the antients morio, or morion, and by our lapidaries the black agate.

It is a ſtone of a very great concealed beauty. Our lapidaries, who know it by the name of the black agate, are very indeterminate in the application of that name, calling by it not only this, but every black ſtone capable of a good poliſh by the ſame name, and never looking for its great character, its hidden colour. It is found in the ſhape of our common flints and pebbles, but ſeldom larger than an egg; it appears, on a ſlight inſpection, to be of a fine deep black, but held up againſt the ſun, or the light of a candle, it diſcovers itſelf to be of a fine ſtrong red, without the leaſt admixture of any other colour. It is moſt frequently of a purpliſh tinge, like the amethyſt, but is at times found of all the degrees of red, from the pale flower colour of the hyacinth to the deep red of the carbuncle. It is of great hardneſs, and capable of an elegant poliſh.

It is produced only in the Eaſt-Indies; and we ſometimes have it thence among other ſtones, but it is not much regarded with us. The Romans were fond of it for engraving on, as we find by Pliny, and by a much more undeniable proof, many of the valuable antiques being cut on it. *Hill's Hiſt. of Foſſ.*

PRA'SIUS, in natural hiſtory, the name of a gem, much approaching to the nature of the emerald, but of a coarſer green, and wanting its hardneſs, and having in its green a caſt of yellow.

It is the ſtone which the antients called praſites; and, when of a greater than ordinary admixture of yellow, the chryſopraſus, and of which the gem, diſtinguiſhed by later authors under the name of the ſmaragdopraſus, is only one of the varieties.

The Praſius, even in its moſt perfect ſtate, is much leſs beautiful than moſt of the other gems: it is found of various ſizes, and not unfrequently conſiderably large: it is ſeldom met with ſmaller than a pea; from that to the ſize of a horſe bean is its moſt uſual ſtandard, from this to the ſize of a nutmeg it is more rarely found; and the larger ſpecimens are coarſer and leſs frequent than theſe.

PRA'YER, (*Dict.*)—We ſhall not here amuſe the reader with a critical enquiry into the origin of words that expreſs that duty which men have in all ages thought themſelves indiſpenſably bound to pay unto the deity, of what nature ſoever he be. It is almoſt needleſs too bſerve that to adore and adorare are derived from ad and orare; as if we ſhould ſay, ad os referre manum, to pray with the hand before the lips. We ſhall only obſerve, that men have extremely multiplied the terms deſigned to expreſs a religious act, imagining, perhaps, that the ſame idea expreſſed in their prayers in different terms, attended with certain ceremonies which they thought moſt acceptable to God, might prove more ſucceſsful, and in a more effectual manner ſecure the divine aſſiſtance. The Greeks and Romans thought there was a ſort of magic charm in ſome particular words and ſuperſtitious forms, which they made uſe of in their Prayers, and were even perſuaded, that, by the prevailing power of them, they could compel the deity to be favourable to them. As all mankind in general have the ſame favours to beg of God, it is no wonder that their forms of Prayer ſhould be almoſt the ſame, or at leaſt alike in many reſpects. They all tend to the ſame end, and their neceſſities are the ſame; but as man by degrees began to loſe the true idea of the divine being, and took upon him to attribute corporeal qualities, or human frailties, to him, he likewiſe loſt the true ſpirit of Prayer. He added ſuperſtition to his worſhip, ſerved God under corporeal notions, and, being no longer capable of contemplating him in ſpirit, was pleaſed to repreſent him by images, ſtatues, &c. Hence aroſe ſo many extraordinary ceremonies, ſuch extravagant acts of devotions, and ſuch an infinite number of forms uſed in Prayer; ſuch, among the antients, was the Io Pæan, which made a part of their pompous addreſſes to Apollo, &c.

With regard to Prayers, Jeſus Chriſt forbids his diſciples to lengthen them by vain and impertinent repetitions. Doubtleſs a repetition of the ſame thing in Prayer proceeds neither from zeal nor reſpect. It is very probable, that the Prayers of idolaters might be very tedious; but it is ſurpriſing that Chriſtians ſhould have fallen into the ſame error. Surely, to repeat the ſame Prayer to God fifty times, in the ſpace of an hour, is as impertinent as to preſent fifty copies of the ſame petitions one after another to a prince. Among the Turks there are a ſort of bigots who affect to repeat the name of God with an irreverent volubility, which rather reſembles madneſs than devotion. The antients were very fond of uſing the number 3 in their Prayers; for inſtance, Tibullus ſays, Ter cane, ter dictis reſpice carminibus; and Ovid, Ter tollit in æthera palmas, &c. They imagined alſo that the gods delighted in a long train of titles of pompous appellations, to expreſs their ſupremacy and power; and leſt they ſhould unhappily diſtinguiſh thereby any nature that might give offence, they took peculiar care to mention thoſe attributes with a ſalvo, or ſome modeſt reſtriction, ſuch as, Sive deus, ſive dea es; not preſuming to aſcertain the ſex of the deity whom they worſhipped:

When they prayed aloud, a miniſter of the gods rehearſed the Prayer to the people, who repeated it in the very ſame terms; and the ſame thing is now practiſed among the Roman Catholics and Proteſtants, as well as among the Turks.

The piety of the ancient Greeks, and the honourable opinion they entertained of their deities, is in nothing more manifeſt than in the continual Prayers and ſupplications they made to them; for no man of the leaſt prudence would undertake any thing of moment, without firſt aſking the advice and aſſiſtance of the gods: and we are told by Plato, that, ‘ at the riſing both of the ſun and moon, one might every-where behold the Greeks, as well thoſe in proſperity, as thoſe in afflictions and diſtreſſes, proſtrating themſelves, and hear their ſupplications’.

The Lacedæmonians had a peculiar form of Prayer; for they never uſed, either in their public or private devotions, to make any other requeſt, than that the gods would grant what was honourable and good for them.

There were ſeveral ceremonies attending the manner of their ſupplicating the gods. The petitioners were uſually crowned with garlands, and carried boughs of laurel or olive in their hands; laurel being an emblem of ſucceſs or victory, and olive of peace and good-will. With theſe boughs they touched the knees, or head of the ſtatue, to which they addreſſed themſelves. Sometimes they proſtrated themſelves at the entrance of the temples, and kiſſed the ſacred threſhold.

The poſtures they uſed were different; ſometimes they prayed ſtanding, ſometimes ſitting, but moſt commonly kneeling, that being expreſſive of the greateſt humility. The poets furniſh us with innumerable examples of proſtration before the images, altars, and threſholds of the temples. They turned their faces to the eaſt, when they prayed to the gods; and to the weſt, when they addreſſed themſelves to the heroes or demigods.

It was alſo an uſual geſture, in praying, to liſt up their hands, and is ſometimes therefore uſed to ſignify praying; as in Horace:

Cœlo ſupinas ſi tuleris manus.

When they lay proſtrate, or kneeled upon the earth, it was cuſtomary to beat it with their hands.

It was a common opinion, that their Prayers were more prevalent and ſucceſsful when offered up in a barbarous and unknown language. The reaſon aſſigned for this was, that the firſt and native languages of mankind, though barbarous and uncouth, yet conſiſted of words and names more agreeable to nature. If they obtained their requeſt, and it was a matter of conſequence, they preſented to the god ſome rich gift, or offered a ſacrifice. Sometimes the favour received was regiſtered in the temple, as a memorial of the goodneſs of the god.

Under the article of Prayer may be included that of imprecations. Theſe were extremely terrible, being thought ſo powerful, when duly pronounced, as to occaſion the deſtruction, not only of ſingle perſons, but of whole families and cities.

The moſt terrible imprecations were thoſe pronounced by parents, prieſts, kings, or other ſacred perſons.

Among the Hebrews, it is certain, that Prayers were daily put up, together with their offerings. For this purpoſe they had liturgies, or preſcribed forms, which may be proved to be uſed in the very infancy of the Hebrew nation. The forms of Prayer that belonged to the worſhip of the ſynagogue were very few at firſt; but they are ſince increaſed to a large number, which makes the ſervice very long and tedious.

The moſt ſolemn part of the Jewiſh Prayers is that which they call the eighteen Prayers, compoſed, as they ſay, by Ezra, with the aſſiſtance of the great ſynagogue. To theſe eighteen another was added, a little before the deſtruction of Jeruſalem, in the time of rabbi Gamaliel. It was deſigned againſt the Chriſtians, who are meant in it under the names of heretics and apoſtates.

Theſe nineteen Prayers are, in the Jewiſh liturgies, no other than as the Lord's Prayer in ours, being but the fundamental and principal part; for, beſides theſe, they have many others, ſome going before, others intermixed with them, and others following after: but theſe alone, on account of their great excellency, are at this day uſed, without any the leaſt difference, by the Jews in all parts of the world; and that, not only in their ſynagogue, but alſo in their private houſes.

The Jews, anciently, when they went to pray, covered their head and face with a veil, as a mark of humility and confuſion, when they appeared before the divine preſence. The poſtures they uſed were, either ſtanding, according to the example of holy men recorded in ſcripture, or bowing, or kneeling, or proſtrating; which three laſt were uſed upon the great day of expiation, and other ſolemnities of confeſſion and humiliation. They always turned their faces towards the temple, if they dwelt at Jeruſalem; and towards the holy land, if they lived elſewhere. They were obliged to appear clean and neat in their cloaths, when they came to public worſhip, and not to eat, drink, or ſleep, in their ſynagogues, in which every thing was to be done with decency and order.

The duty of Prayer is conſtantly and ſtrongly enforced in the Koran of Mahommed. The muſſulmans are directed to ‘ remember God (that is, to pray to him) ſtanding, ſitting, and lying on their ſides’; viz. at all times, and in all poſtures.

The Turks perform their devotions, in their moſques, five times every day. When they come to the moſques, they pull off their ſhoes, and go in bare-footed; then they kneel down, laying their ſhoes before them, and reſting their back-parts on their heels. At the concluſion of their Prayers they take out their beads, which are ninety-nine in number. After this, they lift up their hands at a little diſtance from their faces, and repeat a certain Prayer to themſelves; then they ſmooth down their faces with their hands, take up their ſhoes, and go out of the moſque. Theſe public prayers laſt but about a quarter of an hour.

PRE′BEND (*Dict.*)—The term Prebend is uſually confounded with canonicate, or canonica; yet there is a real difference. A Prebend is properly a right which an eccleſiaſtic has in a cathedral, or collegiate church where he officiates, to receive certain eccleſiaſtical revenues, and to enjoy certain dues, either in money or in kind; (ſo called à præbendo, q. d. afforded or allowed him; not à præbendo auxilium or conſilium epiſcopo) whereas canonica is a mere title, or ſpiritual quality, which a perſon enjoys independent of any præſtation, or any temporal revenue: ſo that the Prebend may ſubſiſt without the canonicate; but the canonicate is inſeparable from the Prebend.

For it is not to the Prebend that the right of ſuffrage and other ſpiritual rights are annexed, but to the canonicate; and, when the Prebend is joined to the canonicate, it becomes ſpiritual by virtue of the canonicate becauſe it is abſolutely attached to it.

Anciently the pope created canons with a right of having place in the choir, a deliberative voice in the chapter, and an expectation of the firſt Prebend that ſhould become vacant; but this was prohibited by the council of Trent: yet the pope ſtill confers the canonicate without any Prebend, when he would confer a dignity in a church, for the obtaining whereof, it is required the candidate be a canon.

This they call a canonicate ad effectum, and ſometimes jus ventoſum, which is no more than an empty title, conferred purely to qualify a man for a dignity reſtrained to the capacity of canon.

In ſome churches there are double Prebends, and in others ſemi-Prebends.

Originally the Prebend was only a livery, or portion of things neceſſary to life, given daily; at preſent the rents and profits of the church are divided into fixed portions, called Prebends, which are enjoyed independently. The nomination to Prebends is in the king. In France it is one of the honorary rights of the king, on his joyful acceſſion to the crown, to nominate to the firſt Prebends vacant by death in the cathedral and collegiate churches.

Prebends are either ſimple, or with dignity.—The latter are ſuch as, beſides their Prebends, have ſome juriſdiction annexed to them.

Theological, or *divinity* PREBEND, is a Prebend appropriated to a doctor in divinity, in each cathedral and collegiate church throughout France, for preaching on Sundays, and making a public lecture thrice a week.

Preceptorial PREBEND, is that Prebend whoſe revenues are deſtined for the ſupport of a preceptor or maſter, who is obliged to inſtruct the youth of the place gratis.

The canonicate is not here neceſſary to the Prebend.

Panorm. obſerves, that in the cathedral church of Chartres there are Prebends appropriated to laymen, and for the ſubſiſtence of ſome perſons of birth and diſtinction.

PREDETERMINA′TION (*Dict.*)—*Phyſical Predetermination, or promotion*, if there be any ſuch thing, is that action of God, whereby he excites a ſecond cauſe to act; or by which, antecedently to all operation of the creature, or before it could operate in conſequence either of the order of nature or reaſon, he really and effectually moves and occaſions it to produce all its actions: that is, whatever the creature does or acts, is really done and acted by the agency of God on the creature, who is all the time paſſive. So that, without ſuch Predetermination of God, all creatures muſt remain in an eternal ſtate of inactivity; and, with ſuch Predetermination, it is impoſſible but they ſhould do what they are thus put upon doing.

It is ſtrongly controverted, whether or no ſuch a phyſical Predetermination be neceſſary to the action of natural cauſes? The Scotiſts maintain the negative; urging, that all natural cauſes are, of their own nature, determined to a certain action; whence it ſhould ſeem needleſs to call in a new Predetermination of God, e. gr. to fire, to make it warm the hand. For if an object be, by the courſe of divine providence, applied to fire; what need a ſecond application of the fire, to make it warm the object applied thereto, ſince beings are not to be multiplied unneceſſarily?

And ſuch Predetermination ſome philoſophers hold ſtill leſs requiſite to produce the acts of the will: at leaſt, ſay they, the human mind muſt be allowed the common power and privilege of a ſecond cauſe, and therefore be intitled to produce its own acts, as well as other ſtrictly natural agents.

The Thomiſts, on the other hand, ſtand up ſtrenuouſly for the phyſical Predetermination: one of their principal arguments is drawn from the ſubordination of ſecond cauſes to the firſt. Where there are ſeveral ſubordinate agents, ſay they, the lower agents do not act, unleſs firſt moved and determined thereto by the firſt; this being the very eſſence of ſubordination.

Again, the like they argue from the dominion of God over all his creatures: it is of the eſſence of dominion, ſay they, to apply and direct things ſubject thereto to its own operations; and this, if the dominion be only moral, morally; but if it be alſo phyſical, phyſically. And that this is the caſe in reſpect of God, and his creatures, is confeſſed.

PREMONSTRATE′NSES (*Lat.*) in French Premontrés; a religious order, founded by St. Norbet, deſcended from a noble family in the dioceſe of Cologn, who embraced the rule of St. Auſtin, and retired with thirteen companions to a place called Premonſtratum, in the dioceſe of Leon, in Picardy, where he began his order, about the year 1119. The place was called Premonſtratum, becauſe it was pretended the bleſſed virgin herſelf pointed out (premonſtravit) this place for the principal houſe of the order, and at the ſame time commanded them to wear a white habit.

The religious of this order were, at firſt, ſo poor, that they had nothing they could call their own, but one poor aſs, which ſerved them to carry wood, which they cut down every morning, and ſent to Leon, where it was ſold to purchaſe bread: but, in a ſhort time, they received ſo many donations, and built ſo many monaſteries, that, thirty years after the foundation of this order, they had above an hundred abbeys in France and Germany.

The popes and kings of France have granted many privileges, and been very liberal to the Premonſtratenſes. Beſides a great number of ſaints, who have been canonized, this order has had ſeveral perſons of diſtinguiſhed birth, who have been contented with the humble condition of lay-brother, as Guy, earl of Brienne; Godfrey, earl of Namur, &c. It has likewiſe given the church a great number of archbiſhops and biſhops.

The order of Premonſtratenſes increaſed ſo greatly, that it had monaſteries in all parts of Chriſtendom, amounting to a thouſand abbeys, three hundred provoſtſhips, a vaſt number of priories, and five hundred nunneries. Theſe were divided into thirty cyrcaries or provinces. But this number of houſes is greatly diminiſhed; for, of ſixty-five abbeys it had in Italy, there is not one remaining at preſent; not to mention the loſs of all their monaſteries in Sweden, Norway, Denmark, England, Scotland, and Ireland.

Theſe monks, vulgarly called white canons, came firſt into England in the year 1146, where their firſt monaſtery, called New-houſe, was built in Lincolnſhire, by Peter de Saulia, and dedicated to St. Martialis. In the reign of Edward I, when that king granted his protection to the monaſteries, the Premonſtratenſes had twenty-ſeven houſes in this kingdom.

PRESBYTE′RIANS (*Dict.*)—The Preſbyterians, as to doctrine, agree with the church of England: their chief difference lies in the point of diſcipline, viz. who ſhall appoint the governors of the church, and what ſubordination there ſhall or ſhall not be between them.

The Preſbyterians allow of no hierarchy, no ſubordination in the perſons of their miniſters; biſhops and prieſts, they maintain, in the times of the apoſtles, were the ſame; and therefore, though they allow epiſcopacy as now ſettled in the church of England to be very ancient, yet they deny it to be jure divino.

In lieu of a ſeries of miniſters one over another, in quality of prieſts, biſhops, and archbiſhops, their polity conſiſts in a ſeries of aſſemblies, or ſynods: thus every miniſter is to be obedient to the claſſis under which he lives; and that claſs to a ſynod, provincial, claſſical, or œcumenical.

The power of ordination, with them, reſides in a claſſis; and none are admitted to adminiſter the ſacrament, but thoſe ordained by the impoſition of hands of other miniſters.

They make uſe of elders or lay-men to take care of their poor; and likewiſe in the government of the church, whence their name, from the Greek, πρεσβύτερος, ſignifying ſenior, elder.

This is now the reigning diſcipline in the church of Scotland; as it was, during the interregnum, in England.

Elders take care of the collections made on Sundays for the poor; each elder in a pariſh has a diſtinct diſtrict which he ſuperintends, as is were, and acquaints the kirk ſeſſion of any irregularities that are committed therein, as fornication, drunkenneſs, &c. and he recommends any perſon who is an object of charity, for a weekly allowance, &c. from the ſeſſion, out of the ſaid weekly collections.

PRESENTA′TION (*Dict.*)—PRESENTATION *of the virgin* is a feaſt of the Romiſh church held on the twenty-firſt of November, in memory of the holy virgin's being preſented by her parents in the temple, to be there educated.

It is pretended, that there were young women brought up in the temple of Jeruſalem; which ſome endeavour to prove from the ſecond book of Maccabees, Sed & virgines quæ concluſæ erant, procurrebant ad Oniam; which is the ſentiment of Eutochius on this paſſage. And Lyranus adds, that other more ancient authors obſerve, that young women were educated till marriage, either in the temple, or at leaſt, in buildings contiguous thereto.

Emanuel Comnenus, who began to reign in 1143, makes mention of this feaſt in his conſtitution. Some even imagine it to have been eſtabliſhed in the eleventh century, among the Greeks; and think they ſee evident proofs of it in ſome homilies of George of Nicomedia, who lived in the time of Photius: ſo that it ſeems a miſtake in ſome modern critics to refer its inſtitution to Gregory XI. in 1372.

Some take it to have been inſtituted in memory of the ceremony practiſed among the Jews for their new-born females, correſponding to the circumciſion on the eighth day for males.

PRESENTATION *of our lady* alſo gives the title to three orders of nuns.

The firſt, projected in 1618, by a maid named Joan of Cambray. The habit of the nuns, according to the viſion ſhe pretended to have, was to be a grey gown of natural wool, &c. but this project was never accompliſhed.

The ſecond was eſtabliſhed in France about the year 1627, by Nic. Sanguin, biſhop of Senlis. It was approved by Urban VIII. This order never made any great progreſs.

The third was eſtabliſhed in 1664, when Fred. Borromeo, being apoſtolical viſitor in the Valteline, was intreated by ſome devout maids at Morbegnobourg to allow them to live in community in a retired place; which he granted, and erected them into a congregation, under the title of congregation of our lady. They live under the rule of St. Auguſtin.

PRE'TOR (*Dict.*)—For the better underſtanding the dignity of the Pretors, it will be proper fully to examine the reaſon of their name, inſtitution, number, dignity, and what their power and charge was. The word Pretor was peculiarly applied to this new magiſtrate, for before it belonged to the conſuls, and all perſons in authority, whether in civil or ſacred things; hence it is that we read, in ſome ancient epitaphs, Prætor ſacrorum, Prætor juventutis, &c.

The ancients not only called thoſe Pretors who commanded the armies, but alſo ſuch as had the charge either of ſacred or civil things. The occaſion of creating this magiſtrate, was a multiplicity of buſineſs upon the conſul's hands, and this was anno 388, and the neceſſity the republic found itſelf under of granting to the people a conſul of their own order; for the ſenate did not allow it, but upon condition that a new magiſtrate ſhould be created, that is, the Pretor, who was taken out of the patrician order: but, in the year 416, Q. Philo, a plebeian, got himſelf advanced to the office of Pretor, notwithſtanding the oppoſition made by the conſul Sulpicius againſt him.

There was no more than one of them from the year 388, till 510, according to Lipſius; but buſineſs coming to increaſe ſo much by reaſon of the great number of citizens and ſtrangers that came to live in Rome, and one being not enough, they thought it proper to conſtitute another, and their buſineſs was diſtinct; for one adminiſtered juſtice to the citizens of Rome, and for that reaſon was called Pretor urbanus; and the other took cognizance of the ſuits that happened between the citizens and ſtrangers, and he was called Prætor peregrinus: the firſt was more honourable than the other, and ſo he was intitled Prætor honoratus, and his edict named jus honorarium, as the lawyers ſay. But towards the year 520, they appointed two new Pretors: Livy informs us, they made ſix Pretors for one year. Tiberius afterwards named twelve Pretors, the number eſtabliſhed by Auguſtus, and as the ſenate preſſed him to increaſe them, he ſwore he would not do it: however he increaſed them to fifteen, in the year 786, according to Dion. The emperor Claudius enlarged the number to eighteen; but upon the declenſion of the empire, they were reduced to three only, as we may ſee by the laws of the emperors Valentinian and Macrinus, ſet forth, *L. II. C. de Off. Præt.*

The pretorſhip was the ſecond office for dignity in Rome, ſince it was conferred by the ſame auſpices as the conſulſhip, and that the Pretors were in hiſtory called collegæ conſulum, as Livy obſerves, L. I. Decad 1. The exterior enſigns of this office were the robe called prætexta, the curule chair, and ſix lictors. This office was annual, and he who diſcharged the ſame with honour, and without any diſgrace, had a right for all his life-time to wear the prætexta and white trabea; but ſuch as were guilty of male-adminiſtration were forced to lay it down. All their buſineſs in general conſiſted in three things, viz. to adminiſter juſtice to citizens and ſtrangers, to preſide over games, and to take care of the ſacrifices: they took care of the ſacrifices offered to the goddeſs called Bona Dea, as Plutarch ſays in Cæſar's life, and Cicero, L. I. Ep. 10. *ad Atticum.*

PRI'CKLE-*back*, in natural hiſtory, a ſmall fiſh ſo called from the Prickles on its ſides and back. Vaſt numbers of theſe little fiſh are to be found in almoſt all freſh waters, wherever it is poſſible for fiſh to live, as Mr. Arderon informs us, Philoſophical Tranſactions N°. 482, who gives us ſome account of theſe creatures. They are very deſtructive to the ſpawn of all ſorts of fiſh; and they themſelves are tormented to death by a kind of louſe of an oval figure, with eight legs and a very tranſparent body. This louſe has little fins always in motion, whether it be ſwimming about or fixed on the fiſh.

PRIDE *of the Iſis*, a name given by Dr. Plot to the common lampern, from its being found very plentifully and very delicate in that river.

PRIEST (*Dict.*)—Religious worſhip being once confined to temples, the appointment of miniſters for the deities became neceſſary: God himſelf inſtituted thoſe whom he deſigned for the ſervice of the true religion, and mankind eſtabliſhed thoſe who propagated that which was the falſe. Both the one and the other, from the mercenary views of worldly intereſt, have been multiplied to an infinite number. The Prieſts found means to hinder men from action, till they had been firſt conſulted. They ſet all the ſprings of the paſſions in motion; were at the head of all intrigues, and made themſelves maſters of the courts of princes; ſo great has the authority of Prieſts ever been in all religions. We know the power of the augurs, ſoothſayers, and Prieſts, among the Greeks and Romans; of the Magi among the Perſians; of the Druids among the Gauls, &c. The Mufti, and other doctors of the Mahometan law, are too often the grand engines in the moſt important debates of the Divan. Among the Germans, the Prieſts gave ſentence of life and death upon criminals. Many nations formerly choſe their Prieſts for kings. In the Eaſt and Weſt-Indies, China, Japan, &c. the Prieſts and monks have an unlimited power. Men are ſo formed by nature that there is an abſolute neceſſity that Prieſts ſhould have reſpect paid them, in order to maintain the dignity of religion; but the main point is, to ſet ſeaſonable bounds to that reſpect, ſo as not to fall into the exceſſes of thoſe, who give themſelves up blindly to the paſſions of Prieſts.

Among the ancient Greeks, the dignity of prieſthood was eſteemed ſo great, that, in moſt of their cities, and eſpecially at Athens, it was joined with that of the civil magiſtrate. In Egypt, the kings were all Prieſts; and, if any one, who was not of the royal family, uſurped the kingdom, he was obliged to be conſecrated to the prieſthood, before he could mount the throne.

But, beſides theſe royal Prieſts, there were others, taken from the body of the people, and conſecrated to the ſervice of religion. Theſe all were accounted the miniſters of the gods, and by them commiſſioned to diſpenſe their favours to mankind.

The Prieſts were differently appointed to their office; ſome obtained the prieſthood by inheritance, others by lot, others by the deſignation of princes, and others by popular elections. Whoever was admitted to this office, it was neceſſary he ſhould be ſound and perfect in all his members, it being thought a diſhonour to the gods to be ſerved by any one that is maimed, or any other way imperfect: and therefore, at Athens, before their conſecration, they were examined, whether they were ἀφέλεις, perfect, having neither defect, nor any thing ſuperfluous. They were likewiſe obliged to be upright in mind, as well as perfect in body; to live chaſtely and temperately, abſtaining from thoſe pleaſures, which were allowed to other men: ſome were ſuch rigid obſervers of chaſtity, that they diſmembered themſelves. But, though moſt of them were obliged to ſtrict chaſtity and temperance, yet there are inſtances of married Prieſts among the Greeks.

It is not eaſy to give an exact account of the different orders of Prieſts among the Greeks; for not only every god had ſeveral ſorts of Prieſts conſecrated to him, but even the Prieſts of the ſame God were different, according to the diverſity of places and circumſtances.

What has been ſaid concerning the Grecian Prieſts is applicable likewiſe to thoſe of the Romans.

Among the Hebrews, the prieſthood was not annexed to a certain family, till after the promulgation of the law of Moſes. Before that time, the firſt-born of every family, the fathers, the princes, and the kings, were Prieſts. Cain and Abel, Noah, Abraham, and Job, Abimelech, and Laban, Iſaac and Jacob themſelves, offered their own ſacrifices. But, after the giving of the law, the prieſthood was annexed to the family of Aaron, of the tribe of Levi. However, we find the judges and kings of the Hebrews, on ſeveral occaſions, offering ſacrifices to the Lord, eſpecially before a conſtant place of worſhip was fixed at Jeruſalem.

The high-Prieſt was at the head of all religious affairs, and was the ordinary judge of all matters concerning the juſtice and judgment of the Jewiſh nation.

It was required, as neceſſary qualifications for the high-Prieſt, that he ſhould be born of one of his own tribe, that his father had married a virgin, and that he ſhould be exempt from all corporal defects and infirmities. When he was inveſted with that high dignity, and clad in pontifical ornaments, he was conſidered as the oracle of truth, and gave anſwers to the queſtions propoſed to him.

The high-Prieſt was forbidden to mourn for any of his relations, even for his father or mother; or to enter into any place where a dead body lay, that he might not contract any uncleanneſs. The habit of the high-Prieſt was much more magnificent than that of the other Prieſts. He wore a long robe of an azure-colour, at the bottom of which was a border adorned with little golden bells and pomegranates, and made of wool of different colours, and ranged alternately to equal diſtances. This robe was girded about with the ephod. Upon his breaſt he wore a pectoral, or breaſt-plate, and upon his head a tiara or bonnet, from whence hung down a plate of gold, on which were engraven theſe words, Holineſs to the Lord. The ordinary or inferior Prieſts ſerved immediately at the altar, offered the ſacrifices, killed and flead them, and poured their blood at the foot of the altar.

The common habit of the Prieſts was, a kind of ſurplice, or linen tunic, without ſeam, with a ſaſh of ſeveral colours, hollow, like the ſkin of a ſerpent. It went twice round the body, was tied before, and the ends hung down to the feet. When they were in the act of ſacrificing, they threw this girdle over the left ſhoulder, that they might perform their office with the greater freedom. The Rabbins made this ſaſh to be two and thirty cubits long. They wore a cap, or bonnet, of fine linen, folded ſeveral times round the head.

The age at which they entered upon the ſacred miniſtry, was fixed by Moſes to twenty-five or thirty years, and they were to end it at fifty. But, in David's time, the rule was changed; and they were permitted to attend the ſervice of the temple at twenty years of age, and to dedicate themſelves to the prieſthood, during life.

The Lord had given no lands of inheritance to the tribe of Levi, in the diſtribution of the land of promiſe; but they were to be ſupported by tythes, firſt-fruits, and offerings. In the peace-offerings they burnt upon the altar the fat that covers the bowels, the liver, and kidney; the reſt belonging to the Prieſt. The ſkin or fleece of every ſacrifice was the Prieſt's; and this article alone was no inconſiderable allowance. When an Iſraelite killed any animal for his own uſe, he was to give the Prieſt the ſhoulder, the ſtomach, and the jaws. He had alſo a ſhare in the wool, when the ſheep were ſhorn. All the firſt-born, both of man and beaſt, belonged to the Lord, that is, to the Prieſts. The men were redeemed for five ſhekels. The firſt-fruits of trees likewiſe belonged to the Prieſts, as alſo of the land, and of animals. God alſo provided houſes for the Prieſts, by appointing them forty-eight cities for their habitation.

Next to the ſervice of the temple, the Prieſts were employed in inſtructing the people, deciding controverſies, and diſtinguiſhing the ſeveral ſorts of leproſy, the cauſes of divorce, vows, and all cauſes relating to the law. They publicly bleſſed the people in the name of the Lord. In the time of war, their buſineſs was to carry the ark of the covenant, to conſult the Lord, to ſound the holy trumpets, and encourage the people. The conſecration of Aaron and his ſons to the prieſthood was performed by Moſes, in the wilderneſs, with great ſolemnity. Whether the ſame ceremonies were repeated at the conſecration of every new high-Prieſt, is uncertain; and as to the inferior Prieſts, it does not appear that any particular ceremony was uſed for their conſecration; but they ſeem to have been admitted to the prieſthood only by performing the functions of the order.

PRI'MULA *veris, the primroſe,* in botany, a genus of plants, whoſe characters are:

The root is perennial, the leaves are oblong and wrinkled, the calyx is quinquefid, pentagonal, and ſoft: in this calyx is ſeated a monopetalous flower, ſhaped ſomewhat like a ſalver, with its margin divided into five heart-ſhaped, bifid, ſegments; this flower is furniſhed with five ſtamina, which ariſe from the inſide of its tubulous part. The ſeminal veſſel is an oblong ſhell, concealed in a calyx, furniſhed with a long tuble, and gaping at its apex; the ſeeds are roundiſh.

The flowers are commended by ſome, as good againſt diſorders ariſing from melancholy, and phlegmatic humours; the juice of the root is ſometimes uſed as an errhine to purge the head of the tough ſlimy phlegm. *Miller's Bot. Off.*

PRI'NCES *Feather*, in botany, a name given to the amaranth. See AMARANTH.

PRINCES *Metal.*—Copper, though one of the leſs precious metals, yet has been found of ſo great uſe in the common affairs of life, that ſcarce any other has been ſubject to ſo many trials for its improvement, or the rendering it either more beautiful or more fit for certain purpoſes.

One of the firſt diſcoveries in theſe attempts was the making it into braſs, by means of an addition of lapis calaminaris; and, though it was not at that time known to be a ſtone which contained any metal, yet the braſs was always found to weigh one third more than the copper which had been uſed in the proceſs. This yellow metal gave many people hopes of making copper approach yet nearer to gold, and, without knowing that zink was the ſeparated metalline part of lapis calaminaris, the experimenters ſoon found, by happy accident or repeated chance mixtures, that it would give copper a yet finer and purer yellow; but it was alſo found, that this mixed metal was much more brittle than braſs made in the common way. This, however, did not prevent the world from ſtill valuing it for ſuch works as were to be finiſhed by caſting, and did not require the hammer: and we, who firſt had it in perfection, called it Princes metal, from Prince Rupert, whom ſome ſuppoſe to have been the inventor of it; but the greateſt perfection this metal was ever brought to, was by two Frenchmen, Mr. La Croix, and Mr. Le Blanc. Their methods of making the compoſition, though both beautiful, were very different. Mr. Le Blanc's was the brighteſt, and of the moſt elegant and lively colour; but Mr. La Croix's was greatly ſuperior to that in ductility and ſoftneſs, ſo that it was very eaſily malleable. Mr. La Croix invented a ſort of varniſh or lacquer for his metal, which added a ſomewhat deeper tinge to it, as it was naturally rather too pale; and had this farther advantage, that, while it remained on the metal, it preſerved it from ruſt or decay. This is a very material point in regard to a metal of which copper is the baſis, ſince that is, of all other metals, moſt ſubject to be injured by the air, or by the contact of liquids of almoſt any kind. Mr. Le Blanc's metal is of a deeper, yet lively colour, and remarkably bright; and is of ſuch a temper as to be admirably fit for working. The whole hiſtory of theſe metals is certainly, that they are compoſed of zink and copper in different proportions the one to the other; but it is not eaſy, without the help of numerous experiments, to determine what is to be the true proportion for either.

The microſcope, however, ſhews a manifeſt difference, which may lead ſomewhat towards it; for the metal of La Croix is ſeen to be compoſed merely of a number of irregular ſtriæ, while the other is diſcovered to conſiſt of always two regular beds of them, which meet in the center of the piece; hence it is that this is always brittle, and will not well poliſh. The fabric of theſe metals was long kept a ſecret; but it was always to be diſcovered by melting it in a crucible in a ſtrong fire, when it always ſent up plain flowers of zink, and the remaining metal appeared no other than copper altered by calamine; that is, common braſs. *Mem. Acad. Par.* 1732.

PRI'NCIPLE, in chemiſtry (*Dict.*)—*Fire conſidered as a* PRINCIPLE.—We reckon elementary fire the firſt Principle of bodies, as being that, from whence all the reſt receive their activity. It is a ſimple and moſt ſubtile body, in a continual ſwift motion, filling, and eaſily permeating, the pores of all other bodies. Its immenſe ſubtility is evident from this, that it penetrates all bodies whatſoever; and its ſwift motion, from that rapidity which it is capable of communicating to them. Its force is in proportion to the quantity of it any where collected. In the ſun, which may be looked upon as a vaſt congeries of this ſubſtance, its motion is moſt violent. In culinary fires, the quantity and motion of it are not ſo great, but ſtill greater, than in ſpirituous and volatile liquors, where it is hardly to be perceived, except when they are ſet on fire. Not only all motion, but, alſo, heat proceeds from it, which, as it exiſts in bodies, is nothing but the exceſſive motion of their parts. It is, alſo, too ſubtile and active ever to be collected pure in chemical analyſes; wherever it is found, it is always united with water and earth, in ſalts and ſulphurs; and is ſometimes concentered with bodies in ſo great quantities, as conſiderably to increaſe their weight, as is evident in calcined antimony, in which there is an addition made of almoſt a fifth part.

Water conſidered as a PRINCIPLE.— Elementary water is a ſimple, liquid, inſipid, inodorous, pellucid ſubſtance. Its fluidity is owing entirely to the action of fire, and when that action is very great, its parts are actually divided, and the whole turned to vapour; but, when it is very ſmall, they cohere ſtrongly, and turn to ice. This element the chymiſts call phlegm, and it may be conceived to conſiſt of ſmall, ſmooth particles, of an oblong or oval figure, and perfectly rigid or inflexible. From the minuteneſs of its particles, it eaſily penetrates the pores of almoſt all bodies. An oval figure ſeems more agreeable to the fluidity and motion of the water, than a ſpherical, and, likewiſe, to the ſolidity we obſerve in ice; the points of contact being too few, in ſpherical bodies, to form ſo ſtrong a coheſion. Were its particles angular and flexible, they would be too weak to penetrate and diſſolve ſalts, and would, likewiſe, be too much reſiſted; but, as their ſurface is ſmooth, they can eaſily enter the pores of ſalt, and afterwards they eaſily ſeparate their parts, that is, diſſolve them by their rigidity and oval figure. The want of taſte or ſmell in water ſeems to proceed from the ſmoothneſs, obtuſeneſs, and ſmallneſs of its particles, which cannot vellicate the nerves of the tongue and noſtrils. The fluidity of water ariſes from the ſmallneſs, ſmoothneſs, and figure of its particles, and from the eaſy motion thereof by the fire contained in their interſtices. Without the action of fire ſeparating theſe particles, and keeping them in continual motion, their fluidity would preſently be loſt, how much ſoever their ſtructure may diſpoſe them to it, and they would become one ſolid maſs. On the other hand, if the action of fire upon them be very great, they are farther ſeparated from one another, and fly off in vapour and ſmoke. In fine, water is tranſparent, becauſe its pores are ſo diſpoſed, as readily to tranſmit the rays of light.

Earth conſidered as a PRINCIPLE.—Elementary earth is the ſame with the terra damnata, or caput mortuum of the chymiſts; being a ſimple, friable, porous ſubſtance, without ſmell or taſte, conſiſting of particles of no regular figure, and altogether unfit for motion. The poroſity of earth ſeems to ariſe from the irregular figure of its particles; and as theſe particles often touch one another only by their angles, the whole maſs muſt neceſſarily be friable. The want of taſte and ſmell ſeems to be owing to their inaptitude for motion.

In the analyſes of bodies, the laſt thing is always this Principle of earth; and, in their compoſition, it ſeems to ſerve as a baſis or foundation for the other parts of the mixture; and to it the dryneſs, ſolidity, and hardneſs of bodies, are in a great meaſure, to be aſcribed.

Salt, as has been ſaid, is a mixed body; but I chuſe to introduce it immediately after the Principles, becauſe, in all the common analyſes of bodies, it is obtained entire, and a great deal of pains and accuracy is required to decompoſe it, or reduce it to its principles. It is, alſo, the ſole origin of the taſte, ſmell, and many other properties of bodies. It may be defined to be a mixed body, formed by the concretion of fire, water, and earth, into a ſolid rigid ſubſtance, ſoluble in water, and fuſible by fire. As its particles may be conceived to cohere by large ſurfaces only, ſalt cannot be friable like earth; but requires a conſiderable force to ſeparate its parts, which fly off from one another, like thoſe of glaſs, with a ſenſible noiſe. It becomes the cauſe of taſte and ſmell, becauſe its particles terminate in ſtrong points, which vellicate the nervous membranes of the tongue and noſe.

Salt is of three kinds, acid, acrid, or alcaline, and a third, compounded of the other two, called, in Latin, ſal ſalſus.

Acid ſalt is a congeries of inflexible ſolid parts, of an oblong figure, and pointed at both ends. That its particles are rigid and hard, appears from the force, with which it divides and diſſolves ſolid bodies; and its ſharpneſs and pungency are evident from the effect it has on the tongue, different from the corroſion of acrid ſalts. Acid ſalt is eaſily diſſolved by water, and after this ſolution, its particles are equally diſperſed through that fluid, and have the ſame motion with it. Hence it appears, that the particles of both ſubſtances have nearly the ſame ſpecific gravity; and, likewiſe, that the motion of the aqueous parts is great enough to overcome the coheſion of the parts of ſalt.

Concerning the manner, in which the particles of acid ſalt are compounded of fire, water, and earth; nothing can with certainty be determined. It may be conjectured however, that ſeveral particles of water, being collected into one little maſs, are cemented together by ſome particles of fire and earth, lodged in the interſtices left between them; and that all theſe, taken together, are diſpoſed in an oval form, or that of two cones joined by their baſis. This configuration, however, is not the ſame in all acid ſalts; but the differences may all be reduced to three; the nitrous acid, the muriatic, and the vitriolic.

The word alcali is derived from cali, the Arabic name of a plant, from the aſhes of which a ſalt is obtained, proper for making glaſs: and thence it came to be uſed for all ſalts got from the aſhes of plants, and afterwards for all ſalts, and other ſubſtances whatever, that ferment with acids.

Acrid or alcaline ſalt ſeems to be a congeries of ſpherical particles, with rough, prickly ſurfaces, becauſe of their great diſpoſition to motion, and their corroſive burning taſte, the points of the ſurfaces acting on the nervous papillæ of the tongue, like ſo many files, whereas acid ſalt is only pungent. But then, by theſe points, a larger ſurface is expoſed to the action of fire, than could otherwiſe; and thus the particles of alcaline ſalt are very volatile, and eaſily raiſed by a gentle heat. The origin of this ſalt is probably from a certain connection of acid points and terreſtrial particles; becauſe, in many operations of chymiſtry, ſuch ſalts ariſe from the mixture of acid ſalts and earth; as we ſee particularly in the preparation of fixed nitre, and fermentation of urine. Nitre, being diſtilled, leaves a compound fixed ſalt behind, of the ſame nature with the ſea-ſalt, out of which, by a nicer diſtillation, an acid liquor may be extracted, without any volatile ſalt, or, at leaſt, but a very ſmall quantity; but if the ſame fixed ſalt be previouſly fermented, and then diſtilled, it yields a large quantity of volatile ſalt, and very little fixed ſalt, or acid; becauſe, by fermentation or calcination, the acid and terreſtrial particles are intimately mixed, the acid ſpicula entering the pores of the earth, and ſo forming new molecules, which are denſe and cloſe towards the center, and prickly on the ſurface, by the acid points ſticking out. Such are the particles of volatile alcalies, of which, if a great number be joined together, they muſt cohere very ſtrongly, by means of their points, and form molecules of irregular figures, in the pores of which watery, earthy, ſulphureous, or acid particles may be received and abſorbed. Hence it is that acid ſalts are ſeldom pure; and, as they are very often filled with particles of earth, they reſiſt the moſt violent degree of fire, and will ſooner melt than be raiſed by it. This is the true nature of fixed alcaline ſalt, ſuch as ſalt of tartar, or the ſalts got from the aſhes of plants called lixivial ſalts. If they be impregnated with ſulphureous particles, they continue very volatile, and are raiſed by a ſmall degree of fire; as we ſee in ſalt of urine, hartſhorn, and others got from animals. Acrid ſalts eaſily melt, when expoſed to a moiſt air, becauſe the particles of water contained in it readily enter their pores. When thus melted, they become properly lixivia, and are commonly termed oils, as oil of tartar per deliquium. Volatile alcaline ſalts, diluted with water, are called volatile urinous ſpirits; ſuch as the volatile ſpirit of urine, of hartſhorn, blood, and others.

The ſal ſalſus, or third kind, is compounded of acid and alcaline molecules united together; and the figure of its particles is principally produced by the kind of acid that enters its compoſition. The impreſſion theſe particles make on the tongue is more dull and languid, than that made by acid or acrid parts alone; becauſe the molecules formed by the union of theſe are larger in bulk, and conſequently leſs diſpoſed for motion; and, therefore, though there is a greater quantity of alcali, or points, in one of theſe molecules than in the former, yet their bulk makes them leſs capable of entering the pores of the ſkin, and vellicating the nervous papillæ, than when they are in a disjointed ſtate. The taſte of theſe ſalts is termed ſaline, and varies according to the thickneſs of the ſpicula, their number, and the other parts that may be mixed with them. That this is the true original of this kind of ſalts, is evident, both from the artificial compoſition thereof, from acid and acrid particles blended together, and from the reſolution of them into the ſame. Thus, by pouring ſpirit of nitre, of ſea-ſalt, or of vitriol, on ſalt of tartar, new ſalts are produced exactly of the ſame appearance with nitre, ſea-ſalt, or vitriol; and, by analyſing theſe three ſalts, the eſſential ſalts of plants, ſal ammoniac, and others, an acid and alcaline ſalt may be obtained, in ſome fixed, in others volatile.

What the chymiſts call oil, or ſulphur, is not a ſimple ſubſtance, but a body compounded of fire, water, earth, and ſalt; but we chuſe to introduce it here, as it is moſt commonly ſeparated in the operations of chymiſtry, and is not reſolved without difficulty into its component Principles. It may be defined to be a fluid, viſcid, inflammable, tranſparent body, without taſte or ſmell, though by mixing it differently with ſalts theſe ſenſible qualities are produced, compounded of fire, water, earth, and ſalt; and it may be conceived to conſiſt of many flakes or flocculi, each of which is again made up of very ſmall flexible filaments, formed of the four Principles before-mentioned, by fermentation, as well in the bowels of the earth, as in the bodies of vegetables and animals: thus, an aromatic plant, growing in water, will, by diſtillation, yield an oil, which could never have been obtained from the water, in which it ſtood; and all oils may by art be reſolved into water, earth, and ſalt. From theſe filaments variouſly concreted ariſe the flakes already mentioned, which are of different thickneſſes; and in the pores thereof is lodged the element of fire, which, alſo, runs in rivulets through their interſtices. Upon theſe depend the ſpecific levity, inflammability, and fluidity of oil; but, as, notwithſtanding the inteſtine motion cauſed by the element of fire, the ſmall flakes ſtill adhere, in ſome meaſure, together, this fluid muſt be more viſcid than any other.

From what has been ſaid concerning the nature of alcaline ſalts, and the figure and ſtructure of the oily flocculi, it is eaſy to conceive, why all alcalies diſſolve ſulphurs; for, ſince the alcaline particles are ſpherical and prickly, they cannot enter the interſtices of the flakes, without carrying away ſome of them from the reſt; and thus, by degrees, thoroughly diſſolving them. But the denſe, rigid, and pointed molecules of acids, being forced into theſe interſtices, increaſe the denſity, and ſtrengthen the texture of the flocculi; and from the diverſity of theſe, and of the acid ſpicula mixed with them, ariſe the different kinds of ſulphurs. Sulphurs formed in the earth by fire, acid ſalt, water, and a very fine earth, are termed bitumens. Thus bitumens diſſolved in a large quantity of water form the mineral oils, or petrolea. But, if they are mixed with earth and ſalt, the ſolid bitumens are produced, differing from one another in degrees of purity, according to the quantity or groſsneſs of the earth, or different degrees of mixture. Thus foſſil coals, jet, amber, and the common bitumens, and bituminous earths, are produced. If there be but a ſmall quantity of earth, and much acid ſalt, the common mineral ſulphur of brimſtone is formed. If the mineral original bitumen is joined to a fuſible earth, capable of vitrification, it communicates to it a metallic form; that is, the ſound, brightneſs, ſoftneſs, ductility, malleability, and all the other ſenſible qualities of metals.

This origin of mineral bitumens may be confirmed by many experiments: if a mixture of equal parts of oil of vitriol and oil of turpentine be digeſted together, for a conſiderable time, in a very gentle heat, and afterwards diſtilled in a retort, there will come over firſt a yellowiſh liquor, reſembling petroleum, both in ſmell and conſiſtence. What remains in the retort, is, at firſt, a ſoft bitumen, and afterwards turns into an hard black maſs, eaſily inflammable, and, when burnt, ſmelling exactly like a foſſil coal. But, if the diſtillation be continued, a white acid liquor will next be obtained, which, by ſtanding, lets fall a grey powder, which is true common brimſtone, a yellow ſubſtance of the like nature adhering likewiſe to the neck of the retort; what is left behind being a black, ſhining, light ſubſtance, diſpoſed in thin diſgregated ſtrata, like talc, in which, by the help of the load-ſtone, iron may be diſcovered. Thus, therefore, all theſe bitumens may be artificially produced; and the analyſis of the natural ones further confirms the manner of their formation. Thus the chymiſts have ſhewn, that metals are nothing but bituminous ſubſtances, which have undergone a long digeſtion; for, by depriving of them of their ſulphur, they are reduced to aſhes, and then to glaſs. This is eaſily ſeen in the imperfect metals; for, if any of them are expoſed to a long heat, and eſpecially to the rays of the ſun, collected by a large burning-glaſs, the ſulphureous principle flies off, and only a calx or aſhes will be left behind, which, in a more vehement degree of fire, are preſently vitrified; and, by reſtoring the ſulphur, this glaſs may be again reduced to metal.

The inflammable ſubſtances in animals and vegetables conſiſt of a different combination of the Principle of ſulphur and acid ſalt; for the oil, or ſulphur, in theſe, is formed by a ſmall portion of earth joined to the elementary fire, acid ſalt, and water: this oil, when joined to an acrid ſalt, produces gums; when joined to a fine acid, and a new acceſſion of fiery particles, it produces eſſential oils and inflammable ſpirits; but, if the acids are more groſs, by reaſon of a larger quantity of earth joined to them, it forms reſins, as we learn from the artificial compoſition of all theſe ſubſtances. By mixing ſpirit of wine with volatile ſpirit of urine, we obtain a mucilaginous concretion, or thin gum. Oil of olives and ſalt of tartar, melted together, make a kind of ſoap, or thick gum; and if ſpirit of wine be digeſted for a long time with oil of vitriol, and then diſtilled, an inflammable oil is obtained, reſembling, in ſmell, and other qualities, the eſſential oils of plants, a true reſin being left behind in the retort.

In animals this ſame oleaginous Principle forms the fat, and other glutinous or gelatinous ſubſtances; theſe laſt being compoſed of an acrid volatile ſalt and oil, as appears from their analyſis: but fat is made of the ſame oil and acid ſalt; for, if oil of olives and ſpirit of nitre be mixed together and digeſted, a ſubſtance will be found in every thing reſembling the fat of animals.

Sulphureous ſubſtances found in bodies are either fixed or volatile. The fixed ſulphurs are either ſolid, ſuch as fat, reſin, and the bitumens; or fluid, as oils. Volatile ſulphurs are ſuch as fly off with a ſmall degree of fire, and have an appearance compounded of that of oil and water. Such are inflammable ſpirits obtained from the flowers and fruits of plants.

All bodies conſiſt of the five Principles above-mentioned; and the diverſity of bodies ariſes entirely from the different combination of them. Theſe combinations, or mixtures, of the five Principles are produced by motion, and that motion entirely by the element of fire. This motion is ſometimes ſlow and inſenſible, as in the growth and maturation of fruits; more lively and quick, as in the fermentation of muſt; or very vehement, as in the deflagration of bodies. All theſe motions go by the general name of fermentation; and, if they tend to the deſtruction or diſſolution of bodies, they are termed corruption.

The moſt ſimple, or leaſt compounded, mixture of Principles is ſeen in the fermentation of ſalts, which conſiſts principally of water and earth; next of ſulphur, made up of water, earth, and ſalt; then of the acrid ſalts, both fixed and volatile, with the eſſential ſalts of plants, and ſulphureous bodies, whether ſolid or liquid. The manner how theſe mixtures are brought about, and the changes ariſing from thence, will beſt be underſtood by examples.

The fruit of the vine, juſt beginning to put on the form of grapes, is inſipid, or, at leaſt, taſtes only like graſs. As it grows, a certain acidity is diſcovered in it, which at firſt produces an auſtere taſte; then an acerb one, in which ſtate the juice is termed omphacium, which, in diſtillation, yields a great quantity of water, ſome acid liquor, and a ſmall portion of oil, a large proportion of earth being left behind. In this juice, therefore, the auſtere and acerb taſtes are owing to the acid ſpicula, juſt breaking out through the earthy parts, but not wholly diſengaged from them. When the grapes come to be fully ripe, the auſtere taſte is changed to a ſweet one, becauſe the juice, being more thoroughly penetrated by the element of fire, is rarefied, and put in a more violent motion, by which the ſalts throw off their earthy involucra entirely, and by a new combination of theſe ſalts, water, and earth, are formed ſulphurs, or oils. But, if any of the acid ſalts remain after the compoſition of the ſulphurs, they continue ſtill entangled by the filaments thereof; and their ſharp points, vellicating the nervous papillæ of the tongue, create that agreeable taſte which is perceived in muſt. The muſt in diſtillation affords a quantity of phlegm, next a pretty large portion of an acid water, ſome acrid or volatile urinous ſalt, and a quantity of thick oil, much beyond what was gained by the former diſtillation. Laſtly, from the maſs that remains in the retort, an acrid fixed ſalt may be obtained by the common method. However, even in this juice of ripe grapes, or muſt, the ſalts and oils are not carried to the greateſt degree of fineneſs, and part of them remain ſtill involved in the earthy involucra. But, if a large quantity of it be ſet to ferment, the igneous particles begin to act again, and by them this inteſtine commotion is is continued, till all the groſs parts are either attenuated, or thrown out from the liquor, and the ſalts and ſulphurs perfectly ſet free from the earthy parts, and intimately mixed with one another. The liquor in this ſtate is wine, and the groſs parts, that fall to the bottom of the veſſel, are termed lees. The briſkneſs and penetrating quality of the wine ſeems to be owing to the large proportion of the element of fire, which harbours among the filaments of the ſulphureous flocculi; and, this liquor being diſtilled, we obtain, firſt, a great quantity of inflammable ſpirit, then a copious phlegm, next an acid liquor with ſome portion of an oily ſpirit, a thick oil, and, laſtly, a ſmall quantity of caput mortuum, which will yield a little fixed ſalt.

In this diſtillation a far leſs quantity of acid liquor is obtained than from muſt, which, on the other hand, yields no inflammable ſpirit. If the lees of wine be well dried, and then diſtilled, they yield a very large quantity of volatile urinous ſalt, the acid ſalts, combined with the ſulphureous and earthy particles, being, by fermentation and heat, converted into alcaline ſalts.

In the ſame manner, if green peas or beans be diſtilled, they yield a great deal of acid liquor and phlegm, with a ſmall proportion of oil. If they are firſt fermented with common water, an inflammable ſpirit is got from them in the ſame manner as from wine; and, if they are kept for ſome months in a dry place, they yield a volatile alcaline ſpirit, without any acid liquor, or, at leaſt, but very little. Whence it is evident that acid ſalt, by its union with other particles, is changed into ſulphur; and, by its union with earthy and ſulphureous particles, becomes an alcaline volatile ſalt; and by being driven into earthy particles, becomes an alcaline volatile ſalt; as, by being driven into earthy particles, alone, by the force of fire in calcination, it is changed into a fixed alcali.

It may be proper, upon this occaſion, to obſerve, that the ſalts of all plants are not entirely alike, but differ from one another, not only as the quantity of ſulphur, water, or earth, which is joined to the acid, is greater or leſs; but, alſo, according to the original nature of the acid which enters their compoſition. Acid ſalts, as we have already ſaid, are of three kinds, muriatic, nitrous, and vitriolic. Muriatic ſalts, ſuch as ſea-ſalts and ſal-gemmæ, being cryſtalliſed, put on a cubic figure, the particles thereof appearing to be formed of two quadrilateral pyramids, joined together by their baſes. Nitrous cryſtals repreſent priſms with ſix ſides formed by the juxta-poſitions of two triangular pyramids; and cryſtals of vitriol ſeem to conſiſt of two hexagonal pyramids, as far as can be judged by the particles thereof, when carefully ſeparated from all metals. Theſe original ſalts, combined with others, form compound ſalts, of almoſt all kinds. Thus, in the vegetable kingdom, the different ſorts of vinegars are nothing but ſome original acid ſalt diſſolved in phlegm. The eſſential ſalts of plants, obtained without fire, conſiſt of ſome acid joined with particles of earth, or of the other Principles. Sal ammoniac ariſes from the union of acid and volatile alcaline ſalts. Fixed alcalies are only the acid ſpicula ſtruck into earthy molecules; and volatile alcalies conſiſt of the ſame acid joined to very fine particles of earth and ſulphur, ſo as to form prickly globules. Moreover, the ſame varieties of acid ſalts are to be met with in vegetables, that are found in minerals. Thus, the eſſential ſalts of pellitory of the wall, borage, wild cucumber, and the like, are nitrous; and, when thrown upon burning charcoal, they fulminate like nitre. The fixed ſalts of carduus benedictus, glaſs-wort, and ſpurge, are like ſea-ſalt, their particles having the ſame cubic figure; and, when thrown upon burning charcoal, they decrepitate. The cryſtals of tartar are like thoſe of vitriol; and that they are formed by a vitriolic acid, appears from the ſulphureous ſmell of tartar, when artfully calcined. Beſides the ſaline compounds already mentioned, other mixtures are formed in plants, ſuch as gums, reſins, honies, and the like. Gums are ſomething between acid and oil, being an acid ſalt, ſo fixed in the earth, as that the greateſt part of it is changed to an alcali, the other into oil; ſo that the mixture ariſing from thence is an oily ſalt, reſembling the ſaponaceous concretes of the chymiſts, made of oil of olives, and a lixivium of tartar, or the mucilaginous bodies formed of ſpirit of wine and the volatile ſpirit of urine. And thus we ſee, that all ſeeds which are oily, when ripe, are in the beginning only a mucilage, or imperfect oil. Reſins conſiſt of oil and acid, and accordingly are artificially produced by mixing ſpirit of vitriol with ſpirit of wine, or of turpentine. They are either ſolid, or liquid; but theſe differ from one another only in the proportion of earth, that enters their compoſition. Melleous juices, which either exude ſpontaneouſly from plants, ſuch as manna, or are obtained by art, as ſugar, are eſſential ſalts, conſiſting of a mixture of acid and alcali, with a large proportion of oil.

The mineral kingdom furniſhes us with a great variety of inſtances of the way how the Principles of bodies may be combined together. The lime-ſtone and parget are ſo framed, that, by being calcined, a vaſt number of cells are opened by the fire, into which water eaſily enters, with an hiſſing or colliſion of the included igneous particles. If the water remains long in theſe little receptacles, nitrous parts are formed, as we ſee in old walls, built with theſe materials, from which nitre may always be obtained. The greateſt part of this nitre, by diſtillation, is changed into an acid ſpirit; but, by calcination, turns to an alcaline ſalt. And it may be, that the nitre of the ancients, or that alcaline mineral ſalt, which was dug out of the earth in Egypt, and other countries, and is obtainable by art from mineral waters, was nothing but nitre calcined by the heat of the earth, and ſo converted into a fixed alcaline ſalt. The vitriolic acid, joined with different metallic ſubſtances, produces all the kinds of vitriol; with an aſtringent earth, it forms alums; and, with the Principle of fire, common brimſtone, which, by deflagration, may again be converted into oil of vitriol, the other Principles flying off. Brimſtone may, likewiſe, be artificially produced by uniting the Principle of fire to any vitriolic acid.

The like mixture of the Principles of bodies may be obſerved in the animal kingdom. Chyle and milk contain a latent acid; which eaſily diſcovers itſelf by putrefaction, but this acid ſalt, having undergone a due fermentation, or ſome other action analogous to that in the animal body, is changed into a volatile alcali, obtainable in great plenty from the blood, ſerum, bile, urine, and other juices

In a healthful body, however, theſe volatile alcalies are never perfectly formed, the animal ſalts being more of the nature of ſal ammoniac, with a mixture of earthy and oily parts, to which mixture the glutinous quality of the blood and ſerum is owing. By putrefaction, or calcination, all animal liquors are changed, ſo as to afford perfect volatile alcalies, has has been evidently ſhewn by experiment. *Geoffroy.*

Original PRINCIPLE, *principium originale*, a name, given by Tachenius and ſome other authors, to ſalt, without conſidering it as acid, alcali, or of any other particular kind, or any mode of exiſtence: the ſalt of wood, or vegetables, not being alcali till after burning, and ſo on; but ſalt, that is the baſe of theſe, being evidently exiſtent in the bodies, and, in regard to wood, ſeeming indeed to conſtitute its character as ſuch, ſince the evaporation of it cauſes the wood to loſe all its ſtrength and to decay; for we find that in rotten wood there is no alcali at all; and the Venetians, who ſink their timber for ſhip-building into water, while it is green, prevent, by that means, the evaporation of thoſe ſalts, and leave the wood little leſs durable than ſtone. On theſe and the like principles, Tachenius ſuppoſes ſalt to be the true original Principle of bodies; but many others allow this name only to water, or at leaſt that water is, in almoſt all natural bodies, the moſt copious, the moſt active, and the moſt influencing part; yet even this is found to agree much better with ſome bodies than with others. The birch and elder feed more kindly on a thin uliginous moiſture; the elm, the pine, the fir, and cedar, chuſe a ſtronger liquor; yet theſe and many more, the moſt widely different that can be from one another, are often ſeen to draw their whole ſubſtance and bulk, whether annual or perennial, from the ſame piece of ground, impregnated, ſo far as is poſſible to be judged of, with the ſame ſort of juices, and from the ambient air and dews, when as yet by our beſt diligence we cannot diſtinguiſh the liquors or ſalts approaching cloſely to their ſeveral roots; and, if we wholly take away and exchange all the earth from the roots of trees whoſe barks, ſap, and fruit, have very much differing ſalts, and are of very different kinds, yet we ſhall find each tree to proſper better by the exchange, inſtead of being injured by it.

Hence, we may ſuſpect, that the very contextures of the bodies of plants, from the firſt germination of the ſeed, and as they form gradually from the inviſible Principles of their ſeeds, are, however and imperceptibly, the natural alembics, where the common water and air are changed into the different juices, gums, reſins, &c. as the animal organiſation in the body of the cow changes the juices of every ſort of graſs and eſculent vegetable into one and the ſame milk.

The ſea plants growing on ſhells, or affixed to yet harder ſtones, taking no nouriſhment from the thing they grow on, but being as it were all root, and taking the whole from the ambient water; yet, that water giving to different ſpecies of them, though itſelf the ſame to all, the different textures of herbaceous to ſome; tough and horny to others; and to ſome abſolutely ſtony; as the corals, many of which have been eſteemed, by the generality of authors, abſolute ſtones.

Trees of ſeveral different kinds are found in America growing out of the ſame dry and hard rock, and the various kinds of ſucculent plants; the poiſonous ones and their oppoſites, or remedies, as the euphorbium and the antieuphorbium; the moſt acid pungent, and the moſt ſoft and emollient, out of the ſame barren lands of Arabia, where it could not be expected that any plants could grow at all. Hence, it is eaſy to apprehend, how the ſeeds in their time, and after them the roots, ſtems, and leaves of trees, may be the proper ſtrainers to ſeparate and prepare the ſeveral ſaps and juices, and to ferment the liquors into their ſeveral particular ſalts. See the articles VEGETATION and SALT.

PRISMA'TIC *Antennæ*, in natural hiſtory, a term uſed to expreſs the horns or antennæ of a peculiar genus of butterflies. As theſe of the common kind are ſlender and buttoned at the end, thoſe become very thick a little way from their origin, and continue of that diameter through their whole length, till juſt at the extremity they turn a little and terminate in a ſharp point. The anterior part of theſe is rounded, as in the other kinds; but behind they are made up of two planes meeting in an angle, and each of theſe has a row of hairs on it: theſe meeting at their ſummits, form an angular vacant ſpace or alley below. *Reaumur's Hiſt. Inſ.*

PRI'STIS, *the ſaw-fiſh*, a fiſh of a very large ſize, and armed with a very remarkable weapon like a ſaw, at his noſe, from whence he has his name. See *plate* XXXV. *fig.* 5.

This fiſh, from its large ſize, is generally reckoned a kind of whale, but erroneouſly; for it is truly of the ſame genus with the galei or hound fiſhes. It is aſh-coloured on the back, and white on the belly; its head is of a heart-like ſhape, and flatter; its mouth is placed far below the end of the ſnout, and in the under part of the head, as in the zygæna; its lips are rough and ſharp, like a file, but it has no other teeth; its head is terminated by a long and flat bony ſubſtance, furniſhed on each ſide with jags or points like deep teeth of a ſaw. There are from twenty to thirty of theſe teeth on each ſide. The body is round, and grows ſmall towards the tail. The ſword of this fiſh is ſometimes five feet long. It is found in the Weſtern Ocean.

PRI'VET-*fly*, in natural hiſtory, the name of a ſpecies of fly, very common on the ſhrub from whence it has its name. It is called the erinopterus, and is remarkable for having its wings deeply divided into ſegments, ſo that they ſeem compoſed of feathers like birds wings. The creature, as it ſits, looks like a ſmall feather.

PROBABI'LITY (*Dict.*)— In the doctrine of Probability, one important obſervation may be made, viz. that, if one premiſs only of an argument be probable, the concluſion is neceſſarily probable. But, if two or more premiſſes be probable, the concluſion will not be neceſſarily probable. Thus, for inſtance, ſuppoſing the Probability of each premiſs expreſſed by $\frac{7}{10}$, the Probability of the concluſion will be but $\frac{49}{100}$, which ſhews it to be improbable. For we may call any thing improbable, if the meaſure of the chance for its happening is leſs than $\frac{1}{2}$. If there had been three premiſſes, and the Probability of each equal to $\frac{7}{10}$, the Probability of the concluſion would be $\frac{743}{1000}$, which is conſiderably improbable. Again, ſuppoſing the Probability of the truth of each premiſs be 2 to 1, or expreſſed by $\frac{2}{3}$, the Probability of the concluſion, in the caſe of the two premiſſes, would be $\frac{4}{9}$. Where three premiſſes are aſſumed to infer a concluſion, this would be $\frac{8}{27}$; and, in caſe of four premiſſes, the Probability of the concluſion would be but $\frac{16}{81}$, which is leſs than $\frac{1}{5}$; ſo that one might with advantage lay four to one againſt the truth of a concluſion founded upon four probable premiſſes, for the truth of which, ſeparately taken, two to one might be laid. It is to be obſerved, in all theſe caſes, that the premiſſes are ſuppoſed independent, that is, not neceſſarily connected with each other.

Hence, it is eaſy to account, how it happens, that the moſt plauſible political and phyſical reaſonings lead ſo often to concluſions falſe in fact.

Mr. de Moivre has ſolved two problems, tending to eſtabliſh the degree of aſſent that ought to be given to experience. He determines from his ſolutions, that after taking a great number of experiments, it ſhould have been obſerved, that, if the happenings or failings of an event have been very near in a ratio of equality, it may ſafely be concluded, that the Probabilities of its happening or failing, at any one time aſſigned, are very near equal.

And if, after taking a great number of experiments, it ſhould be perceived, that the happenings and failings have been nearly in a certain proportion, ſuch as two to one, it may ſafely be concluded, that the Probabilities of happening or failing, at any one time aſſigned, will be very near in that proportion; and, that the greater the number of experiments has been, ſo much the nearer the truth will the conjectures be, that are derived from them.

Chance very little diſturbs the events which, in their natural inſtitution, were deſigned to happen or fail according to ſome determined law. For, if in order to help our conception, we imagine a round piece of metal, with two poliſhed oppoſite faces, differing in nothing but their colour, whereof one may be ſuppoſed to be white and the other black; it is plain that this piece may with equal facility exhibit a white or black face; and we may even ſuppoſe that it was framed with that particular view of ſhewing ſometimes the one face, ſometimes the other; and that conſequently, if it be toſſed up, chance will decide the appearance.

But, although chance may produce an equality of appearance, and that a greater inequality, according to the length of time in which it may exert itſelf, ſtill the appearance, either one way or the other, will perpetually tend to a proportion of equality. This is, in like manner, applicable to a ratio of inequality; and thus in all caſes it will be found, that, although chance produces irregularities, ſtill the odds will be infinitely great, that in proceſs of time, theſe irregularities, will bear no proportion to the recurrency of that order which naturally reſults from original deſign. *De Moivre's Doctrine of Chances.*

Kepler's PRO'BLEM (*Dict.*) — As to the ſolution of this Problem, the late excellent mathematician, Mr. Machin, obſerves, that many attempts have been made, at different times, but never yet with tolerable ſucceſs, towards the ſolution of the Problem propoſed by Kepler: to divide the area of a ſemicircle into given parts, by a line from a given point of the diameter, in order to find an univerſal rule for the motion of a body in an elliptic orbit. For, among the ſeveral methods offered, ſome are only true in ſpeculation, but are really of no ſervice. Others are not different from his own, which he judged improper. And, as to the reſt, they are all ſome way or other ſo limited and confined to particular conditions and circumſtances, as ſtill to leave the Problem in general untouched. To be more particular, it is evident, that all conſtructions by mechanical curves are ſeeming ſolutions only, but in reality unapplicable; that the roots of infinite ſerieſes are, upon account of their known limitations in all reſpects, ſo far from affording an appearance of being ſufficient rules, that they cannot well be ſuppoſed as offered for any thing more than exerciſes in a method of calculation. And then, as to the univerſal method, which proceeds by a continued correction of the errors of a falſe poſition, it is, when duly conſidered, no method of ſolution at all in itſelf; becauſe, unleſs there be ſome antecedent rule or hypotheſis to begin the operation, (as ſuppoſe that of an uniform motion about the upper focus, for the orbit of a planet; or that of a motion in a parabola for the perihelion part of the orbit of a comet; or ſome other ſuch) it would be impoſſible to proceed one ſtep in it. But, as no general rule has ever yet been laid down to aſſiſt this method, ſo as to make it always operate, it is the ſame in effect, as if there were no method at all. And accordingly in experience it is found, that there is no rule now ſubſiſting, but what is abſolutely uſeleſs in the elliptic orbits of comets; for, in ſuch caſes, there is no other way to proceed but that which was uſed by Kepler: to compute a table for ſome part of the orbit, and therein examine, if the time to which the place is required, will fall out any where in that part. So that, upon the whole, it appears evident, that this Problem (contrary to the received opinion) has never yet been advanced one ſtep towards its true ſolution.

Mr. Machin afterwards proceeds to give his own ſolution of this Problem, which is particularly neceſſary in orbits of a great excentricity; and he illuſtrates his method by examples, for the orbits of Mercury, of Venus, of the comet of the year 1680. All which ſhew the univerſality of that method.

PROBOU'LEUMA, Προβούλευμα, among the Athenians, a decree or vote of the Areopagus, or ſenate of Athens.

PROCHARISTE'RIA, Προχαριστήρια, in antiquity, a ſolemn ſacrifice which the Athenian magiſtrates yearly offered to Minerva, when the ſpring firſt began to appear. *Potter*, *Archæol. Græc.*

Marine PRODUC'TIONS.—To inveſtigate the nature of marine Productions, Count Marſigli moiſtened in ſea water ſome branches of coral, newly taken up, and found that the tubercles ſo frequent on its branches, after a little time, all opened themſelves into regular flowers, each terminated by eight points. Theſe were white, and were ſuſtained by a cup divided into the ſame number of ſegments; and, on the taking the branches again out of the water, he found theſe flowers all immediately cloſe themſelves up again, and only make red irregular tubercles; and the vigorous branches of coral retained this property of opening and cloſing their flowers for ſeven or eight days after they were taken out of the ſea. The tubercles, when wounded, yield a milky juice, in which, doubtleſs, there is contained the ſeed of the coral.

When this curious naturaliſt had found coral to be a true plant in its organiſations, it appeared a very deſireable thing to enquire whether it would yield vegetable principles, or thoſe of another kind, in a chemical analyſis. This experiment he carefully tried, not only on coral, but on many other of the ſtony plants, and found all of them yielded the ſame principles with vegetables. All of them yielded on this trial a phlegm, a volatile urinous ſpirit, with always more or leſs of a ſea-water ſmell, and a thick reddiſh black fœtid oil; and the remainder in the retort being calcined, always yielded a fixed alkaline ſalt like that of plants.

The ſea productions all afforded more or leſs of every one of theſe principles; but thoſe of which ever kind that had been kept a long time after they were taken out of the ſea, afforded always much leſs fluid matter than thoſe which were freſh. Mr. Geoffroy was very deſirous of following the count in theſe reſearches; and, as he had no opportunity of procuring any freſh coral from the ſea, he put into the retort a pound of the common red coral, ſold by the druggiſts, which is what wants the outer bark, and has uſually been a long time out of the ſea. This yielded two drachms and ſix grains of a reddiſh volatile urinous ſpirit, and two or three grains of a fœtid oil; and the remainder in the retort, by the common treatment, yielded afterwards near two drachms of a lixivial ſalt of a ſaline taſte: the matter remaining after the lixiviation appeared a ſort of lime.

The ſpirit appeared to Mr. Geoffroy to be wholly the ſame with that which the count had himſelf ſent to the academy under the title of the ſpirit of old coral; and it appeared ſcarce at all different from ſpirit of harts-horn. It turned ſyrup of violets green, and made a white coagulation with a ſolution of corroſive ſublimate. Though this was much the ſame with the count's ſpirit, the ſalts drawn from the caput mortuum were, however, different; that made by Mr. Geoffroy making a white coagulation with a ſolution of corroſive ſublimate, and that of count Marſigli having no ſuch effect; both the ſalts, however, turned the ſyrup of violets green, and Mr. Geoffroy judged the difference in the other trial to be only from the count's ſalt having been leſs carefully made, and containing ſome quantity of earth, which weakened its power and prevented this effect from it. It follows from all this, that the corals and all the other ſea productions of that claſs are properly plants, though of the hardneſs of ſtones: and, in the internal uſe of coral, it may be proper to conſider it not as a mere abſorbent, but as a ſubſtance which contains alſo a volatile ſpirit and oil, which may well be ſuppoſed to poſſeſs virtues above thoſe of mere abſorbent earth; and that there is great difference between the virtues of ſuch coral as has been long kept, and ſuch as is newly taken up from the ſea. The count, after analyſing coral in this manner, tried the ſame proceſs on ſeveral parts of the rocks on which the coral grew; but he found this to yield none of theſe active principles; ſo that, although the hardneſs of corals and of ſtones ſeems the ſame, there is great difference between them in their principles, their nature, and effects.

There is yet one queſtion remaining to be determined in this point, which is, what is the nature of this milky juice contained in the tubercles of flowers, and perhaps not leſs in the other parts of coral. The count has ſaid nothing as to its qualities, but Boccone ſays it is hot, acrid, and almoſt cauſtic; whence perhaps it is the natural ſap of the plant, and is analogous to the milky juice of the ſpurges and ſome other plants. It were to be wiſhed that this liquor could be tried with acids and alkalies, and in other ways, and its analyſis known: this perhaps would make our knowledge of the nature of this ſtony vegetable perfect. *Mem. Acad. Par.* 1708.

PROGRE'SSION (*Dict.*)—As a right line, or figure, may increaſe continually, and never amount to a given line or area; ſo there are Progreſſions of fractions which may be continued at pleaſure, and yet the ſum of the terms be always leſs than a given number. If the difference between their ſum and this number decreaſe in ſuch a manner, that by continuing the Progreſſion, it may become leſs than any fraction, howſmall ſoever, that can be aſſigned, this number is the limit of the ſum of the Progreſſion, and is what is underſtood by the value of the Progreſſion, when it is ſuppoſed to be continued infinitely. Theſe limits are analogous to the limits of figures, and they mutually aſſiſt each other. The areas of figures can, in many caſes, be no otherwiſe expreſſed than by ſuch Progreſſions; and, when the limits of figures are known, they may ſometimes be advantageouſly applied for approximating to the ſums of certain Progreſſions.

PRONG-*hoe*, in huſbandry, a term uſed to expreſs an inſtrument uſed to hoe or break the ground near, and among the roots of plants.

The ordinary contrivance of the hoe in England is very bad, it being only made for ſcraping on the ſurface; but, the great uſe of hoeing being to break and open the ground, beſides the killing the weeds, which the ancients, and many among us, have thought the only uſe of the hoe, this dull and blunt inſtrument is by no means calculated for the purpoſes it is to ſerve.

The Prong-hoe conſiſts of two hooked points of ſix or ſeven inches long, and, when ſtruck into the ground, will ſtir and remove it the ſame depth as the plough does, and thus anſwer both the ends of cutting up the weeds and opening the land. The ancient Romans had an inſtrument of this kind, which they called the bidens; but they were afraid of its uſe in their fields and gardens, and only uſed it in their vineyards. The Prong-hoe comes into excellent uſe, even in the horſe-hoeing huſbandry; in this the hoe-plough can only come within three or four inches of the rows of the corn, turneps, and the like; but this inſtrument may be uſed afterwards, and with it the land may be raiſed and ſtirred, even to the very ſtalk of the plant. *Tull's Husbandry.*

PROOF, in the ſugar trade, a term uſed by the refiners of ſugar for the proper ſtate of the diſſolved ſugar when it ſhould be ſet to harden.

The proceſs in the bringing ſugar to this ſtate may be underſtood by performing the whole work in miniature in this manner: take ſix pounds of coarſe, or unrefined ſugar; diſſolve it over the fire in ſix pints of lime-water; add to this the whites of four eggs beat up to a froth, ſtir the whole together; then boil the liquor to a higher conſiſtence than ſyrup, or till, when expoſed to the cold, it will concrete into grains. This is what the ſugar-bakers call proof. Pour this ſyrup into an earthen mould, with a hole at its bottom; ſtop the hole, and ſet the veſſel in a moderately warm place.

The ſugar in a few days will ſet and harden; then open the hole at the bottom, and lay over the top of the ſugar ſome tobacco pipe clay, made into a ſoft pap with water. The clay muſt be afterwards wetted at times, and the water from among it will gradually be ſoaked up by the ſugar, and, running thro' it, will waſh away the treacle, without diſſolving the grained part. And thus all the treacle will by degrees be drained out of the maſs, and a loaf of white ſugar procured. *Shaw's Lectures.*

PROPAGA'TION (*Dict.*) — The number of vegetables that may be propagated from an individual, is very remarkable, eſpecially in the moſt minute plants.

It has been recorded, that, in ſo large a plant as the common mallow, the annual product of one ſeed was no leſs than 200,000; but it has been ſince proved, by a ſtrict examination into the more minute parts of the vegetable world, that ſo deſpiſed a plant as the common wall moſs produces a much more numerous

merous off-ſpring. In one of the little heads of this plant, there have been counted 13824 ſeeds. Now allotting to a root of this plant eight branches, and to each branch ſix heads, which appears to be a very moderate computation, the produce of one ſeed is $6 \times 13824 = 82944$; and 8×82944 gives 663552 ſeeds, as the annual produce of one ſeed, and that ſo ſmall that 13824 of them are contained in a capſule, whoſe length is but one ninth of an inch, its diameter but one twenty-third of an inch, and its weight but the thirteenth part of a grain. *Philoſophical Tranſactions*, N°. 478.

PRO′PHECY (*Dict.*— A late author obſerves, that the Chriſtians have this in common with the Pagans, that they equally build their religions upon Prophecy and divination.

He adds, that divination was an art learned by the Romans in ſchools, or under diſcipline; as the Jews did propheſying in the ſchools and colleges of the prophets.

In theſe ſchools, as the learned Dodwell obſerves, the candidates for Prophecy were taught the rules of divination practiſed by the Heathens, who were in poſſeſſion of the art long before them. It is added, that the gift of Prophecy was not an occaſional thing, but a conſtant and ſtanding matter of fact; and ſome think they have diſcovered an eſtabliſhment of an order of prophets in the Old Teſtament, in analogy to the Heathen diviners.

This is certain, from many paſſages of ſcripture, that there were great numbers of prophets among them, who not only exerciſed their talents in matters of government and religion, but even in the diſcovery of loſt goods, and in telling of fortunes.

One of the greateſt difficulties in Chriſtianity turns upon the completion of the ſcripture Prophecies. In the prophets of the Old Teſtament are frequent predictions of the Meſſiah; which the writers of the New frequently urge to the Jews and Heathens as fulfilled in Jeſus Chriſt; and on this principle evince the truth of his miſſion: but theſe texts thus urged from the Old, in the New Teſtament, are ſometimes not to be now found in the Old; and, at other times, not urged in the New in the literal and obvious ſenſe which they ſeem to bear in the Old; whence moſt of the Chriſtian commentators, divines, and critics, ancient and modern, judge them to be applied in a ſecondary, typical, allegorical, or myſtical ſenſe.

Thus, for inſtance, St. Matthew, after an account of the conception of the Virgin, and the birth of Jeſus, ſays, ‘ All this was done, that it might be fulfilled which was ſpoken by the prophet, ſaying, Behold a virgin ſhall be with child, and ſhall bring forth a ſon, and they ſhall call his name Emanuel.’ But the words, as they ſtand in Iſaiah, whence they are ſuppoſed to be taken, do, in their obvious and literal ſenſe, relate to a young woman who was to bring forth a child in the days of Ahaz; as appears from the context, and is owned by Grotius, Huetius, Caſtalio, Curcellæus, Epiſcopius, Hammond, Simon, Le Clerc, Lamy, &c.

This Prophecy then being not fulfilled in Jeſus, in the primary, literal, or obvious ſenſe of the words, is ſuppoſed, like the other Prophecies cited by the apoſtles, to be fulfilled in a ſecondary, typical, or allegorical ſenſe; i. e. this Prophecy, which was firſt literally fulfilled by the birth of the prophet's ſon in the time of Ahaz, was again fulfilled by the birth of Jeſus, as being an event of the ſame kind, and intended to be ſignified either by the prophet, or by God, who directed the prophet's ſpeech.

Grotius obſerves this to be the caſe in moſt, if not all the Prophecies and citations quoted from the Old in the New Teſtament; and Dodwell, with Sir John Marſham, refer even the famous Prophecy in Daniel, about the ſeventy weeks, to the time of Antiochus Epiphanes; ſhewing, that the expreſſions taken thence by Chriſt, and urged by him as predicting the deſtruction of Jeruſalem by the Romans, have only in a ſecondary ſenſe a reſpect to that deſtruction.

And even that famous Prophecy in the Pentateuch, ‘ A prophet will the Lord God raiſe up unto thee, like unto me; to him ſhall ye hearken;’ which St. Luke refers to as ſpoken of Jeſus Chriſt, is, by Simon, Grotius, Stillingfleet, &c. underſtood to ſignify, in its immediate ſenſe, a promiſe of a ſucceſſion of prophets.

It is allowed then, the apoſtles applied the Prophecies they quote from the Old Teſtament, in a typical ſenſe: but unhappily the rules whereby they quoted are loſt. Dr. Stanhope laments the loſs of the Jewiſh traditions or rules for interpreting ſcripture received among the rabbins, and followed by the apoſtles. But this loſs Surenhuſius, Hebrew profeſſor at Amſterdam, thinks he has retrieved from the Jewiſh talmud, and the ancient Jewiſh commentaries; and has accordingly publiſhed to the world the rules whereby the apoſtle quoted the Old Teſtament.

But the truth is, theſe rules are too precarious, ſtrained, and unnatural, to gain much credit.

Mr. Whiſton condemns all allegorical explanation of the Prophecies of the Old Teſtament cited in the New, as weak, enthuſiaſtic, &c. and adds, that if a double ſenſe of the Prophecies be allowed, and there be no other method of ſhewing their completion, than by applying them ſecondarily and typically to our Lord, after having been in their firſt and primary intention long ago fulfilled in the times of the Old Teſtament, we loſe all the real advantages of the ancient Prophecies, as to the proofs of Chriſtianity.

He therefore ſets up a new ſcheme in oppoſition thereto: he owns, that, taking the preſent text of the Old Teſtament for genuine, it is impoſſible to expound the apoſtles citations of the Prophecies of the Old Teſtament, on any other than the allegorical foundation; and therefore, to ſolve the difficulty, is forced to have recourſe to a ſuppoſition contrary to the ſenſe of all Chriſtian writers before him, viz. that the text of the Old Teſtament has been greatly corrupted ſince the apoſtolical age by the Jews.

His hypotheſis is, that the apoſtles made their quotations out of the Old Teſtament rightly and truly from the Septuagint verſion, which in their time was in vulgar uſe, and exactly agreed with the Hebrew original; and that, as they made exact quotations, ſo they argued juſtly and logically from the obvious and literal ſenſe of the ſaid quotations, as they then ſtood in the Old Teſtament: but that, ſince their times, both the Hebrew and Septuagint copies of the Old Teſtament have been ſo greatly corrupted, and ſo many apparent diſorders and diſlocations introduced therein, as to occaſion many remarkable differences and inconſiſtences between the old Old and New Teſtament in reſpect to the words and ſenſe of thoſe quotations.

As to the manner wherein theſe corruptions were introduced, he ſays, the Jews in the ſecond century greatly corrupted and altered both the Hebrew and Septuagint, eſpecially in the Prophecies cited by the apoſtles, to make their reaſoning appear inconcluſive: that in the third century, they put into Origen's hand one of theſe corrupted copies of the Septuagint; which Origen, miſtaking for genuine, inſerted in his Hexapla, and thus brought into the church a corrupted copy of the Septuagint; and that, in the end of the fourth century, the Jews put into the hands of the Chriſtians, who till then had been almoſt univerſally ignorant of the Hebrew, a corrupted copy of the Hebrew Old Teſtament.

The diſagreement then between the Old and New teſtament, in reſpect to the ſaid quotations, he contends, has no place between the genuine text of the Old Teſtament, now no-where exiſting, but only between the preſent corrupted text of the Old and New Teſtament: and therefore, to juſtify the reaſonings of the apoſtles, he propoſes to reſtore the text of the Old Teſtament, as it ſtood before the days of Origen, and as it ſtood in the days of the apoſtles: from which text thus reſtored, he doubts not it will appear, that the apoſtles cited exactly, and argued juſtly and logically from the Old Teſtament.

But this ſcheme of accompliſhing Prophecies labours under difficulties at leaſt as great as the allegorical ſcheme. Its foundation is incredible, and its ſuperſtructure, from firſt to laſt, precarious. In effect, it is inconceivable the Old Teſtament ſhould be ſo corrupted; and it may even be made appear, that the Hebrew and Septuagint diſagreed in the times of the apoſtles: add to this, that the means whereby he propoſes to reſtore the true text, will never anſwer that end; nor has he himſelf, from all the means he was yet poſſeſſed of, able to reſtore one prophetical citation, ſo as to make that ſeem literally, which before only ſeemed allegorically applied.

PRO′PHET (*Dict.*)— Among the canonical books are thoſe of ſixteen Prophets; four of which are denominated the greater Prophets, viz. Iſaiah, Jeremiah, Ezekiel, and Daniel; ſo called from the length or extent of their writings, which exceed thoſe of the others, viz. Hoſea, Joel, Amos, Obadiah, Jonas, Micah, Nahum, Habakkuk, Haggai, Zachariah, and Malachi; who are called the leſſer Prophets, from the ſhortneſs of their writings.

The Jews only reckon three greater Prophets; Daniel they exclude, as no more to be ranked among the Prophets than David: not but that both the one and the other foretold many important things: but becauſe their manner of life differed from that of the other Prophets, David being a king, and Daniel a peer.

In the Greek church, the leſſer Prophets are placed in order before the great ones; apparently becauſe many of the leſſer Prophets are more ancient than the greater.

Among the Greeks too, Daniel is ranked among the leſſer Prophets.—In the 48th chapter of Eccleſiaſticus, Iſaiah is particularly called the great Prophet, both on account of the great things he foretold, and the magnificent manner wherein he did it.

Spinoſa ſays, the ſeveral Prophets propheſied according to their reſpective humours; Jeremiah, for inſtance, melancholy and dejected with the miſeries of life, propheſied nothing but miſfortunes.

Dacier obſerves, that among the ancients the name poet is ſometimes given to Prophets; as that of Prophet is at other times given to poets.

PRO′POLIS, a name given by authors to a certain ſubſtance more glutinous and tenacious than wax, with which the bees ſtop up all the holes or cracks in the ſides of their hives. Beſides the wax and the honey which the bees gather in their daily travels, they have occaſion for this third ſubſtance at times, and that eſpecially when they are placed in a new hive. They very well know that it is neceſſary to their well-being, that they ſhould be kept perfectly warm in their hives, and ſtrongly defended againſt the injuries of weather: to keep out wind and rain they ſtop every little chink in the ſides of their habitations with this matter; nor is this the only reaſon for it, they have other enemies of the inſect tribe, which are on different occaſions eternally ſeeking a way into their habitations; ſome of them feed on their honey, others on the wax, and others on their young offspring. To be guarded againſt theſe, they as firmly as poſſible block up all the accidental holes or cracks in the hive, and guard the principal opening, which ſerves as the gate of their city, by numbers, which are always placed round about it, ſo that no enemy can come in that way.

The Propolis itſelf is a ſubſtance perfectly different from wax; it is found to be ſoluble in ſpirit of wine, or in oil of turpentine, and is ſoft when laid on by the bees, but grows hard afterwards; it may, however, even in its hardeſt ſtate, be ſoftened by heat. By all theſe obſervations it appears very plainly, that the Propolis is a true genuine vegetable reſin, of the nature of many others which we have in common uſe. The authors who have treated of this ſubſtance, have deſcribed it very differently; George Pictorius, who has written of bees, ſays, that it is of a yellow colour and an agreeable ſmell, like that of ſtorax, and that it would ſpread when warmed properly. Pliny and the old writers deſcribe it as being of a rank and ſtrong ſmell, and being uſed as a ſuccedaneum for galbanum; and at preſent we uſually find it of anaromatic and agreeable ſmell, inſomuch that ſome rank it among the perfumes. The apothecaries, in ſome places, keep it as a medicine in their ſhops; but it is to be obſerved, that it is very various in its nature; for, according to the deſcription of authors, it is ſometimes ſweet and ſometimes ſtinking. The truth is, that the bees who collect it as a thing to be uſed for a cement, not for food, are not over curious of what plants they gather it from; and hence in different hives it is found of very different colours and conſiſtences. In general, the Propolis is of a browniſh red colour on the ſurface; the red ſometimes predominating, ſometimes the brown; but when broken it is yellowiſh, or approaching to the colour of wax. It very readily diſſolves in ſpirit of wine or oil of turpentine, and this ſolution is of a fine gold colour, and will ſerve extremely well as a varniſh to colour ſilvered picture frames, or other the like work, into the appearance of gold. It gives a fine gold-like appearance, indeed, to any white metal of a poliſhed ſurface; all that it wants is a little more brilliancy, which is eaſily given it by mixing a ſmall quantity of maſtich, or of ſandarach, in the ſolution. *Reaumur's Hiſt. Inſ.*

Mr. Reaumur was very deſirous of ſeeing the manner in which the bees collected this tenacious matter, but watched them in vain in the fields and upon the trees: although an accident gave him an opportunity of obſerving them at their work on this occaſion. He had taken off the cover of one of his glaſs hives on ſome occaſion, and as there was much of the Propolis ſticking to its edges, which the bees had uſed to ſtop the crevices when it was fixed in, the bees of a neighbouring hive ſoon found that here was this ſubſtance ready for them in large quantities together, and that they could have it at a very eaſy rate: they therefore immediately detached a party to bring it off; and, in conſequence of this, it was eaſy to obſerve any one of them, during the whole courſe of his work. The manner of ſeparating it from the ſubſtance it lay upon, was by detaching very ſmall pieces at a time with the teeth; theſe, when they had been with great labour looſened from the reſt, were delivered to the foot of one of the fore-legs: they were here moulded into a roundiſh lump, and, after a little working, delivered to the foot of a ſecond leg; and finally, by this to the flat triangular piece which makes the third joint of the hinder legs, the part deſtined in their common labours to receive the lumps of rough wax. It is here preſſed down with ſome violence, and afterwards fixed in its place by three or four ſtrokes from the ſame foot; and then another is ſeparated by the teeth in the ſame manner, and by the ſame means carried to the ſame place, and added to the firſt piece; and ſo on till the whole work is finiſhed. The bees which found this treaſure loaded themſelves to an immenſe degree, carrying off a lump larger than a pea on each leg; and the time to take up theſe large parcels was at leaſt half an hour: after carrying this load to the hive, and being relieved from it by the joint labours of ſeveral others, the bee which has been at all the pains of collecting it, joins a cluſter of others in ſome quiet part of the hive, where it reſts for the remainder of that day.

PROPO'RTIONALS, in geometry, are quantities, either linear or numeral, which bear the ſame ratio or relation to each other.

Thus, if 3, 6, 12, be Proportionals, then will 3 : 6 : : 6 : 12.

To find a fourth PROPORTIONAL *to three given lines*, A B, A C, and B D, *Plate* XXXV. *fig.* 6. draw an angle F A G at pleaſure; from A ſet off the firſt of the lines to B; from A, the ſecond, to C; and, from B to D, the third: draw B C; and in D make an angle equal to A B C: then is C E the fourth Proportional ſought; and A B : A C : : B D : C E.

If a third Proportional be required to two given lines, A B and A C; make B D equal to A C, i. e. let A C be repeated twice: then A B : A C : : A C : C E.

To find a mean PROPORTIONAL *between two given lines* A B and B E, *fig.* 7, join the two given lines into one continued right line, and biſect it in C. From C, with the interval of A C, deſcribe a ſemicircle A D E; and from B erect a perpendicular B D; this is the mean Proportional ſought; and A B : B D : : B D : B E.

The geometricians have been theſe two thouſand years in ſearch of a method for finding two mean Proportionals.

The ancients performed it mechanically, by the meſolabe deſcribed by Eutochius; and many of them attempted to give the demonſtration; ſome by the ſolid loci, as Menechmus; others by the plain loci, as Nicomedes, Diocles, and, in our times, Vieta; and others by implicit motions, as Plato, Archytas, Pappus, and Sporus; others tentatively, by the deſcription of circles, as Hero and Apollonius, &c. but all in vain.

To find a mean PROPORTIONAL *between two numbers:* half the ſum of the two given numbers is an arithmetical mean Proportional, and the ſquare root of their product a geometrical mean Proportional.

PROSLAMBANO'MENOS, in the ancient Greek muſic, was the firſt note of their ſcale, whether aſcending or deſcending. It was uſual among the Greeks to conſider a deſcending as well as an aſcending ſcale; the former proceeding from acute to grave preciſely by the ſame intervals as the latter did from grave to acute. The not diſtinguiſhing theſe two ſcales has led ſeveral learned moderns to ſuppoſe, that the Greeks, in ſome centuries, took the Proſlambanomenos to be the loweſt note in their ſyſtem; and in other centuries to be the higheſt. But the truth of the matter is, that the Proſlambanomenos was the loweſt or higheſt note, according as they conſidered the aſcending or deſcending ſcale. The learned author of this remark thinks this diſtinction of the aſcending or deſcending ſcales conducive to the variety and perfection of melody; but he ſays, he never met with above one piece of muſic, where the compoſer appeared to have any intelligence of that kind: and this piece was above 150 years old.

PRO'STYPA, Πρόστυπα, in the ſculpture of the ancients, images carved in ſuch a manner as to be only half raiſed above the ground, or plain, on which they were formed.

PRUNE'LLA, *ſelf-heal*, in botany, the name of a ſmall plant, uſed in medicine.

The roots of ſelf-heal are ſlender, creeping, and fibrous; the lower leaves grow on long foot-ſtalks, beſet with a few hairs, as is the reſt of the plant; they are broadeſt in the middle, and narrower at both ends, leſs than betony, and not at all indented about the edges. The ſtalks are ſquare, about a foot high, with two leaves ſet oppoſite at a joint, which are not many on a ſtalk; the nearer they grow to the top, the ſhorter are their foot-ſtalks. The flowers are ſet on the top of the branches in thick verticillated ſpikes, of a purple colour, having an hollow galea, and a three lipped labella, ſtanding in brown flattiſh calyces, ſix ſtanding round the ſtalk in a whorle; each flower is ſucceeded by four longiſh brown ſeeds growing in the bottom of the calyx. It grows every-where in meadows and paſture grounds, flowering all the latter part of the ſummer: the leaves and flowers are uſed. Self-heal is reckoned among the vulnerary plants, and is accounted ſerviceable for all ſorts of wounds, and putrid ulcers. It is reſtringent, and good for inward bleedings, and making bloody water; and is much uſed in gargles, for ulcers in the mouth, throat, or gums, either the juice or a ſtrong decoction. *Miller's Bot. Off.*

Prunella abſterges and conſolidates: its principal uſe is in wounds, eſpecially of the lungs, and in coagulations of blood. It is alſo frequently employed outwardly in wounds, and in the quinſey, and other affections of the mouth and fauces, hæmorrhages, and dyſenteries, and in ſpitting or piſſing of blood. *Hiſt. Plant. adſcript. Boerhaave.*

PRU'NING (*Dict.*)—There is not any part of gardening, which is of more general uſe than that of Pruning; and, yet, it is very rare to ſee fruit-trees ſkilfully managed: almoſt every gardener will pretend to be a maſter of this buſineſs, though though there are but few who rightly underſtand it; nor is it to be learned by rote, but requires a ſtrict obſervation of the different manners of growth of the ſeveral ſorts of fruit-trees; ſome requiring to be managed one way, and others muſt be treated in a quite different method, which is only to be known from carefully obſerving how each kind is naturally diſpoſed to produce its fruit: for ſome ſorts produce their fruit on the ſame year's wood, as vines; others produce their fruits, for the moſt part, upon the former year's wood, as peaches, nectarines, &c. and others upon curſons or ſpurs, which are produced upon wood of three, four, or five, to fifteen or twenty years old, as pears, plums, cherries, &c. therefore, in order to the right management of fruit-trees, there ſhould always be proviſion made to have a ſufficient quantity of bearing wood in every part of the trees, and, at the ſame time, there ſhould not be a ſuperfluity of uſeleſs branches, which would exhauſt the ſtrength of the trees, and cauſe them to decay in a few years.

The reaſons which have been laid down for Pruning of fruit-trees, are as follow: firſt, to preſerve trees longer in a vigorous bearing ſtate; the ſecond is, to render the trees more beautiful to the eye; and, thirdly, to cauſe the fruit to be larger, and better taſted.

1. It preſerves a tree longer in an healthy bearing ſtate; for by Pruning off all ſuperfluous branches, ſo that there are no more left upon the tree than are neceſſary, or than the roots can nouriſh properly, the root is not exhauſted in ſupplying uſeleſs branches, which muſt afterwards be cut out; whereby much of the ſap will be uſeleſly expended.

2. By ſkilful Pruning of a tree, it is rendered much more pleaſing to the eye: but here I would not be underſtood to be an advocate for a ſort of Pruning which I have ſeen too much practiſed of late; viz. the drawing a regular line againſt the wall, according to the ſhape or figure they would reduce the tree to, and cutting all the branches, ſtrong or weak, exactly to the chalked line; the abſurdity of which practice will ſoon appear to every one who will be at the pains of obſerving the difference of thoſe branches ſhooting the ſucceeding ſpring. All therefore that I mean by rendering a tree beautiful, is, that the branches are all pruned according to their ſeveral ſtrengths, and are nailed at equal diſtances in proportion to the different ſizes of their leaves and fruit; and that no part of the wall, ſo far as the trees are advanced, be left unfurniſhed with bearing wood. A tree well managed, though it does not repreſent any regular figure, yet will appear very beautiful to the ſight, when it is thus dreſſed, and nailed to the wall.

3. It is of great advantage to the fruit; for the cutting away all uſeleſs branches, and ſhortening all the bearing ſhoots, according to the ſtrength of the tree, will render the tree more capable to nouriſh thoſe which are left remaining, ſo that the fruit will be much larger, and better taſted. And this is the advantage which thoſe trees againſt walls of eſpaliers have to ſuch as are ſtandards, and are permitted to grow as they are naturally inclined; for it is not their being trained either to a wall or eſpalier which renders their fruit ſo much better than ſtandards, but becauſe they have a leſs quantity of branches and fruit for their roots to nouriſh; and, conſequently, their fruit will be larger, and better taſted.

There are many perſons who ſuppoſe, that if their fruit-trees are but kept up to the wall or eſpalier, during the ſummer-ſeaſon, ſo as not to hang in very great diſorder, and, in winter, to get a gardener to prune them, it is ſufficient: but this is a very great miſtake; for the greateſt care ought to be employed about them in the ſpring, when the trees are in vigorous growth; which is the only proper ſeaſon to procure a quantity of good wood in the different parts of the tree, and to diſplace all uſeleſs branches, as ſoon as they are produced, whereby the vigour of the tree will be intirely diſtributed to ſuch branches only, as are deſigned to remain; which will render them ſtrong, and more capable to produce good fruit; whereas, if all the branches are permitted to remain, which are produced, ſome of the more vigorous will attract the greateſt ſhare of the ſap from the tree, whereby they will be too luxuriant for producing fruit, and the greateſt part of the other ſhoots will be ſtarved, and rendered ſo weak, as not to be able to produce any thing elſe but bloſſoms and leaves, as hath been before mentioned; ſo that it is impoſſible for a perſon, let him be ever ſo well ſkilled in fruit-trees, to reduce them into any tolerable order by winter Pruning only, if they are wholly neglected in the ſpring.

There are others, who do not intirely neglect their trees during the ſummer ſeaſon, as thoſe before mentioned; but yet do little more good to them by what they call ſummer Pruning; for theſe perſons neglect their trees at the proper ſeaſon, which is in April and May, when their ſhoots are produced, and only about Midſummer go over them, nailing in all their branches, except ſuch as are produced fore-right from the wall, which they cut out; and at the ſame time often ſhorten moſt of the other branches; all which is intirely wrong practice; for thoſe branches which are intended for bearing the ſucceeding year, ſhould not be ſhortened during the time of their growth, which will cauſe them to produce two lateral ſhoots from the eyes, below the place where they were ſtopped, which ſhoots will draw much of the ſtrength from the buds of the firſt ſhoot, whereby they are often flat, and do not produce their bloſſoms; and if thoſe two lateral ſhoots are not intirely cut away at the winter Pruning, they will prove injurious to the tree, as the ſhoots which theſe produce will be what the French call water-ſhoots: and in ſuffering thoſe luxuriant ſhoots to remain upon the tree until Midſummer, before they are diſplaced, they will exhauſt a great ſhare of the nouriſhment from the other branches, as was before obſerved; and by ſhading the fruit all the ſpring-ſeaſon, when they are cut away, and the other branches faſtened to the wall, the fruit, by being ſo ſuddenly expoſed, will receive a very great check, which will cauſe their ſkins to grow tough, and thereby render them leſs delicate. This is to be chiefly underſtood of ſtone-fruit and grapes; but pears and apples, being much hardier, ſuffer not ſo much, though it is a great diſadvantage to thoſe alſo, to be thus managed.

It muſt alſo be remarked, that peaches, nectarines, apricots, cherries, and plums, are always in the greateſt vigour, when they are the leaſt maimed by the knife; for, where theſe trees have large amputations, they are very ſubject to gum and decay; ſo that it is certainly the moſt prudent method carefully to rub off all uſeleſs buds when they are firſt produced, and pinch others, where new ſhoots are wanted to ſupply the vacancies of the wall; by which management trees may be ſo ordered, as to want but little of the knife in winter Pruning, which is the ſureſt way to preſerve theſe trees healthful, and is performed with leſs trouble than the common method.

The management of pears and apples is much the ſame with theſe trees in ſummer; but in winter they muſt be very differently pruned: for, as peaches and nectarines do, for the moſt part, produce their fruit upon the former year's wood; and therefore muſt have their branches ſhortened according to their ſtrength, in order to produce new ſhoots for the ſucceeding year; ſo pears, apples, plums, and cherries, on the contrary producing their fruit upon curſons or ſpurs, which come out of the wood of five, ſix, or ſeven years old, ſhould not be ſhortened, becauſe thereby thoſe buds which were naturally diſpoſed to form theſe curſons or ſpurs, would produce wood-branches, whereby the trees would be filled with wood, but never produce much fruit; and as it often happens, that the bloſſom-buds are firſt produced at the extremity of the laſt year's ſhoot, ſo, by ſhortening the branches, the bloſſoms are cut away, which ſhould always be carefully avoided.

There are ſeveral authors who have written on the ſubject of Pruning in ſuch a prolix manner, that it is impoſſible for a learner to underſtand their meaning: theſe have deſcribed the ſeveral ſorts of branches, which are produced on fruit-trees; as wood-branches, fruit-branches, irregular branches, falſe branches, and luxuriant branches; all which they aſſert, every perſon who pretends to Pruning, ſhould diſtinguiſh well: whereas there is nothing more in all this but a parcel of words to amuſe the reader, without any real meaning; for all theſe are comprehended under the deſcription already given of luxuriant or uſeleſs branches, and ſuch as are termed uſeful for fruit-bearing branches: and, where due care is taken in the ſpring of the year, to diſplace theſe uſeleſs branches, as was before directed, there will be no ſuch thing as irregular, falſe, or luxuriant branches, at the winter Pruning; therefore it is to no purpoſe to amuſe people with a cant of words, which, when fully underſtood, ſignify juſt nothing at all.

The following hints will be of great uſe in Pruning ſtandard trees.

Firſt, you ſhould never ſhorten the branches of theſe trees, unleſs it be where they are very luxuriant, and grow irregular on one ſide of the tree, attracting a great part of the ſap of the tree, whereby the other parts are unfurniſhed with branches, or are rendered very weak; in which caſe the branch ſhould be ſhortened down as low as is neceſſary, in order to obtain more branches, to fill up the hollow of the tree: but this is only to be underſtood of pears and apples, which will produce ſhoots from wood of three, four, or more years old; whereas moſt ſorts of ſtone fruit will gum and decay, after ſuch amputations.

But from hence I would not have it underſtood, that I would direct the reducing of theſe trees into an exact ſpherical figure, ſince there is nothing more deteſtable, than to ſee a tree, which ſhould be permitted to grow as it is naturally diſpoſed, with its branches produced at proportionable diſtances, according to the ſize of the fruit, by endeavouring to make it exactly regular at its head, ſo crouded with ſmall weak branches, as to prevent the air from paſſing between them; which will render it incapable to produce fruit. All that I intend by this ſtopping of luxuriant branches, is only when one or two ſuch happen on a young tree, where they intirely draw all the ſap from their weaker branches, and ſtarve them; and then it is proper to uſe this method, which ſhould be done in time, before they have exhauſted the roots too much.

Whenever this happens to ſtone fruit, which ſuffer much more by cutting than the former ſorts, it ſhould be remedied by ſtopping or pinching thoſe fruits in the ſpring, before they have obtained too much vigour; which will cauſe them to puſh out ſide branches, whereby the ſap will be diverted from aſcending too faſt to the leading branch, as hath been directed for wall trees; but this muſt be done with caution, as before.

You muſt alſo cut out all dead or decaying branches, which cauſe their head to look very ragged; eſpecially at the time when the leaves are upon the tree, theſe being deſtitute of them, have but a deſpicable appearance; beſides, theſe will attract noxious particles from the air, which are injurious to the trees; therefore, the ſooner they are cut out, the better: in doing of this, you ſhould obſerve to cut them cloſe down to the place where they were produced, otherwiſe, that part of the branch left will decay, and prove equally hurtful to the tree; for it ſeldom happens, when a branch begins to decay, that it does not die quite down to the place where it was produced, and, if permitted to remain long uncut, does often infect ſome of the other parts of the tree. If the branches are large which you cut off, it will be very proper, after having ſmoothed the cut part exactly even with a knife, chiſſel, or hatchet, to put on a plaiſter of grafting clay, which will prevent the wet from ſoaking into the tree at the wounded part.

All ſuch branches as run acroſs each other, ſhould alſo be cut out; for theſe not only occaſion a confuſion in the head of the tree, but, by lying over each other, rub off their bark by their motion, and very often occaſion them to canker, to the great injury of the tree; and on old trees, eſpecially apples, there are often young vigorous ſhoots from the old branches near the trunk, which grow upright into the head of the trees: theſe therefore ſhould carefully be cut out every year, leſt, by being permitted to grow, they fill the tree too full of wood; which ſhould always be guarded againſt, ſince it is impoſſible for ſuch trees to produce ſo much, or ſo good fruit, as thoſe trees whoſe branches grow at a farther diſtance; whereby the ſun and air freely paſs between them, in every part of the tree. *Miller's Gard. Dict.*

PRU'NUS, *the plum*, in botany, a genus of trees, whoſe characters are:

The calyx is monophyllous and quinquefid; the flower roſaceous, pentapetalous, and furniſhed with thirty or more ſtamina. The ovary in the bottom of the calyx becomes an ovated or globous fruit, containing, under a thin, ſmooth membrane, or ſkin, a ſoft pulp, in the middle of which is incloſed an oblong or oval flattiſh ſtone, acuminated at both ends, and containing a ſingle kernel; the pedicle of the fruit is of a good length. See PLUM.

PRU'SSIAN *Blue.* See the article *Pruſſian* BLUE.

PSE'UDO-*acacia*, *baſtard acacia*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the papilionaceous kind, and from its cup there ariſes a piſtil, ſurrounded by a fimbricated membrane. This finally becomes a flat pod, which burſts into two parts, and contains kidney-ſhaped ſeeds. To this it is to be added, that the leaves are placed in ſeries over-againſt one another, on a middle rib, the end of which is terminated by a pod leaf.

PSEUDO-*pulex arboreus*, in natural hiſtory, the name of a genus of inſects deſcribed by Mr. Reaumur, and ſomewhat approaching in their form to the pulex arboreus; but having their wings covered with a ſquammoſe caſe, which thoſe creatures have not, and having broader and flatter bodies.

Theſe principally live upon the fig-tree and the box; they paſs through a ſort of metamorphoſis into a hopping fly, ſuppoſed by ſome of the nature of the graſhopper; but erroneouſly, for that animal has a caſe for its wings, and the other not.

PSEUDO-*tinea*, in natural hiſtory, the name of a very remarkable inſect, deſcribed by Mr. Reaumur, approaching to the nature of the tinea, or cloaths moth, while in the worm ſtate; but not making themſelves coats of the ſubſtance of leaves, cloaths, &c. though they form a ſort of caſes for their defence againſt a very terrible enemy.

Theſe creatures are truly of the caterpillar kind, and have, in the manner of any of theſe inſects, ſixteen legs. They feed on wax, and for food enter the bee-hives; where they boldly engage the bees, and are not to be prevented by them from feeding, though at the expence of their habitations and the cells of their reſervoirs of honey: ſo that it is no uncommon thing for a ſwarm of bees to be forced to change their place of habitation, and make new combs elſewhere; leaving the old ones to this contemptible victor, whom they know not how to drive out or diſpoſſeſs.

PSI'TTACUS, *the parrot*, in the Linnæan ſyſtem of zoology, makes a particular and diſtinct genus of birds, of the order of the hawks; the diſtinguiſhing characters of which are, that the feet have two toes before and two behind.

The parrot is a very well known bird, of which there are ſeveral very beautiful ſpecies.

Its head is large, and beak and ſkull extremely hard and ſtrong. It might ſeem a wonder why nature has deſtined to this, which is not naturally a bird of prey, but feeds on fruits and vegetable ſubſtances, the crooked beak allotted to the hawk and other carnivorous birds; but the reaſon ſeems to be, that the parrot being a heavy bird, and its legs not very fit for ſervice, it climbs up and down trees by the help of this ſharp and hooked bill, with which it lays hold of any thing, and ſecures itſelf, before it ſtirs a foot; and beſides this, it helps itſelf forward very much, by pulling its body on with this hold.

Of all animals, the parrot and crocodile are the only ones which move the upper jaw; all creatures elſe moving the under only. As ſome particular animals beſides are fond of particular foods, ſo the parrot loves nothing ſo much as the ſeeds of the carthamus, or baſtard ſaffron; and eats them without any hurt, though they are a purge when given to other creatures.

The parrots are common both in the Eaſt and Weſt-Indies: they are a very briſk and lively bird in the warmer countries, but with us loſe much of their vigour. They lay two or three eggs in the hollow of a tree.

In all the known parrots the noſtrils are round and placed very high upon the beak, and very near one another.

PSY'LLIUM, *fleawort*, in botany, a genus of plants, whoſe characters are:

It agrees, in all reſpects, with the plantago and coronopus; only the ſtalks are leafy and ramous, or divided into a multitude of branches.

Fleawort has round hairy ſtalks, a foot or more high, beſet at the joints with two, and ſometimes three, long, narrow, ſharp-pointed, ſomewhat hairy leaves, often lightly cut in about the edges. From the boſom of theſe, towards the upper part of the ſtalks, ariſe pretty long ſlender foot-ſtalks, bearing at the ends round ſhort ſpikes of ſmall ſtamineous flowers, of four leaves apiece, with a-pices ſtanding out, and ſomewhat reſembling the heads of the long plantain; and are ſucceeded by round ſeed-veſſels; containing two round ſhining reddiſh-brown ſeeds, that look like fleas, whence it takes its name. The root is ſtringy and fibrous; it grows in the ſouthern parts of France, from whence we have the ſeed which only is uſed.

Some attribute a purgative quality to this ſeed, but we uſe it only to extract a mucilage for ſore mouths and throats, and to help thruſhes and quinſeys. It is, likewiſe, uſeful to obtund ſharp acrimonious humours, which corrode the bowels, and cauſe dyſenteries. Outwardly it is good for ſore, inflamed, blood-ſhot eyes. *Miller's Bot. Off.*

The ſalt of this plant reſembles that of coral, but is mixed with a little of ſal ammoniac, a great deal of ſulphur, and terreſtrial parts.

By the chymical analyſis, it yields a great deal of oil and earth, no volatile concrete ſalt, a little urinous ſpirit, and ſeveral acid liquids.

Pſyllium-ſeed is uſed in the electuary de pſyllio; but its purgative virtue ought to be attributed to the ſcammony, and the other cathartics. The mucilage of Pſyllium is very lenifying, and good to aſſwage the inflammation of the eyes: it is given in a clyſter for the dyſentery, and inflammation of the kidnies. *Martyn's Tournefort.*

PTI'LOSIS, πτίλωσις, from πτίλος, a perſon who has loſt his eye-laſhes. A baldneſs of the eye-laſhes. Paulus Ægineta, Lib. 3. cap. 23, ſays, the Ptiloſis and madaroſis are diſorders of the external margins of the eye-lids. The madaroſis is only a falling off of their hairs, produced by a defluxion of acrid humours; whereas, in a Ptiloſis, the margins of the eye-lids become thick and callous; ſo that it is a diſorder complicated of a madaroſis and an hard lippitude: for which reaſon the remedies proper for the one are, alſo, conducive to the removal of the other. For procuring the growth of the hairs, and preventing an itching and corroſion of the corners of the eyes, the beſt medicine is that of Philoxenes, diſtinguiſhed by the epithet dry. For removing a dimneſs of ſight, the following preparation is excellent:

Take of cadmia, eight drachms; of ſal ammoniac, two drachms; of ſaffron and ſpikenard, each two drachms; and of white pepper, one drachm: mix all together for uſe. Antimony, alſo, anſwers the ſame purpoſe.

For a corroſion of the corners of the eyes and a Ptiloſis:

Take of calcined antimony, extinguiſhed in women's milk, thirteen drachms; of aloes, myrrh, and ſpikenard, each two drachms; and of calcined barley, carefully triturated, four drachms: mix, and uſe dry.

Another medicine for a Ptiloſis, and corroſion of the eye-lids, is thus prepared:

Take of the marrow of an ox, a ſufficient quantity; triturate it duly with ſoot, and uſe it.

The ſoot intended for this purpoſe is to be thus prepared: immerſe a ſufficient quantity of paper in the oleum ſeſaminum: put the paper in a lamp, kindle it, and hold above it a ſmooth ſhell, or brazen veſſel, in order to collect the ſoot, which, when triturated, with the above-mentioned marrow, is to be uſed. The rennet of a calf is, alſo, excellent for the ſame purpoſe.

For a milphoſis, an increaſe of fleſh in the corners of the eyes, and other inveterate diſorders of them, Soſander directs the following medicine:

Take of cadmia, antimony, crude chalcitis, and crude miſy, each eight drachms: bruiſe theſe, mix them with honey, and torrefy them, after extinguiſhing them in wine, and triturating them: add to them, of ſpikenard, two drachms; of torrefied ſaffron, two drachms; and of pepper, one drachm; all theſe, when triturated together, are to be uſed.

The more ſimple medicines contributing to the cure of a Ptiloſis, and a corroſion of the eye-lids, are boiled amurca, Indian lycium, and Armenian ſtone, uſed by the painters; which laſt, when mixed with water, and uſed by way of ointment, conſumes the peccant humours, and augments the natural hairs; the ruſt of iron, triturated for many days in the heat of the ſun, and reduced to the form of a collyrium, with wine and myrrh; and ſpodium, mixed with the juice of onions, is all of ſervice.

PU'CERON, the name given by naturaliſts to a ſmall inſect of a peculiar nature, frequently found on the young branches of trees and plants, and that often in ſuch cluſters, as wholly to cover them.

The Puceron is a ſmall animal, but very numerous in the ſeveral genera and ſpecies; inſomuch that Reaumur has obſerved that there is ſcarce a vegetable to be found, either in the fields or gardens, that has not its peculiar ſpecies of Puceron to feed on its juices. M. de la Hire, of the Paris academy, has left many curious particulars in regard to theſe animals, in the year 1703; and Mr. Lewenhoek, and others ſince, have given figures and deſcriptions of ſeveral of the ſpecies.

Pucerons are all viviparous animals, and that after a very ſingular manner. It is to be obſerved, that the name is ſcarce more expreſſive of the creature, than ſome of the others given of late to inſects; that of the polype to a creature which has no legs or feet at all, is very improper; and that of the Puceron hardly leſs ſo, as it would naturally lead us to imagine, that the creature thus called was able to hop like a flea, whereas, in reality, it is very ſlow in its motions, and ſeldom ſo much as walks.

Theſe creatures have ſix legs, which are extremely ſmall and ſlender; and which, when the animal is at its full growth, are loaded with a weight ſo large, that they ſeem ſcarce able to ſupport it. Some of theſe ſpecies arrive at a tolerable bigneſs for common obſervation; but the greater number are too ſmall to be accurately ſeen, without the aſſiſtance of glaſſes. Among theſe inſects there are great numbers that in their full perfection have wings, and become a ſort of little flies: theſe are diſtinguiſhed from the others, by the name of luted Pucerons. *Reaumur's Hiſt. Inſ.*

The elder is the tree, on which they are of all others the moſt plentifully produced, and on which they are obſerved in their ſeveral ſtages with the greateſt accuracy and eaſe. They often cover the thick green roots of this tree for many inches together, and ſometimes for many feet; and they are always placed ſo cloſe together, that they touch in every part, and ſometimes they lie two beds, one over another. Theſe are of a greeniſh black. If they are obſerved on the branches undiſturbed, they are always found to be perfectly quiet, and ſeem to paſs their whole lives in inaction; but they are all this time doing the moſt neceſſary buſineſs of life, that is, ſucking in the nouriſhment from the juices of the tree. They do this by means of a fine ſlender trunk, which eaſily eſcapes the naked eye, but is always found by the microſcope; and it is by means of this that they pierce the bark of the tender parts of the vegetables, and get at their juices. The trunk is uſually of two thirds of the length of the body; but, when they are moving on, it is always applied ſo cloſely under the belly, that it is not ſeen.

Bladder PUCERON, a ſort of Puceron that lives in bladders on the leaves of trees.

We often obſerve, on the leaves of different trees, a ſort of roundiſh bladders, which only adhere to the leaf by a ſhort pedicle: theſe are a ſort of ſmall galls, and their figure varies much in the different kinds; ſome are leſs round than others, and many are very rough on the ſurface; and ſometimes they are long, terminating in a point, and being broader at the baſe than in any other point, and ſuſtained by no pedicle, but fixed immediately to the leaves.

The elm and aſh afford us more frequent inſtances of theſe than any other trees, and very often, on the firſt of theſe, they grow to the bigneſs of a nut, and ſometimes much larger; and, when they are grown to their full ſize, they often take up the whole ſurface of the leaf. When theſe bladders are opened, they are found to contain a large number of Pucerons.

If theſe bladders are examined at the time when they are newly riſen, which uſually is in the beginning of June, on opening them there is uſually found in them only one Puceron, and that always a female big with young; and, in others more advanced, the parent inſect is found ſurrounded with different numbers of her young ones. Theſe bladders have all of them at firſt only one female Puceron; but afterwards they have more, as they become larger; and the largeſt of all are uſually found filled with a prodigious number of young ones. The newly riſen bladders are always found cloſe and firm in every part, the aperture, at which the female had entered, being uſually neatly and cloſely ſtopped up. The queſtion is, how this bladder was formed?

We very well know, that winged inſects of ſeveral kinds prick holes in the leaves and branches of vegetables, and depoſit their eggs in them; and that thence ariſe all the various ſpecies of galls, the eggs hatching within theſe tumors into worms or maggots, and theſe finally become winged inſects like their parents.

Malpighi has given an excellent account of the ſeveral ſpecies of theſe galls; but he has not mentioned any of them being produced by a viviparous inſect, for the bringing up her numerous family: he has not omitted the bladders on the leaves of trees among the numbers of galls, but he has had no true idea of their origin; nor could this, indeed, have been any way found out, but by the obſervation that the creatures contained within them were of the ſame nature and origin with thoſe on the ſurface of the ſame or other leaves.

There ſeems no doubt, but that each of the female Pucerons, found in the bladders of theſe leaves, has been herſelf the occaſion and the maker of that bladder in which ſhe is found ſo cloſe ſhut up.

The female thus finds herſelf in a ſecure place, and the elevation ſhe makes in the leaf is ſcarce perceivable, only appearing as an oblong ſmall ſpecies of gall. The mark of the aperture at which ſhe made her way in, is always to be ſeen at ſome diſtance behind her, though uſually very neatly cloſed up: thus the whole continues till the creature produces her young. But, then, the ſcene is quite altered; the young ones begin to ſuck as ſoon as produced, and as they uſually ſeize upon the ſides of the ſmall gall, already formed for that purpoſe, this derives more juices than otherwiſe would flow into it; and it begins to elevate itſelf much higher, and forms a tubercle of the ſhape of a nut or pear.

Its growth in this caſe is intirely analogous to that of the common galls on the branches of trees, &c. and all the difference, in the ſhape of the ſeveral bladders, is owing to the manner of the young Pucerons ſucking: for, if they ſuck much at its baſe, that enlarges and becomes the broadeſt part, as is the caſe in the conic and pointed ones; but, if they let this alone, and ſuck only the ſides and upper part, they ſwell while this does not, and conſequently this forms a ſort of pedicle to the growing bladder. *Reaumur's Hiſt. Inſ.*

PUFF-*ball*, the common Engliſh name for the fungus pulverulentus, or lycoperdon.

The duſt contained within this body, which, when it is cruſhed, flies out in an inconceivable fine powder, in form of a cloud of ſmoak, when examined by the microſcope, appears to be a multitude of regular figured, though extremely ſmall bodies. Theſe require the moſt powerful magnifiers to diſtinguiſh them, and are found to be little globules of an orange colour, and ſomewhat tranſparent; and ſo ſmall, that the cube of the diameter of a hair would be equal to an hundred and twenty-five thouſand of them. In other ſpecies of this muſhroom, the globules are evidently ſeen to be ſo many Puff-balls, being of a darker colour, and having each a little ſtalk or tail: by means of theſe ſtalks they penetrate into the ground, when ſhed from the parent plant.

The duſt of theſe muſhrooms is very hurtful to the eyes, and we have had inſtances of perſons being blinded for a long time by it, with violent pain, ſwelling, and inflammation; and this is probably owing to the ſharpneſs of theſe almoſt inconceivably minute ſtalks or tails. *Baker's Microſcope.*

PU'FFIN, *puffinus*, in zoology, the name of a water-fowl, with its three fore-toes connected by a membrane; but its hinder ones looſe, and with a ſharp and crooked beak. It is a ſea bird, but not generally known.

It is larger than the tame pigeon: its head, neck, and back, are black: its breaſt and belly white: its beak is two fingers breadth long, and its baſe covered by a naked membrane, and has on each ſide a furrow, running from thence to the end of it: its wings are very long, and its tail a hand's breadth long, and black: it is extremely common in the Iſle of Man, but is ſo fat, that its fleſh is accounted unwholeſome, unleſs it is ſalted: it is alſo common in the iſlands of Scilly. They breed only in the Calf of Man, an uninhabited part of the firſt mentioned iſland, and each female only lays one egg.

They lay in rabbit holes, and, as ſoon as the young are hatched, they follow their parents all day to ſea, returning only in the evening. The people take them early in the morning, about the time of their going out; and, that every man may remember how many he takes, he always cuts off one of the legs, and keeps it in his pocket; hence they vulgarly obtained an opinion, that Puffins have but one leg. *Ray's Ornithol.*

PUGNI'TIUS, in zoology, the name of the common ſtickleback, or barnſticle, called alſo from its ſpines aculeatus, and by ſome authors ſpinachea, turonilla, and centiſcus.

PULE'GIUM, *pennyroyal*, in botany, a genus of plants, whoſe characters are:

The flowers, which are very ſmall, are diſpoſed in cloſe thick whorles, and their upper lip is intire: in other reſpects, this herb reſembles the mentha or mint.

Pennyroyal has many creeping fibrous roots; from which ſpring a great many ſmooth roundiſh ſtalks, hardly able to ſupport themſelves, but leaning on the ground, and ſending out ſmall fibres, by which it roots itſelf in the ground: it bears two ſmall, round, but yet pointed leaves, at a joint: the flowers grow towards the upper part of the branches, coming forth juſt above the leaves, in thick cloſe whorles; they are of a pale purple colour, ſmall and galeated, ſet in ſmall and ſomewhat downy calyces, in which grow four ſmall ſeeds. The whole plant has a very ſtrong ſmell, and an hot aromatic taſte: it grows frequently upon moiſt commons, and in places where water has ſtood all winter, and flowers in July. But what we uſe in the ſhops is generally cultivated in gardens, where it grows tall and large: the whole herb is uſed.

It is hot and dry, of very ſubtile volatile parts, and is peculiarly appropriated to the female ſex, being a good uterine, provoking the menſes and lochia, expelling the birth and ſecundines. It likewiſe warms and comforts the bowels, and helps the cholic and jaundice, and is good againſt coughs and ſhortneſs of breath: the juice, or a ſtrong decoction of the leaves, ſweetened with ſugar, has been accounted a ſpecific againſt a whooping cough.

Officinal preparations are only the diſtilled water and oil. *Miller's Bot. Off.*

This plant, which is very bitter, acrid, and of a very penetrating ſmell, gives a deep tincture of red to the blue paper; ſo that it is probable, it contains a volatile, aromatic, and oily ſalt, loaded with acid; whereas, in the artificial, volatile, and oily ſalt, this acid is detained by the ſalt of tartar.

Thus this plant is aperitive, hyſteric, and good for the diſeaſes of the ſtomach and breaſt; ſince it evacuates thoſe glutinous ſordes, which fill part of the bronchia, and veſicles of the lungs; eſpecially if it is boiled with honey and aloes; for then, as Dioſcorides obſerves, it purges, and procures expectoration. Tragus very much commends the decoction of pennyroyal in white-wine, for the ſuppreſſion of the menſes, and fluor albus. The juice of this plant, according to the ſame author, clears the ſight, and removes lippitude. Montanus preſcribed the powder of pennyroyal mixed with equal quantities of vinegar, honey, and water, for the diſeaſes of the eyes. The conſerve of its flowers and leaves is good for the dropſy and jaundice. Ray affirms, from Mr. Boyle, that a ſpoonful of the juice of pennyroyal is a good remedy for the chin-cough of children. Cheſneau preſcribes a glaſs of its decoction for hoarſeneſs, and adviſes to take it before going to bed.—For the method of propagating pennyroyal; ſee the article PENNYROYAL.

PU'LEX, *the flea.*—It is to Signior Redi that we owe the true hiſtory of the generation of this common and troubleſome animal. The flea lays its eggs, and from each egg is hatched a ſmall worm: this worm ſpins itſelf a bag of ſilk, in the ſame manner that the ſilk-worm does, and out of this bag it comes at laſt in the perfect form of a flea, as the other does in its winged ſtate.

The flea depoſits its egs on the bodies of dogs, cats, and other animals, and on the cloaths of men, or the beds, and other places where they ſleep. Theſe eggs, being round and ſmooth, ſlip eaſily down till they come into ſome fold of the cloaths, or ſome other place, where they are hatched. In this place each egg produces a ſmall white worm of a ſilvery appearance; theſe worms feed on the white ſcurfy matter which is found in great plenty on the ſkins of dogs and other animals; and they are alſo found among the folds of linen in drawers, and other places: they are a fortnight in arriving at the full bigneſs of the worm ſtate, and will roll themſelves cloſe up into a ball, in the manner of the wood-louſe, when touched. They, ſoon after this, ſpin themſelves their web, in which they lie a fortnight, and then come out perfect fleas.

The flea, if examined a day or two before its full growth in the bag, is found to have all its parts and lineaments; but it is ſoft and white. After this it gradually becomes hard and coloured, is as ſtrong and large as it ever is to be.

PULEX-*eaters*, a name given by naturaliſts to a ſort of worms, frequently found on the leaves of trees, where they devour the animals called pulices arborei.

Of theſe there are ſeveral ſpecies, which owe their origin to the eggs of different creatures; for they are none of them in their ultimate ſtate in this their time of feeding. According to the different animals whoſe eggs they are hatched from, theſe are of different form and ſtructure; ſome are hexapodes, or endued with ſix feet; theſe belong to the beetle tribe, and finally change into beetles like the parent animal from whoſe eggs they ſprung: others have no legs, and are produced from the eggs of flies of various kinds: and, finally, others are genuine caterpillars, though ſmall; but theſe are the moſt rare of all.

The two general kinds are the hexapodes, or beetle-worms, and the apodes, or fly-worms. The fly which gives origin to the laſt of theſe, is a four-winged one, and takes care always to depoſit her eggs in a place where there are plenty of the pulices, uſually on the ſtalk or young branches of a tree in the midſt of large families of them. The worm, as ſoon as hatched, finds itſelf in the midſt of abundance of food, preying at pleaſure on theſe animals, which are wholly defenceleſs. The ſtalk of the elder and wood-bine are frequently found covered over with theſe Pulices, and among them there may uſually be found one or more of theſe deſtroyers feeding at will, ſucking in the juices from their bodies, and then throwing away the dry ſkins. Beſides the worms of this four-winged fly, there is one of a two-winged waſp-fly, very deſtructive of theſe animals. *Reaumur's Hiſt. Inſ.*

PULEX *arboreus*, in natural hiſtory, the name given by Mr. Reaumur to a very large genus of ſmall animals. They are a kind of half-winged creature; they have granulated antennæ, and ſome of them, in their moſt perfect ſtate, have perfect wings.

PU'LMO *marinus*, *ſea lungs*, in natural hiſtory.—This ſubſtance floats in the ſea; is of a pellucid bluiſh colour, reſembling, in ſome meaſure, that of cryſtal; and is ſo tender, that it can hardly be taken out of the ſea intire. When recently triturated, and uſed by way of ointment, it cures gouts and chilblains. *Dioſcor. Dale.*

PULMONA'RIA, *ſage of Jeruſalem*, in botany, a genus of plants, whoſe characters are:

The calyx is like a tube, pentagonal and quinquefid. The flower is monopetalous, cylindrical in its lower part, and ſhaped like a baſon above, with its margin cut into five round ſegments. From the ſides of the internal cylindrical part, which are neatly fimbriated, ariſe five ſtamina.

This is accounted a pectoral, balſamic plant, and good for coughs, conſumptions, ſpitting of blood, and the like diſorders of the lungs. It is, likewiſe, put into wound-drinks, and traumatic decoctions; being agglutinating, and good to heal wounds and ulcers, and old ſores. *Miller's Bot. Off.*

PU'LVIS *e bolo compoſitus*, a powder preſcribed in the late London Pharmacopœia, and intended to be uſed in the place of the confectio Fracaſtorii or diaſcordium. It being ſuppoſed that this medicine was by its author meant as an alexipharmic, and being now principally uſed as an aſtringent, it was thought neceſſary to make this ſeparate medicine. This powder is compoſed of bole armenic, half a pound; cinnamon, four ounces; and tormentil-root and gum arabic, of each three ounces, made together to a powder. *Pemberton's London Diſpenſatory.*

PULVIS *bezoarticus*, the name given in the late London Diſpenſatory to the powder commonly called Gaſcoign's powder.

This is now ordered to be made only of crab's claws, one pound; prepared pearls and red coral, of each three ounces; and oriental bezoar, an ounce. The amber and hartſhorn are left out of the compoſition, as improper or inefficacious ingredients; and the whole ordered to be kept alſo without the bezoar, and called by the name of Pulvis e chelis cancrorum compoſitus, the name the Gaſcoign's powder uſed to be known by. *Pemberton's Lond. Diſp.*

PU'LVIS *e ceruſſa*, a medicine preſcribed in the late London Pharmacopœia, in the place of the white troches of Rhaſes or Razi.

The late compoſitions of that medicine had been much more complex than the original receipt of the author, and the college have therefore retrenched the number of ingredients in them; and, as the medicine is always to be powdered for uſe, it is now ordered to kept in the form of powder.

It is thus preſcribed there: take ceruſs, five ounces; ſarcocolla, an ounce; gum tragacanth, half an ounce; make the whole into a fine powder. *Pemberton's Lond. Diſp.*

PULVIS *contrayervæ compoſitus*, the name given, in the late London Diſpenſatory, to the compoſition uſually called lapis contrayervæ.

The preparation is alſo, there, made much leſs complex, by leaving out the leſs powerful abſorbent powders, and uſing the compound powder of crab's claws in the place of all.

This is now ordered to be made only of the compound powder of crab's claws, a pound and an half; and contrayerva-root, five ounces. *Pemberton's Lond. Diſp.*

PULVIS *e myrrha*, a form of medicine preſcribed in the late London Diſpenſatory, to ſupply the place of the troches of myrrh.

The compoſition is the ſame, but for the omiſſion of one or two of the ingredients, ſuppoſed not of the ſame virtues with the reſt, or very diſagreeable to the taſte.

It is ordered to be made thus: take of dried leaves of rue, of dittany, of crete, of myrrh, each an ounce and a half; of aſſa fœtida, ſagapenum, Ruſſia caſtor, and opopanax, each an ounce; beat all together to a fine powder. *Pemberton's Lond. Pharm.*

PULVIS *e ſcammonio*, a name given, in the late London Diſpenſatory, to the purging powder commonly called the Earl of Warwick's powder.

It is, however, wholly altered here, the cryſtals of tartar and diaphoretic antimony being left out, and the medicine ordered to be made only of four ounces of ſcammony and three ounces of burnt hartſhorn reduced together to a fine powder. *Pemberton's Lond. Diſp.*

PULVIS *e ſuccino*, *amber-powder*, a form of medicine preſcribed, in the late London Pharmacopœia, to ſtand in the place of the troches of amber, or trochiſci de carbone of former diſpenſatories.

The compoſition of the powder is this: take prepared amber and gum arabic, of each ten drachms; juice of hypociſtis, balauſtines, and Japan earth, of each five drachms; olibanum, half an ounce; ſtrained opium, a drachm; mix all together into a fine powder. *Pemberton's Lond. Diſp.*

PULVIS *fœcundans*, in natural hiſtory, a name given by late writers to that fine powder which is contained in capſules upon the ſtamina or threads in the flowers of plants, and is called by ſome Engliſh writers the male duſt, and in general the farina of flowers.

Puteolanus PULVIS, in natural hiſtory, the name of a foſſil ſubſtance, found in form of powder, and famous for its conſolidating under water. The accounts of it ſeem, however, to be a little erroneous.

The ſubſtance itſelf is a pale greyiſh powder, compoſed of particles ſo extremely minute, as to eſcape the diſtinction even of the beſt glaſſes, and appear, when viewed by the microſcope, only a looſe, very fine, irregular powder. It has among it a few ſmall ſpangles of talc, and, being ſhook up in a phial of water, leaves a whitiſh muddineſs in it, which is very long in ſubſiding. If wetted with ſalt-water, it immediately dries into a firm ſolid maſs, like ſtone. It does the ſame alſo in common water; but the maſs is leſs firm.

The antients were all acquainted with this ſubſtance, and its properties. It is ſaid, indeed, that, on running down into the water, it becomes a hard ſtone, while it remains under it; but this is probably a miſtake, ariſing from this, that the powder was continually running down the hills into the ſea, and lodging on their ſides in large quantities in many places; when theſe maſſes came wet with the waves, in ſtorms or high tides, and afterwards deſerted by them, they naturally hardened into ſo many maſſes of a ſort of ſtone; and theſe were probably what authors have ſeen and deſcribed, for they never, probably, ſearched for theſe maſſes under water. The principal uſe of this powder, among the antients, was in mixing with their cements for buildings ſunk into the ſea. It is at preſent well known in France and Italy, as an ingredient in that ſort of plaiſter they call pozzolane.

The remarkable quality of its coaleſcing, on its being mixed with water, is probably owing to its having in its compoſition a quantity of a certain earth known in almoſt all ages and countries for coaleſcing into a kind of plaiſter without previous burning. The antients knew this earth by the name of gypſum tymphaicum; and we, by that of calx nativa. It is very common on the ſides of hills, in many parts of Italy. *Hill's Hiſt. of Foſſ.*

PU'NCTURE, (*Dict.*)—Among the number of the moſt ſimple wounds are reckoned thoſe which are made by Puncture, or ſtabbing on the external parts, and not penetrating to a very great depth. In theſe wounds, after the blood has been ſtopped at the firſt dreſſing, by the application of dry lint, the common digeſtive, or linimentum Arcæi, is to be ſpread upon a pledget and applied once every day; or, if the diſcharge is but ſmall, every other day, covering the dreſſings with a plaiſter and compreſs, and ſecuring the whole with a proper bandage. At each dreſſing, care muſt be taken to remove every thing that will give way readily; the pus or ſanies is to be gently wiped off with fine rags; and, unleſs a great diſcharge of matter make it neceſſary, too frequent dreſſings do rather harm than good. The firſt dreſſings that have been applied, eſpecially when there has been a flux of blood, ſhould by no means be removed forcibly, but be left till they will fall off of themſelves, which they will do after a ſuppuration is formed: and, by this caution, much pain, and, perhaps, a freſh hæmorrhage, are avoided.

When a Puncture, however, penetrates very deep, the cure is attended with many difficulties; eſpecially if it is made perpendicularly down, and has no depending orifice: for, in this caſe, the blood and matter are eaſily collected at the bottom, and protract the cure, and frequently form fiſtulæ. To prevent theſe conſequences, it will be proper to preſs the wound from the bottom upwards, to apply a compreſs towards the bottom of the wound externally, and to apply a bandage over all, which preſſes much tighter upon the lower than upon the upper parts. If all this precaution, however, prove of no effect, which, indeed, is too often the caſe, it is the moſt proper method to make a large opening at the bottom of the wound, before any fiſtulæ are formed there. In order to make this opening to the greater advantage, it will be proper to get a particular ſort of probe or needle, very blunt at top, and at the other end provided with a large eye, or hole, through which a linen rag may be paſſed. This probe is to be paſſed to the bottom of the wound, and the blunt end of it preſſed outwards toward the ſkin, till you can feel it with a finger: when you can feel it, cut down upon it, if you can ſafely, and make a large opening; ſpread the rag that you have run through the eye of the probe with ſome vulnerary balſam, and draw it through the wound after the manner of a ſeton, and leave it there, dreſſing up both the orifices with the ſame balſam, and covering the whole with compreſſes and the proper bandages. In every ſucceeding dreſſing, that part of the rag that is left out of the wound, is to be ſpread with freſh ointment, and the lower part drawn down till this takes place in the new wound. This method is to be continued till the wound is well cleanſed, the diſcharge greatly diminiſhed, and all in a readineſs to heal: the ſeton is then to be removed, and the wound healed as uſual. *Heiſter's Surg.*

P'UPIL (*Dict.*)—Pupil *contracted.* The diſtemper of the eye called by ſurgeons a contraction of the Pupil, is ſo total or cloſe a contraction of that part as will not let it tranſmit light enough to the bottom of the eye to enable the patient to ſee objects diſtinctly. Sometimes this diſorder is from infancy, and ſometimes it ariſes from an intenſe inflammation of the eye, or other cauſes.

The cure of this is extremely difficult; but Mr. Cheſelden has invented a method by which he has often proved very ſucceſsful in his attempts to relieve it. The method is this: the eye-lids being held open by a ſpeculum oculi, he takes a narrow ſingle-edged ſcalpel, or needle, almoſt like that uſed in couching for a cataract, and paſſing it through the ſclerotica, as in couching, he afterwards thruſts it forward through the uvea or iris, and in extracting it cuts through the iris.

If the diſorder is not accompanied with a cataract, it will be beſt to cut through the iris in the middle; otherwiſe, when there is a cataract, the inciſion ſhould be made a little higher in the uvea, that the cataract may not obſtruct the ingreſs of the rays of light. The cataracts that accompany this diſorder are uſually very ſmall, and ſometimes their adheſion to the iris is ſo firm, as to render it impracticable to couch or ſuppreſs them. *Heiſter's Surg.*

PU'PPETS, in natural hiſtory, the name given by Swammerdam to the nymphæ of animals, which he diſtinguiſhes from the chryſaliſes, by this ſimple name, calling theſe the gilt Puppets, from their golden colour.

PUR *autre vie*, in our law-books, is uſed where lands are held for the life of another.

PU'RCHASE-*book*, among traders, is the name given to a book which is a kind of journal, containing an account of all the purchaſes made, or things bought in the day.

Purchase, in the ſea-language, is the ſame as draw in: thus when they ſay, the capſtan Purchaſes apace, they only mean it draws in the cable apace; alſo, when they cannot draw or hale in any thing with the tackle, they ſay, the tackle will not Purchaſe.

PU'RGATIVE (*Dict.*)— Dr. Cheyne accounts for the action of Purgatives in the following manner: — A Purgative medicine being received into the ſtomach by the mouth, its particles do there vellicate or ſtimulate the fibres of the ſtomach, and thereby increaſe the digeſtive faculty, i. e. bring the muſcular fibres of the ſtomach and the muſcles of the abdomen and diaphragma into more frequent contractions than ordinary, till the medicine is admitted into the inteſtines; the fibres and glands whereof being more ſenſible than thoſe of the ſtomach, (whoſe parts, by the frequent rough contacts of one againſt another, and of the groſs bodies often thrown into it, are, as it were, deadened) it eaſily moves and brings them into frequent forcible contractions, whereby theſe glands are ſqueeſed, and ſo emit a fluid matter, which lubricates the paſſages, and which mixing with the feculent matter of the inteſtines, (which is rendered fluid by the ſame active and ſtimulating quality of the purgative medicine) renders it more fluid; by which, and by the uncommon contractions of the inteſtines, it paſſes more eaſily and plentifully into the inteſtinum rectum, and is thence ejected by ſtool.

Thus do gentle purges act, and only cleanſe the inteſtines, few of their particles entering in by the lacteal veins ſo as to affect the blood.—But in violent Purgatives the ſtimulating particles are mixed with the blood, and produce there, many times, very great effects, by occaſioning unnatural fermentations, by ſeparating the natural coheſions of the fluids of the body; and do alſo, by vellicating the ſpiral fibres of the veins and arteries, bringing thoſe into more forcible contractions, and thereby accelerate the motion of the blood:—all which may have ſometimes a good, ſometimes a bad effect.

As to the effects of Purgatives on animal bodies, Dr. Quincy adds, that every irritation of the inteſtines either quickens the periſtaltic motion in its natural direction, or occaſions ſome little inverſions of it.—Now, in both caſes, any matters that but ſlightly adhere to the coats, or inner membranes, will be looſened, and ſhook off, and carried forwards with the other contents; and they will alſo be more agitated, and thus rendered more fluid.

Hence is manifeſt how a purging medicine haſtens and increaſes the diſcharges by ſtool; but the ſame manner of operation alſo carries its effects much farther, in proportion to the force of the ſtimulus: for, where it is great, all the appendices of the bowels, and even all the viſcera in the abdomen, will, by a conſent of parts, be pulled or twitched ſo as to affect their reſpective juices in the ſame manner as the inteſtines themſelves do their contents.—The conſequence of which muſt be, that a great deal will be drained back into the inteſtines, and made a part of what they diſcharge.—And when we conſider the vaſt number of glands in the inteſtines, with the outlets of thoſe viſcera opening thereunto, and particularly of the liver and pancreas, it will be no wonder, that vaſt quantities, eſpecially in full conſtitutions, may be carried off by one purge.

As to thoſe Purgatives diſtinguiſhed by the names of cholagogues, hydragogues, phlegmagogues, on a ſuſpicion of an elective quality therein, they may be accounted for upon more intelligible principles:—for, when the diſcharges by ſtool diſcover an over-proportion of any particular humours, it is to be ſuppoſed there was a redundance of ſuch an humour, whoſe diſcharge any irritation would have occaſioned. Thus, in proportion to the proximity of ſome humours in the inteſtinal tube, and the diſpoſition of the paſſages to convey them that way, do they require greater or leſſer vibrations or ſhakes of the fibres to fetch them out.

For this reaſon, the briſker cathartics, which vellicate the membranes, moſt of all, pump out, as it were, from all the meſenteric glands, and neighbouring parts, their contents, which, becauſe they abound ſo much with lymphatics, and viſcid watery humours, make the diſcharges thin and watery. Thoſe which act in a ſomewhat lower degree, yet irritate enough to deterge and draw out a great deal of mucous and viſcid matter, which ſometimes, by lodgment and want of due motion, changing into various colours, occaſions the different names of phlegm or choler: as the former therefore paſs for hydragogues, ſo do the latter for purgers of phlegm and choler. But there is another principle beſides that of a ſtimulus, whereby a purging medicine is enabled to anſwer its intentions, viz. by fuſing the humours, and rendering them more fluid than before, whereby they are better fitted to paſs off by their proper emunctories.—Thoſe which conſiſt of very ſubtile and active parts are not ſo ſenſible in the larger paſſages, becauſe of the great quantities of matter, which lay too great a load upon them, and make them unheeded; but, when they are got into the blood in any conſiderable number, they divide and fuſe thoſe coheſions which obſtruct or move heavily along the capillaries, and ſcour the glands; inſomuch that every pulſation throws ſomething through the inteſtinal glands, which goes away by ſtool, that the refluent blood had waſhed away and brought back from all parts of the body.

Of this kind are all thoſe cathartics, which are ſaid to purge the joints, and are preſcribed in rheumatiſms, and arthritic pains, as the radix turpethi, and all the aloetics.—And this is the reaſon why purging medicines of this ſort are ſo eaſily changed into the moſt efficacious alteratives; for an alterative is a cathartic in a lower degree, or of a more remiſs operation. Whatſoever brings ſuch particles to a ſecretory orifice, which is fitted for its paſſage, oftener, either by accelerating the blood's motion, or breaking it into more particles of that particular ſize and diſpoſition, will increaſe the ſecretion. According, therefore, to the difference of the parts where ſuch ſecretions are inlarged, as the glands of the inteſtines, kidneys, or ſkin, are the medicines, which are the inſtruments therein, called cathartics, diuretics, or diaphoretics.

In order to explain more fully the operation of Purgatives, it may be convenient to attend to the common way of making a purge operate, more or leſs, than it otherwiſe would do.

Subſtances, then, which are groſs and heavy, as thoſe conſiſting chiefly of ſaline and earthy particles; ſuch as tartar, manna, and the like; when reduced ſmaller by triture, or repeated ſolutions, operate more gently; but when acuated by acids, or any way made to expoſe their angles more plentifully to the membranes, they become rougher, and ſooner take effect.

Reſinous medicines, as ſcammony, gamboge, jalap, and moſt vegetable productions, are more violent, and operate ſooner, when they are more tenacious and adheſive, as in their extracts; but gentler, when divided by hard brittle ſubſtances, ſuch as ſalt of tartar, ſugar, &c.

Medicines, which have in their compoſition ſulphur and ſalt, are more or leſs rough and ſpeedy in their operation, in proportion to their greater or leſſer participation of the ſaline ingredient, and the aſperity of its angles.—Of this kind are moſt minerals, and their preparations: it may be ſufficient to inſtance in the management of antimony and mercury; the firſt of theſe is by chymical analyſis known to be a compoſition of a ſubtile ſulphur and ſalt; and the more the ſaline part is ſet looſe by preparation, and opening the ſulphur, as it is commonly termed, the ſpeedier, and with the greater vehemence, will it operate; whereas, in its more imperfect preparations, when the ſalts are cloſely wrapped up in their native ſulphur, it will hardly work at all, till it reaches the fartheſt ſtages of circulation.

Mercury per ſe is little known as a medicine; and its firſt preparation, which makes it into a ſublimate, ſo loads it with ſaline ſpiculæ, that it amounts even to a poiſon; but the more thoſe ſpiculæ are broken by triture, ſublimation, &c. the milder doth it operate, and, if to the comminution of its points be added a ſulphur ſubtile enough to join it, it may be reduced to ſo mild a medicine, as not to be felt but in the laſt ſtage of operation.

This ſhort view may be ſufficient to ſhew, 1. That it is the too great aſperity and motion in a medicine, that will not ſuffer it to paſs the ſtomach, without irritating it into ſuch convulſions, as will throw it up again by vomit.

2. That a farther comminution, and ſmoothing its figure, will gain it admittance into the bowels, and cauſe it to operate, as a proper Purgative, by ſtool.

3. That a yet farther remiſſion of theſe properties will convey it into the blood, and allow it there to promote evacuation by urine.

And, laſtly, that a ſtill farther comminution will paſs it into the minuteſt canals, where, by the ſame properties, only in a lower degree, it will cauſe ſweat, or increaſe perſpiration.

Hence it appears, that the more ſubtle medicines operate in the capillaries, and ſmalleſt fibres, by the ſame mechaniſm that the more groſs ones do in the common ſtream of the blood, when they go off by urine; or as the groſſeſt of all do in the greater paſſages, when they promote evacuation by ſtool.

Hence it is evident, that the ſkill of preparing and adminiſtring of medicines conſiſts in proportioning their manifeſt and known properties to the capacity and circumſtances of the part they are to operate in; and to intend or remit their mechanical affections, as they are ſooner or later to take place in the greater or ſmaller veſſels.

Of the firſt claſs there are few can be reduced ſmall enough to go beyond the larger paſſages, and none of them are worth the pains they require, to fit them farther than for diuretics: beſides, their natural diſpoſition to attract, and join with the ſerous part of the blood, whenever they get into that ſtage of motion, runs them off by the kidneys, before they can undergo comminution enough to get farther: but if by frequent repetitions of ſuch medicines, and an uncommon laxity of the paſſages, any parts are paſſed into the habit, their groſſneſs fouls the delicate ſtrainers, which are deſtined for their expulſion; and they lodge upon the glands and capillaries in ſuch manner, as to induce intermittents; which are obſervable in many perſons, after a long uſe of cream of tartar, the common cathartic ſalts, and the purging waters, eſpecially at the latter end of the ſummer, when the heat of the preceding ſeaſon has debilitated the ſolids, and left them under too great a relaxation.

Among the reſinous purges, there are many very powerful ones; but where their operation is deſired in the viſcera, blood, and remoter parts, they muſt be extremely divided; and this we find ſpirituous menſtruums will do, by taking up the moſt ſubtile parts only, and carrying them into the very ſmall paſſages, where they operate chiefly by fuſion; becauſe the ſoftneſs of ſuch ſubſtances cannot enable them, hardly in any degree, to act as ſtimuli, farther, at leaſt, than ordinary detergents. And thus we find that aloe, the chief of this tribe, goes fartheſt into the habit, and continues longeſt before it operates, when managed with a ſpirituous menſtruum, as in the tinctura ſacra. The rad. turpethi, and colocynth likewiſe, with all of the vegetable kind, that will yield to a ſpirituous liquor, may, by that means, be carried into the fartheſt ſcenes of animal action; where they will prove efficacious medicines in caſes, which, with other management, they would never be able to reach: and on this account it muſt undoubtedly have been, that we frequently meet, in practical writers, with many materials of this ſort mentioned as alterants; the colocynth particularly by Helmont: for all medicines, which operate in the fartheſt paſſages, they commonly include under that general appellation.

But the moſt efficacious purges, and thoſe which require the moſt ſkill, are procured from the mineral kingdom; theſe abound in ſolidity beyond any other materials, and therefore, where-ever they are brought into action, neceſſarily excel in the quantity of impulſe; many of theſe therefore want not only the utmoſt comminution to carry them into the farther ſcenes of operation, but alſo ſome reſtraint of their aſperities and motions, to fit them for many intentions.—Thus ſublimate is not only to be much ſweetened, that is, ſmoothed in its points, to make it a ſafe purge in the larger veſſels; but if it be intended to go farther than the blood, and thoſe glands, which in that circuit it is moſt apt to be lodged upon when it ſalivates, it muſt not only be rendered very fine, but alſo be covered with ſuch ſubſtances as weaken its points, and make it paſs into the laſt ſubdiviſions of the conſtitution. To this purpoſe, the common practice wiſely contrives in diſtempers, which, according to the courſe of circulation, lie moſt remote, to wrap up the baſis of this medicine in ſulphurs, and ſuch-like ſubſtances, as follow it into its laſt diviſion, without giving it any aſperities to make it act as a ſtimulus. Thus, for all cutaneous foulneſſes, and habitual taints, the cinnabar, the æthiops, and all of that ſortment, are in readineſs; and that ordinary ſulphurs will cover and deaden the efficacies of mercurial preparations, ſo that they ſhall not operate, but in ſuch parts only, and in certain circumſtances, is demonſtrable in ordinary ſalivations, which are to be lowered by ſulphureous medicines.

Medicines from ſuch minerals where a ſalt and ſulphur are united by nature, as they are in ſome mercurials by art, as antimony, the native cinnabar, ſteel, &c. are manageable only upon the ſame principles; and, the more they are deſigned to be carried into the habit, the more are they to be reſtrained by their natural or adventitious ſulphurs: ſteel, when opened by, and joined with, the points of acid liquors, operates the ſooner, and will ſometimes prove even emetic; but, when it is covered with an additional ſulphur, it will go farther, and anſwer intentions much more remote; as is manifeſt in the common preparations of ſteel with tartar or vinegar, and with ſulphur.

This way of reaſoning on theſe occaſions ſeems the more juſt, from conſidering the texture of thoſe ſubſtances, which by a natural preparation are fitted for operation in the minuteſt part of an animal body; ſuch as thoſe of the aromatic kind, all which, more or leſs, according to their greater or leſſer degree of ſubtility and ſmoothneſs, promote a diaphoreſis: for theſe conſiſt of exquiſitely fine ſalts, covered with a moſt ſubtile ſulphur, as is demonſtrable by chymical analyſis; and the common ſal volatile oleoſum is an admirable contrivance upon the ſame foundation, where a very volatile animal ſalt is covered with a moſt exalted vegetable oil; whereby it is fitted to paſs into the minuteſt fibres, and make, as it were, a part of the animal ſpirits themſelves.

And here it may not be amiſs to obſerve, that all animal ſalts are very volatile, or eaſily rendered ſo; but when bare and naked, juſt as the fire draws them out, with a mixture alſo of its own particles in their compoſition, they are too pungent to be felt without painful ſenſations; and when ſoftened with a fine portion of ſomewhat of an oppoſite texture, which is ſmooth and yielding, they become moſt efficacious and ſafe ſudorifics.

On theſe conſiderations it likewiſe ceaſes to be a wonder, why the ſubtile ſalts of cantharides are more ſenſibly injurious to the bladder than any other parts, and why camphire prevents thoſe injuries; for the exquiſite ſmallneſs of thoſe ſpiculæ makes them imperceptible but in the moſt minute canals, into which the fibres compoſing the membranes of the bladder are known to be divided; and camphire blunts their irritations, becauſe its extreme ſubtility enables it to follow them into thoſe meanders, and ſheathe their aſperities.

To this purpoſe is very remarkable what many now commonly practiſe in guarding even mercurials againſt their ſtimulating properties, and ſending them into the fineſt paſſages to operate by fuſion, and the bare force of impulſe: for not only calomel and the mercurius dulcis may be reſtrained from manifeſt operation in the wider paſſages, and the glands about the mouth; but even the mineral turbith, which of itſelf, in a ſmall doſe, will operate powerfully by vomit and ſtool, will not, when mixed with camphor, be ſo much felt in thoſe reſpects, but go into the fartheſt circuit of motion, and promote the cutaneous diſcharge in a more efficacious manner, than any medicine of leſs ſpecific gravity.—In this management, the camphor is to be mixed but a very little while before taking, otherwiſe it has not the effect; which appears to proceed from its great volatility, which makes it in a great meaſure exhale while it ſtands mixed in a medicine.

PURIFICA'TION, in matters of religion, denotes an offering made the prieſts by women riſing out of child-bed, before they be re-admitted into the church.

By the law of Moſes, a woman, after bringing forth a male child, was unclean forty days; after a female, eight days; during which time ſhe was not to touch any thing holy, nor to go near the temple; but to continue within doors, ſeparate from all company and commerce of others.

This term expired, ſhe was to preſent herſelf at the temple, and at the door of the tabernacle to offer a lamb, as a holocauſt, and a pigeon or a turtle, which the prieſt taking, offered to God, and prayed for her, that ſhe might be purified.

This ceremony, which conſiſted of two things, a holocauſt, and a ſacrifice of expiation, was called טחר טהדה purificatio, purgatio.

The holy virgin, though, according to the fathers, exempt from the terms of the law, yet complied therewith; and at the time preſcribed went to the temple, and accompliſhed the law: in commemoration whereof, the church yearly ſolemniſes the feaſt of the Purification of the virgin, on the ſecond of February; called alſo the feaſt of Candlemas.

The feaſt of the PURIFICATION ſeems to be very ancient. It is ordinarily ſaid to have been inſtituted in the time of Juſtinian, in the year 542; and this, on occaſion of a mortality which that year diſpeopled almoſt the whole city of Conſtantinople. Yet there are ſome who imagine it to have been obſerved before, though in another manner, and on a different day, from that fixed by Juſtinian, viz. between the circumciſion and epiphany.—The ſame day is the preſentation of our Saviour in the temple.

PU'RPLE, *purpura* (*Dict.*)—In natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe: it is a univalve ſhell, jagged and beſet from head to tail with ſpines, tubercles, umbo's, or ſtriæ. The mouth is ſmall and roundiſh: the tail is ſhort, and uſually the baſe runs out into a long beak. It has been uſual with moſt authors to confound together the genera of the murex and Purpura, and to uſe the words as ſynonymous: but, though there is ſome external reſemblance between many of the ſhells of the two genera, yet they are eaſily diſtinguiſhed by this, and the mouth of the Purpura is leſs long, and is leſs dentated and alated than that of the murex. The body and the head of the ſhells of this genus are not ſo elevated as thoſe of the murex kind, and are not covered with points or buttons at the mouth. If a ſhell is therefore found to have a ſmall, ſmooth, and round mouth, and a body covered with undulated leaves, as it were, like thoſe of ſavory or endive, and ſometimes with long points, and its tail, whether long or ſhort, be hollowed and ſomewhat bent, this may be called a Purpura and not a murex.

The antients diſtinguiſhed three kinds of Purpura, one which had a long and crooked tail, made hollow like a tube or pipe; a ſecond which had either no tail at all, or at the moſt a very ſhort one; and a third which had no ſpiral head, or, as we ſhould expreſs it, no clavicle.

On examining the whole family of the Purpuræ, we may diſtinguiſh four remarkable ſpecific differences among them. The firſt of theſe comprehends thoſe Purpuræ which have the body of the ſhell garniſhed with a ſort of undulated foliage in clouded ridges, and have a ſhort and crooked tail. The ſecond comprehends thoſe which have the body of the ſhell covered with acute points, and have a long tail. The third comprehends thoſe which have as long a tail as the former, but have a ſmooth body, or at the utmoſt have only a few ſlight protuberances and wrinkles on it. And the fourth takes in thoſe which are ſmall, and have an elevated clavicle, a ſhort crooked tail, and the body of which is covered either with ſlender ſpines or hairs. See *Plate* XL. *fig.* 1.

This ſpecies of fiſh, as well as the murex, ſerved among the antients to dye the fine purple colour they were ſo fond of, and ſome of the buccina have been of late found to have the ſame juice. The Purpura and murex are both fiſhed up in great plenty in the gulph of Tarentum; but the ſmall quantity of the coloured juice which each fiſh contains, and the neceſſity of uſing it before the animal dies, makes it impoſſible to bring it to any regular article of traffic. The antients uſed this colour only on cotton and woollen ſtuffs, whereas our cochineal, which was unknown to the antients, ſtrikes equally well on ſilks and ſtuffs.

The Purpura lives on other fiſh. It uſually hides itſelf at a ſmall depth in the ſand, ſometimes even in freſh-water rivers, and as it lies hid, it thruſts up a pointed tongue, which wounds and kills any thing that comes over it. We frequently find ſea-ſhells with round holes bored through them, as regularly as if made with a boring inſtrument: theſe are generally allowed to be made by the tongue of the Purpura, in order to its feeling on the fiſh within.

The Purpura has two horns like that of a ſnail; and Fabius Columna ſays, that they have eyes in theſe, not placed at the ends, as in the ſnail, but in the middle of each horn.

The purple-fiſh is very well known, and has been known alſo in almoſt all times to afford a purple liquor; but, as there has been no method diſcovered of bringing this liquor into uſe in dying, the fiſh has been neglected, and its fluid never attempted to be brought into uſe.

The juice which gives this beautiful purple colour is, while it remains in the body of the animal, and while that is in health, wholly white; but no ſooner is it expoſed to the ſun, than it begins to change colour, and in leſs than five minutes goes through the ſeveral changes of pale green, yellowiſh, and a beautiful emerald green: after this, it becomes of a deeper and duſkier green, then bluiſh, reddiſh, and finally a deep and very beautiful purple. Sometimes the juice is found naturally green in the animal; this is probably from the creature's being in a diſeaſed ſtate: but, when it is naturally thus, it immediately becomes red, and afterwards purple, on being expoſed to the ſun, its ſeveral preceding changes ſeeming to have been made already in the body of the animal.

If a piece of linen be rubbed over with this juice, and part of it expoſed to the ſun, part not, that only will turn red which is ſo expoſed, the other remaining green without any alteration; and it is obſerved, that the ſtronger the ſun ſhines, the quicker the change appears, and probably the colour is in proportion alſo the more beautiful and lively. And it is very remarkable, that if a needle, or any other opake body, be laid upon the linen which is yet green, and is to become red on being expoſed to the ſun; after ſuch an expoſure the whole ſhall be changed red or purple, excepting only that ſmall ſpot which is covered by the needle, which will ſtill remain green.

A plate of glaſs, though it be three inches thick, will not prevent the colour from changing purple by being laid over it; but the thinneſt piece of metal will keep it wholly green. The one being opake, and the other pellucid, are evidently the only reaſons for this difference.

If the coloured linen be ſucceſſively covered by three pieces of paper, the one blacked with ink, the other in its natural ſtate, and the third rubbed over with oil, it will change colour on being expoſed to the ſun in different degrees; and that exactly in proportion to the degree of tranſparence in each of the papers: moſt of all in that which was covered with the oiled paper, ſomething leſs than that covered by the paper in its natural ſtate, and leaſt of all in that which was covered with the blacked paper, as that is leaſt tranſparent.

The common heat of a fire, or that of a red-hot iron, produce no change at all in the colour when green. The vapour of burning ſulphur produces a little; but the green which had not changed to purple by theſe experiments, immediately changed to it on being expoſed to the rays of the ſun.

Theſe experiments were all made in the months of January and February, by Mr. Du Hamel, in Provence; and, the ſun having power to change the colour ſo ſpeedily there in theſe cold months, probably in a warmer climate or ſeaſon the air would have been ſufficient for the purpoſe, without the open ſun; ſince it ſeems, from experiment, that both the ſolar rays, and the light alone in a cloudy day, can act upon this colour. The light and heat of the ſun both act on this colour: light is always ſufficient to produce the effect; but the heat may eaſily be too great, or too little, and, to do the whole in perfection, it muſt be at a certain middle degree.

This beautiful purple, if it can ever be brought into uſe in dying, will have one very great advantage from its viſcoſity. The pieces of cloth that had been ſtained by it retained their colour, in ſpite of ſeveral boilings in different liquors, which Mr. Du Hamel made them paſs through; and the colour, on examination, was found not to be ſuperficial, but penetrated the whole body of the ſtuff which was tinged by it. There are many inconveniencies which muſt naturally attend the uſe of this ſubſtance as a dye, but they may, perhaps, all be got over by care and application. It is very certain, that it is of too viſcid a nature eaſily to penetrate many ſubſtances; but it is alſo certain, that this might be obviated by diſſolving it in ſome proper liquor. It appears very plainly, that the ancients had a method of thus diſſolving their purple; but we neither know what was their purple, nor what was its diſſolvent; nor, which would be of much more conſequence to us at preſent, what is the proper diſſolvent for our own. *Mem. Acad. Scien. Par.* 1736.

PU'RPURA. See PURPLE.

PUS (*Dict.*) — A very ſmall portion of Pus, abſorbed into the blood-veſſels, raiſes a putrid fever as certainly as yeſt does a fermentation in wort. This fever is not owing to its ſtimulating the ſolids to quicker and greater vibrations, but to its increaſing the inteſtine motion and accelerating the animal proceſs, haſtening the change of the juices to that ſubtile acrid ſtate which renders them unfit to be retained in the body, and diſpoſes them to run off in colliquative evacuations, ſuch as ſweating and purging, which conſtantly attend theſe putrid or hectic fevers, or riſing to internal ulcers. *Med. Eſſ. Edinb.* When Pus is laudable and mild, it is one of the moſt powerful digeſters, ſuppurants, and incarners; when it ſtagnates too long, or when the liquors and veſſels are faulty, it may become an acrid, ſtimulating, eroding ſanies; when abſorbed into the blood, it affects all the liquors, ſtimulates the veſſels, and is capable of producing violent diſorders.

PU'SHERS, a name given by thoſe who breed ſinging birds to Canary birds when new flown.

PUSILLA'TUM, a word uſed by ſome medical writers to expreſs a coarſe powder, or any medicinal ſubſtance, beat into ſmall pieces for infuſion, or the like purpoſes.

PU'SU, in botany, the name of a famous plant, growing in China, and greatly eſteemed there. This and the ginſeng theſe people a long time kept to themſelves; but at length it was diſcovered, that the one was eſteemed a certain prolonger of life, and the other a preſervative againſt all diſeaſes.

They, in their manner of ſpeaking, ſay, that the Puſu gives immortality: we have not been ſo happy to obtain any of this famous plant for the trial, but the ginſeng having been brought over, and found not to poſſeſs thoſe great virtues they aſcribe to it, and the people in China, who are poſſeſſed of the Puſu, dying, as well as thoſe who have it not, we find, that the virtues of both are ſo greatly exaggerated by the eaſtern dialect that there is not much to be expected from them. *Redi's Experiments.*

PUTO'RIUS, in zoology, the name by which authors call the pole-cat; a creature of the weaſel kind, but larger than the common weaſel, and of a blackiſh colour; and remarkable for its ſtinking ſmell.

The whole circumference of the face is white; at the extremity of the angles of the mouth there begins a broad line of a yellowiſh hue, which ſurrounds the head, and is white in ſeveral parts. Its long hairs are black, its ſhort ones yellowiſh; and the throat, the feet, and the tail, are blacker than any other part of the body. The upper jaws ſtand out a little beyond the lower. The ears are broad and ſhort, and are fringed, as it were, with white. Its ſtink is occaſioned by an extremely fœtid matter, ſecreted by two glands, which it has in common with all the creatures of this kind, within the anus. It feeds on fleſh, conſequently ſtealing hens and other poultry, and ſometimes contenting itſelf with their eggs. *Ray's Syn. Quad.*

PUTREFA'CTION (*Dict.*)—In Putrefaction, there is a great inteſtine motion; when carried to a height, and, when the putrefying ſubſtance is much compreſſed, it is accompanied with heat and ſmoke, and ſometimes flame. Air is neceſſary to it, and the viſible texture of the putrefying maſs is changed. Putrefaction is the moſt ſubtle of diſſolvents. It effectually diſjoins and ſeparates all the component parts of putrifying bodies, except the ſea-ſalt. In this powerful ſolution, the inteſtine action of the minute particles of bodies creates, collects, or is by ſome way or other the cauſe and means of heat.

The fluids of the human body are much diſpoſed to Putrefaction, and out of the body become highly putrid, even in cool air, and without any ſtirring or agitation; and our blood and ſome of our juices, out of the circulation, but within the body, change to putrid matter.

The changes, wrought in bodies by Putrefaction, are no where more remarkable than in the Putrefaction of vegetable ſubſtances, which by means of this change are brought nearly into the condition and nature of animal ſubſtances.

To prove this by an eaſy experiment, take a large quantity of cabbage-leaves, and preſs them hard down with weights in an open tub, with holes bored in its ſide; ſet them in a warm place, and the leaves will ſoon conceive a heat in the middle, and at length the whole, or nearly the whole, will be converted into a ſoft pappy ſubſtance. This ſubſtance, diſtilled in a glaſs retort, yields the ſame kind of volatile ſalt and oil as animal ſubſtances do: neither is it particular to this plant, but all equally do this; the acid and the alcaline, the ſweet and the bitter, the aſtringent and emollient. Hence, we may learn, how it is that nature, in our bodies, converts vegetable into animal ſubſtances; and it is very remarkable, that not a grain of fixed ſalt can be procured from this putrefied maſs. *Shaw's Lect.*

It is an obſervation of lord Bacon, that an enquiry into the means of preventing or ſtaying Putrefaction is of excellent uſe in phyſic. Dr. Pringle has made a great many curious experiments and remarks on this ſubject, which are publiſhed by way of appendix to his Obſervations on the Diſeaſes of the Army.

Putrefaction is one of the inſtruments of nature, by which many great changes are brought about. With regard to medicine, we know that neither animal nor vegetable ſubſtances can become aliment, without undergoing ſome degree of Putrefaction. The criſis of fevers ſeems to depend upon it; and even animal heat, according to Dr. Stevenſon, does the ſame.

Now, that the concoction of the humours is nothing elſe but Putrefaction, ſeems probable from hence, that, whenever they are in that ſtate, they are always more fluid, and fitter to paſs through the ſmaller veſſels, where they ſtagnated before. Again, the offenſiveneſs of the ſweats, or other excretions conſequent on a criſis, is likewiſe a ſure ſign of a high degree of corruption. The time of reſolution or Putrefaction depends on the degree of the habit of the patient, and on the part obſtructed. Reſolution is the Putrefaction of the impacted humour only, but ſuppuration implies a corruption of the veſſels alſo. This manner of ſpeaking, indeed, has been diſuſed, from the prejudice that nothing was putrid but what was offenſively ſo; whereas, in fact, every fibre becoming more tender, and humour thinner, may be conſidered as putrid in ſome degree, whether the change tends to the better health, or to the deſtruction of the perſon, or whether it becomes grateful or offenſive to the ſenſes. *Pringle, Obſerv. on Diſeaſ. of the Army.*

Mr. Boyle has uſed the words fermentation and Putrefaction of the blood promiſcuouſly, in his treatiſe on the human blood. Stahl, and other celebrated chemiſts, likewiſe uſe the terms putrid ferment.

Putrefaction is always found to generate air. Hence, though fleſh, as well as blood, be ſpecially heavier than water, yet dead bodies are found to float, after lying ſome time at the bottom, from air generated in the bowels by Putrefaction. Now, as it has been found by experiments, that the blood and other animal ſubſtances begin to emit air, before they are ſo far corrupted, as the ſame frequently are in putrid diſeaſes, it is probable that ſeveral of the ſymptoms in deep ſurfeits may be owing to the action of the confined air.

As all the humours of the animal bodies become thinner by Putrefaction, ſo the ſolid or fibrous parts are thereby relaxed, or rendered more tender. And hence the extraordinary bulk of the heart, liver, and ſpleen, incident to perſons labouring under putrid diſeaſes, may be accounted for. It is remarkable, that in diſſections of people who die of the plague, the heart is always found of an uncommon bigneſs; and, as to the ſcurvy, the liver and ſpleen are ſometimes inlarged to ſuch a degree that the tumor may be ſeen outwardly. *Id. ibid.*

It being a received opinion, that bodies become highly alkaline by Putrefaction, the doctor made the following experiments, in order to diſcover how far this might be true.

The ſerum of human blood putrefied, made, with a ſolution of ſublimate, firſt, a turbid mixture, and afterwards a precipitation; which is indeed one of the teſts of an alkali, but not to be admitted here, ſince the ſame thing was done with the recent urine of a perſon in perfect health, which is never accounted alkaline. The ſame ſerum did not tinge the ſyrup of violets green, and made no effervеſcence when the ſpirit of vitriol was poured upon it. The experiment was twice made upon portions of different ſerums, both highly putrid; and once on water, in which corrupted fleſh had been ſome time infuſed; and the moſt that could be found was, that, a reddiſh caſt having been previouſly given to the ſyrup with an acid, this colour was rendered fainter, but not deſtroyed by the putrid humours. And, as to effervеſcence, the ſpirit of vitriol being dropped into thoſe liquors unmixed, and alſo diluted with water, the mixture was quiet, and only a few air-bubbles appeared on ſhaking the glaſſes.

Upon the whole, though there were ſome marks of a latent alkali in the putrid ſerum, they were ſo very faint, that a quantity of water, equal to that of the putrid liquors, mixed with only one drop of ſpirit of hartſhorn, being put to the ſame trial, ſhewed more of an alkaline nature, than any of the other.

It has alſo been a maxim, that all animal ſubſtances, after Putrefaction, being diſtilled, ſend forth a great quantity of volatile ſalt in the firſt water; but Mr. Boyle found, that this held good only in urine; and that, in the diſtillation of the ſerum of human blood putrefied, the liquor which came over firſt had little ſtrength, either as to its ſmell or taſte, and did not at firſt effervеſce with an acid. And here it may be obſerved, that the chemiſts have generally applied theſe particles, which they diſcovered in urine, to all the humours indifferently; whereas, in fact, there is a great diverſity: for ſome animal ſubſtances, ſuch as urine, the bile, and the craſſamentum of the blood, ſoon putrefy; the ſerum, the ſaliva, and the white of an egg, ſlowly. Yet, thoſe that ſooneſt corrupt, do not always arrive at the higheſt degree of Putrefaction: thus, the bile is ſooneſt corrupted, but the rankneſs of it is not to be compared to that of fleſh; and the white of an egg is not only much leſs diſpoſed to putrefy than the yolk, but, when corrupted, yields a different and leſs offenſive ſmell.

Doctor Pringle farther obſerves, that it ſeems peculiar to ſtale urine to contain an alkaline ſalt, which, without diſtillation, makes a ſtròng effervеſcence with acids. Whereas moſt other animal humours putrefied, though of a moſt intolerable ſetor, yet contain leſs volatile ſalt, leſs extricable, and then not effervеſcing with acids. But what makes the difference between ſtale urine and other putrid ſubſtances ſtill more ſpecific, is its inoffenſiveneſs with regard to health; whilſt the ſteams of moſt other corrupted bodies are often the cauſe of putrid and malignant diſeaſes. So far then from dreading the volatile alcali as the deleterious part of corrupted bodies, it ſhould rather ſeem to be a corrector of Putrefaction. *Pringle's Obſerv. on the Diſ. of the Army.*

But ſtill there remains a prejudice, as if theſe ſalts, being the produce of corruption, ſhould therefore haſten Putrefaction ; and not only in diſtempers where they are unwarily taken, but alſo in experiments out of the body. As to the effects ariſing from the internal uſe of them, little can be ſaid, unleſs the kind of diſeaſe were preciſely ſtated : for ſuppoſing theſe ſalts were by nature diſpoſed to promote Putrefaction ; yet, if that is already begun, from a languor of circulation, and obſtruction, then may the volatiles, by their ſtimulating and aperient qualities, be the means of ſtopping its progreſs ; and, on the other hand, though they were really antiſeptic, yet, if the humours are diſpoſed to corrupt, from exceſs of heat or motion, theſe very ſalts, by adding to the cauſe, may augment the diſeaſe. So that, upon the whole, it ſeems to be the faireſt criterion of the true nature of theſe volatiles, to enquire whether they accelerate or retard Putrefaction out of the body ?

In order to decide this queſtion, repeated experiments were made, by joining both the ſpirit and the ſalt of hartſhorn to various animal ſubſtances ; and it was conſtantly found, that, ſo far from promoting Putrefaction, they evidently hindered it, even more powerfully than common ſea-ſalt. Hence, the doctor thinks it probable, that the ſame, taken by way of medicine, will likewiſe prove antiſeptic ; or, at leaſt, that we cannot juſtly ſuppoſe them corrupters of the humours, more than fermented ſpirits or ſea-ſalt.

With regard to the Putrefaction of dead bodies, it is found that ſome parts corrupt much ſooner than others. Thus, as the abdominal viſcera and muſcles corrupt the ſooneſt, it is a rule with anatomiſts, to begin their diſſections and demonſtrations with thoſe parts, the quick Putrefaction of which may be aſcribed to the putrid ſteams of the fæces. Next to the abdominal viſcera and adjacent parts, the lungs are commonly ſooneſt tainted, either from the air ſtagnating in the veſiculæ bronchiales, or from ſome remains of perſpirable matter, that, by acting as a ferment, may haſten the Putrefaction. *Pringle's Obſerv. on Diſeaſes of the Army.*

It is obſervable, that the Putrefaction of meat, and other ſubſtances, advances quicker in a confined than free air ; for, as the moſt putrid parts are alſo the moſt fugitive, they inceſſantly iſſue from a corruptible ſubſtance, and diſperſe with the wind ; but, in a ſtagnation of air, they remain about the body, and, in the nature of a ferment, excite its corruption.

Putrefaction is one cauſe of bilious and intermitting fevers, the dyſentery, malignant or peſtilential fevers, the ſcurvy, lepra Arabum, &c.

Putrefaction *of water.* It is ſaid to be the peculiar quality of the Thames water, that it will ſtink, and yet be wholeſome ; and, after this, will recover itſelf again. Many ſailors have been obliged to drink it ſtinking, ſo that they held their noſes while they poured it down their throats, yet no ſickneſs enſued from it. It generates a ſort of ſpirit alſo in this ſtinking ſtate, which will take fire at the approach of a lighted candle, as if ſpirit of wine were touched by the ſame.

PU'TTOCKS, or Puttock-*ſhrouds*, in a ſhip, are ſmall ſhrouds which go from the ſhrouds of the main-maſt, fore-maſt, and mizen-maſt, to the top-maſt ſhrouds ; and, if there be any top-gallant maſts, there are Puttocks to go from the top-maſt ſhrouds into theſe. Theſe Puttocks are at the bottom ſeized to a ſtaff, or to ſome rope which is ſeized to a plate of iron, or to a dead-man's eye, to which the lanniards of the fore-maſt ſhrouds do come.

PY'CNI, πύκνοι, in the ancient muſic, was uſed for ſuch ſounds or chords of a tetrachord as might enter the ſpiſſum, or πύκνον.

PYGA'RGUS, in natural hiſtory, a ſpecies of eagle, called alſo by ſome authors albicilla and ilianularia.

It is a large and fierce bird, of the ſize of a common turkey. Its beak is yellow, and covered with a yellow membrane at its baſe. It has large hazel-coloured eyes. Its feet are yellow, and its claws extremely ſtrong and ſharp. The head is white, and there are no feathers, but ſome fine hairs between the eyes and noſtrils. The upper part of the neck is of a reddiſh brown, and the rump black ; all the body beſides this is of an obſcure ruſt colour, and its wings are partly black, partly grey. Its tail is long, and the upper part of it is white, and the reſt black. It is from this white part that it has its name albicilla.

Authors who have written on this ſubject, ſeem not all agreed to call the ſame bird by this name. The Pygargus of Aldrovand ſeems different from this, and the Pygargus prior of Bellonius ſeems no other than the male of that kind of hawk called in Engliſh the hen-harrier. *Willughby's Ornithol.*

PY'KER, or *Pycar*, in our law books, a ſmall ſhip or herring-boat.

PY'RAMID (*Dict.*)—Under this article we have obſerved that every Pyramid is a third part of a priſm, which hath the ſame baſe and height.

That is, the ſolid content of the Pyramid A B D (*plate* XLIV. *fig.* 21, in the Dictionary) is one third part of its circumſcribing priſm A B E F.

For every Pyramid which has a ſquare baſe (ſuch as A *a* B in the figure) is conſtituted of an infinite ſeries of ſquares, whoſe ſides or roots are continually increaſing in arithmetical progreſſion, beginning at the vertex or point D, its baſe A *a* B being the greateſt term, and its perpendicular height C D is the number of all the terms ; but, the laſt term multiplied into the number of terms, the product will be triple the ſum of all the ſeries.

From hence it will be eaſy to conceive, that every Pyramid is a third of its circumſcribing Priſm, that is, of a priſm of equal baſe and altitude, of what form ſoever its baſe is of, viz. whether it be ſquare, triangular, pentangular, &c.

You may very eaſily prove a triangular Pyramid to be a third part of a priſm of equal baſe and altitude, by cutting a triangular priſm of cork, and then cut that priſm into three Pyramids, by cutting it diagonally.

PYRE'THRUM, in the materia medica, a root of which the druggiſts ſell us indiſcriminately two kinds ; the one the root of a corymbiferous plant, called by authors Pyrethrum flore bellidis, or the daiſy-flowered pellitory of Spain ; the other, the Pyrethrum cumbelliſerum, or umbelliferous pellitory : and it is a diſpute among the learned, which of the two is the genuine and proper kind ; the deſcription left us of it by Dioſcorides, as it is differently written, ſerving as well to prove the one ſo as the other.

The roots of the daiſy-flowered pellitory are what we moſt frequently meet with. They are of three or four inches long, of the thickneſs of one's little finger, greyiſh and wrinkled without, and whitiſh within, and of an acid and burning taſte. Thoſe of the umbelliferous pellitory are of the ſame length, but ſomewhat thinner, of a browniſh grey without, and white within, and are furniſhed with a ſort of beard at top, ſomewhat like the roots of the meum. It is of an acrid taſte, and much reſembles the other in its virtues. They are both uſed in the tooth-ach, and preſcribed by ſome in diſeaſes of the head and nerves, and are found to be diuretic and violently ſudorific ; but they are very ſeldom given.

PY'RGUS, among the Romans, a dice-box of the ſhape of a modius, open above, and having a great many ſhelves or partitions within ; ſo that, when the dice were thrown into it out of the fritillum, they were thereby overturned many times before they could reach the bottom, in which there was an opening for them to fall through upon the table. *Pitiſc. in voc.*

PYRICU'BIUM, in natural hiſtory, the name of a genus of foſſil bodies, uſually comprehended, with many others of a very different figure and ſtructure, under the general name pyrites. See *plate* XL. *fig.* 2.

The diſtinguiſhing characters of the Pyricubia are theſe : they are compound, inflammable, metallic bodies, of a cubic figure, or reſembling a die, being compoſed of ſix ſides.

Of this genus there are only two known ſpecies : Firſt, the great Pyricubium, of a foliaceous ſtructure ; and, ſecondly, the ſmaller ſolid Pyricubium.

The firſt of theſe is a very elegant foſſil, and is ſo regularly ſhaped, and ſo highly poliſhed by nature, that it has been often ſuppoſed to be wrought by art. It is but moderately hard, but is very heavy, and is of a foliaceous ſtructure. It is exactly of the figure of a die, being compoſed of ſix regular ſides, placed at right angles ; but, though ever thus regular in ſhape, it is not at all ſo in ſize : the moſt common ſpecimens of it are about a third of an inch in diameter ; but it is found much larger, even to three inches, and ſo ſmall as to the tenth of an inch. It is perfectly poliſhed and ſmooth on all its ſurfaces, and is of a very beautiful whitiſh green, with a faint admixture of yellow. It is found in the German and Hungarian mines, and in the Eaſt-Indies.

The ſecond ſort, or the ſmall ſolid Pyricubium, is a foſſil of much leſs beauty, though equally regular in its ſhape and appearance. It is very heavy, and extremely firm and hard, and is not of a foliaceous or flaky ſtructure, but of one regular and uniform maſs, and, when broken, appears very bright and gloſſy. It is ever found in the regular form of a cube, or regular ſolid body, made up of ſix flat ſides placed at right angles. Its uſual ſize is about the eighth of an inch diameter, but it is found ſmaller than a pin's head, and ſometimes ſo large as to be near an inch. It is perfectly ſmooth on all its ſurfaces, and is naturally of a pale yellowiſh green, and as bright on the outſide as within ; but very often it is found in a ferrugineous or duſky ſurface, owing to a ſort of ruſting, which is an accident to which the ſeveral ſpecies of naturally bright pyritæ are moſt of them alſo ſubject.

It is very common in Germany and Italy, and in ſome parts of America, as alſo in our own country. With us it is commonly found immerſed in ſlate, ſuch as we cover houſes with ; but, in Germany and other places, it is uſually found looſe among the earth of mountains. With us it is uſually of a bright ſurface, in Germany it is more frequently duſky. *Hill's Hiſt. of Foſſ.*

PYRI'PLACIS, in natural hiſtory, the name of a genus of pyritæ, the characters of which are theſe : they are compound, inflammable, metallic bodies, found in looſe detached maſſes of a ſimple and uniform, not ſtriated, internal ſtructure, and are covered with an inveſtient coat or cruſt.

PYRIPOLYGO'NIUM, in natural hiſtory, the name of a genus of foſſils, the characters of which are, that they are compound metallic bodies, of a regular figure, conſiſting of twelve plants.

There is only one known ſpecies of this genus, though ſubject to great varieties in its appearance ; and this has been by authors hitherto confounded, with many other bodies of a very different nature and figure, under the general name pyrites. The Pyripolygonium, when perfect, is an extremely elegant and beautiful foſſil; but this is a ſtate it is very rarely found in. It is moderately firm, of a compact texture, and very heavy; though its natural figure be a regular body, compoſed of twelve planes, yet it is ſubject to great imperfections and irregularities. It often ſeemsto want one or more of its ſides, and not unfrequently, from the accident of breaking of ſome of its angles, to have more than its number; and very often has a great many other ſmaller and leſs perfect bodies of its own kind, growing to its larger and leſs perfect ſpecimens. It is found, from the twentieth part of an inch, to four inches in diameter; but its moſt common ſize is about a third of an inch. It is naturally of a poliſhed and ſhining ſurface, and of a pale whitiſh yellow; but ſometimes it is browniſh, or of an iron colour.

PYRITES (*Dict.*) — The principal contents of Pyritæ may be in general gueſſed at from their colour. The white Pyrites uſually contains arſenic, the yellowiſh contains ſulphur and iron, and the fully yellow ſulphur and copper. The colours, therefore, make a very eſſential mark for the diſtinction of the ſeveral kinds of this foſſil. The yellowiſh Pyrites, that is, ſuch as contains iron and ſulphur, is found in the ſtrata of ſeveral kinds of ſtone, in clay, and in the earth lying over the mines of ſeveral metals. The white or arſenic Pyrites, and the fully yellow, are leſs common, but are uſually met with about mines. *Agricola de Metall.*

It is a matter of great difficulty to aſcertain the time of the formation of foſſils. Many of them ſeem to have remained in their preſent ſtate, unaltered, from the beginning of the world; but many have alſo been formed in later times, and continue to be formed to this day. Of the number of theſe laſt the ſtalactitæ, or ſtony icicles, hanging down from the roofs of grotto's, are known to be; and it is equally certain, that the pyritæ alſo are ſo formed, for many of the ſtalactitæ, in the caves dug by the German miners, are found to be coated over in ſeveral parts with Pyritæ; and, even in our own kingdom, pieces of wood buried in clay that contains Pyrites, ſuch as is commonly dug to make tiles, if taken up again after a number of years, are always found impregnated with this ſubſtance, forming veins in it, and ſometimes nodules on its ſurface. *Act. Erudit. Ann.* 1726.

The Pyritæ affixed to ſtalactitæ are finer than the other kinds, and it appears very evident to ſuch as have thoroughly conſidered the proceſs of nature in them, that they are not formed of particles brought together by water, in the manner of the Pyrites, in wood buried under clay, or in the manner of theſe ſtalactitæ themſelves; but are compoſed of infinitely minute particles, brought together by their mutual attractions on a proper baſis, and which had been before floating in the air.

The ancients in general ſuppoſed that copper was contained in the Pyrites; but they had no opinion that iron was a part of it, though it is certain that iron is the baſis of almoſt all of them, and copper has a part only in a very few: but this was the effect of judging from appearances, inſtead of having recourſe to experiments. Our own Liſter has the honour of being the firſt author who has treated properly of them, and found out their true and general baſis to be iron; but he carries it too far when he ſuppoſes them to be all properly iron ores: for this is not the caſe, many of them, which contain no other metal beſides iron, yet, holding it in ſmall quantities, and in ſuch a combination of other principles, that it is ſcarce extricable from them, and ſome kinds contain no iron at all. *Liſter de Font. Medic. Angliæ.*

Berger, who has written on the Caroline baths, has taken up the ſubject, and, improving upon Liſter's plan, has given a much more juſt account of them. He allows that iron ſeems the baſis of great numbers of the Pyritæ, and that this is evident from the obſervation, that the remaining matter of many of them, after burning away the ſulphur, is found to be attracted by the magnet; but he obſerves alſo, that in many copper is mixed with the iron, and that, though iron is in general found in even thoſe kinds which give the moſt obvious proofs of copper, yet there are ſome in which there can no iron be found.

This author obſerves alſo, that, beſides the metalline particles, whether iron or copper, there is alſo contained in the pyritæ an unmetallic earth, which is in the compoſition of this ſtone moſt equally mixed and perfectly blended with the particles of theſe metals, and with thoſe of the ſalts and ſulphurs contained alſo in the maſs. Sulphur alſo he acknowledges to make a great part of the Pyritæ, particularly of all the yellowiſh and full yellow kinds. The white or ſilvery Pyrites contains leſs ſulphur than any of the others, and yet the yellow or venereal Pyrites, though it contains much arſenic, yet does not fail to contain ſulphur alſo in conſiderable quantities. *Berger de Font. Carolin.*

The mention of gold and ſilver in the Pyrites is very common among authors, but the colour of theſe ſtones ſeems principally to have given ground for that opinion. In reality theſe metals are very ſeldom found naturally making parts of the Pyrites, and, when they are, it is only in a very inconſiderable quantity. But, in thoſe ſpecimens found about the mines of gold and ſilver, the particles of thoſe metals aſſembled into viſible maſſes are ſometimes found unbedded in lumps of the Pyrites; and ſuch pieces of this ſtone may well then be ſaid to contain thoſe precious metals. The occaſion of this accident, however, is no more than this, that the Pyrites is formed in mines and other places at this day, which is plain from its being in ſome places found adhering to the ſides of the ſtalactitæ, as has already been mentioned; and in like manner it might adhere to particles of gold and ſilver, and thereby give ground to the ſuppoſition of their being parts of it.

The common Pyritæ of our clay-pits and ſea-coaſts are uſed in the making of copperas and vitriol; but among theſe there is found a very great difference, ſome of them turning themſelves very eaſily to vitriol, when only expoſed to moiſt air; others doing it with more difficulty; and ſome not at all, though expoſed many years. Some alſo yield all their vitriol at once, on pouring warm water on them; while others muſt lie expoſed to the air at ſeveral different times, and roaſted in the mean while, in order to obtain it. The ſettled obſervations on this ſubject, as collected from experiments, are theſe: No Pyrites which contains any copper, or any arſenic, will of itſelf turn into vitriol, but requires a previous roaſting.

The ſulphureous iron Pyrites, void of copper or arſenic, all turn to vitriol on being only expoſed to the air; and that the ſooner or later, as they are more or leſs of a compact ſubſtance. The fibrous or radiated Pyritæ are uſually of this kind; but this is no general rule, for there are ſome radiated ones which remain whole years unaltered in the air.

Copper and arſenic always reſiſt the ſhooting of the ſalts of the Pyrites, or its turning to vitriol; but theſe are not the only agents that reſiſt this change, for in ſome merely ferreous and ſulphureous Pyritæ the change is not made but with much time and difficulty. *Henkell, Pyritol.*

It is remarkable alſo, that vitriol is found in ſome Pyritæ, if water be poured upon them immediately after the roaſting; while others will not yield any till they have been afterwards expoſed to the air. It even ſeems, that we are to look into the air for the cauſe of the appearance of vitriol in the copperas ſtones. This it may greatly aſſiſt in effecting, as it carries a quantity of moiſt vapours in it: for it is well known, that the acid of ſulphur has not the power to reſolve iron into the form of a ſalt without the addition of water; nay, oil of vitriol, or of ſulphur, being moderately concentrated, though it be then diluted with much more water than it is united with, while yet in ſulphur, does not even diſſolve filings of iron, unleſs there be four times or ſix times as much water poured to it. Water alone, however, though a great and neceſſary agent, cannot be ſuppoſed to effect the whole change; for, though there are ſome of the Pyritæ that yield their vitriol by means of it, yet there are others that do not; and ſome Pyritæ are preſently turned into vitriol, when expoſed to the air, which had before remained for many years under water unaltered. Of this kind there are many on the ſhores of the ſea in moſt parts of Europe. In England particularly we have them in great plenty in Sheppey iſland in Kent. Theſe Pyritæ will long reſiſt the change into vitriol, when in the air, and yet they evidently contain no copper nor arſenic.

There is alſo a kind very common on the ſhores, which reſembles wood in texture and appearance; and has probably once been wood, but has now its pores filled with the Pyrites: of theſe many lie buried a foot or more deep in the ſand under the ſea water; and in that ſtate they never ſhoot into vitriol, but are of a firm texture and conſiderable hardneſs, and, when broken, look very bright within, and have no taſte of vitriol, nor give any mark that they contain any: yet theſe, if they are taken up and expoſed to the air for a fortnight, loſe all their brightneſs and their hardneſs, and, mouldering to pieces, become ſo rich in vitriol, that it forms itſelf into regular cryſtals on their ſurfaces. Now, if moiſture alone was ſufficient to produce this effect, there is no reaſon why they ſhould not have been reſolved into vitriol under a very moiſt ſand. The great cauſe we are able to aſſign, appears to be the vague acid, ſo common in the foſſil world, and filling alſo the region of air; but an ingenious reaſoner will ſtill own, that, though this may do much, yet there muſt be ſome other cauſe, yet undiſcovered, for the production of vitriol in theſe foſſils; ſince this, as well as the moiſture of the air, ought to act more equally than we find by experience it does on theſe ſtones, if all were owing to it. *Henkell, Pyritol.*

In the expoſing theſe copperas ſtones to the air, if it be a moiſt ſeaſon, no farther care need be taken of them than the piling them up in a heap; but moiſtening them now and then is a neceſſary circumſtance in dry ſeaſons, and in this caſe the water ſhould be ſprinkled on them in ſmall quantities at a time, and the heaps now and then turned and new made. Much depends on this management, the ſame quantity of ſtones yielding twice as much copperas, with proper care, as they would without it.

When the matter of the Pyrites is mixed with the lead ores, the method of ſeparating the metal by aſſaying is this: roaſt two centners of the ore, as in the uſual method, and keep a ſtronger fire than when the ore is pure. The Pyrites, eſpecially when it is merely iron, hinders an ore from eaſily growing clammy, or turning into large lumps, or entirely melting. When the ore is ſufficiently waſhed, let it cool, beat it to powder, and repeat the roaſting to a third fire, till, when it is red-hot in the fire, there is no ſmell of ſulphur: then mix the ore with ſix centners of black flux, and two of ſandiver, and finiſh the work in the common way, only making the fire greater, and continuing it longer, towards the end of the operation. *Cramer's Art.*

PYRITRICHIPHY'LLUM, in natural hiſtory, the name of a genus of foſſils of the claſs of the Pyritæ, the characters of which are theſe: they are compound, inflammable, metallic bodies, found in looſe maſſes not of any regularly angular figure, and of a ſtriated texture, with foliaceous ends to the ſtriæ, appearing on the ſurface or within the maſs. They are common in ſeveral parts of England.

PYRITRI'CHUM, in natural hiſtory, the name of a genus of pyritæ, the characters of which are theſe: they are compound, inflammable, metallic foſſils, always found in detached maſſes of no regularly angular figure, and of a ſimply ſtriated internal ſtructure.

PY'RMONT-*waters.*— The country, all about where theſe ſprings are, abounds with materials which give virtue to the waters; and the quarries of ſtone, wherever they are dug, ſend up ſpirituous and martial exhalations as well as the ſprings that run from them, and the water among them has in general a vitriolic taſte. Iron is found all about the place alſo, under the appearance of a yellowiſh earth or ochre, which contains ſo much of that metal, that it may be worked as an ore of it to great advantage. Ferrugineous ſtones are alſo found in great abundance in the neighbourhood of the place; theſe may be alſo worked as iron ores, and the ſelenites is found in the ſtrata of earth that make up the hills thereabouts, in great abundance, and in beautiful perfection.

The waters themſelves, though they ſhew evident marks of an alcali, yet, have alſo an acid principle in them, of the nature of the common acid of ſulphur, except in this, that in theſe waters the acid carries with it a ſubtile mineral oil or fattineſs; and, mixing with the common alcali ſalt, which is found in all mineral waters, theſe together form a neutral ſalt: but, as in the compoſition of this ſalt there is much more alcali than acid, it is neceſſary that the water ſhould ſhew alcaline rather than acid qualities. The analyſis ſhews alſo, that the waters contain a ſtony matter embodied in them, which is pure, inſipid, colourleſs, taſteleſs, and ſeems to be in nothing different from common cryſtal. The earth about the ſprings contains alſo a great number of lumps of a clayey matter, of the ſize of a walnut, and of a yellowiſh colour; in all of which, when broken, there is found pure cryſtal in ſmall ſhoots, ſometimes in its own regular figure, and ſometimes irregular and mutilated.

A water, containing theſe principles thus combined, cannot but poſſeſs thoſe virtues we find ſo eminent in this; theſe are the opening obſtructions, correcting the ſharpneſs of the humours, and reſtoring the ſolids to their due ſtate. *Scipp. Nova Deſcrip. Font. Pyrm.*

The hiſtory of theſe waters is accurately given by Hoffman in his Obſervations on them, both in their natural ſtate and in mixture with other bodies.

He firſt obſerves, that they contain a volatile and ſubtile principle, greatly more penetrating and ſtrong, as well as in larger quantities, than any other mineral water, but that this is not to be expected in them any where but upon the ſpot, for thoſe who tranſport them to other places are conſtrained to let a part of this fly off to preſerve the reſt. If either glaſs or earthen veſſels be filled at the ſpring, and immediately corked and faſtened down, the conſequence is, that they will burſt on the firſt motion or heat of the weather. They are, therefore, forced to fill them only in part at firſt, and let them ſtand a while for this ſubtile ſpirit to exhale, and then, a while after the filling them up, to cork and fit them for carriage.

Secondly, if they are drank upon the ſpot in a morning on an empty ſtomach, they affect the noſe with a pungent tingling, and diſturb the head for many hours afterwards.

Thirdly, if they are taken at the ſpring, they purge but very little, but, if taken in another place, after tranſportation, they purge conſiderably more, and render the ſtools black. It is obſervable alſo, that, if they are left in an open veſſel a few days, their virtue exhales, and they no longer purge or render the ſtools black.

Fourthly, if tea leaves, balauſtine flowers, or galls, are put into this water, they firſt change it to a blue, from that to a purple, and finally to a black. This is a ready proof, that black is only a deep purple, and purple only a deep blue: a little ſpirit of vitriol added to this liquor deſtroys all the colour, and renders it limpid as before.

Fifthly, if any acid be mixed with Pyrmont-water, there is raiſed an effervеſcence, and bubbles of air are carried up in great quantities; and this whether the ſtronger acids, ſuch as ſpirit of vitriol, or aqua-fortis, be uſed; or the weaker, as vinegar, lemon juice, or Rheniſh wine.

Sixthly, if an alcaline liquor be added, whether it be volatile, as the ſpirit of ſal armoniac, or fixed, as the oil of tartar, there is no ebullition raiſed, but the liquor becomes turbid and milky. If ſpirit of vitriol be afterwards added to this, to ſaturate the additional alcali, the liquor becomes limpid again.

Seventhly, cow's milk mixed in equal quantity with Pyrmont-water does not coagulate, but, on the contrary, becomes thinner than before, and is preſerved from turning ſowre ſo ſoon as it otherwiſe would in hot weather. This is a proof that there is no predominating acid in theſe waters.

Eighthly, if ſyrup of violets be added to this water, it turns it to a beautiful green. This is a proof of the alcaline nature of theſe waters; and it is farther proved by adding ſpirit of vitriol, or any other acid, to this green liquor, which on that becomes limpid again.

Ninthly, four pints of this water, evaporated over a gentle fire, yield no more than two ſcruples of a dry reſiduum. Oil of vitriol being poured on this, an effervеſcence ariſes, and with it an acrid and pungent vapour, like that produced by mixing oil of vitriol and common ſalt. If ſpirit of vitriol be uſed inſtead of the oil, the effervеſcence is in a leſs degree, and the ſalt is in part changed to a bitter ſaline maſs, the remainder ſeparated from which proves to be a calcarious earth no longer fermenting with the ſpirit of vitriol.

Tenthly, if a quantity of Pyrmont-water be expoſed twenty-four hours to the open air in a baſon, it will at the end be found to have loſt all its virtues, taſting wholly inſipid, and being turbid inſtead of the fine clearneſs it had before, and a yellow ochreous earth is precipitated to the bottom; after this, the liquor will no longer ſhew any of thoſe qualities which were before its diſtinguiſhing characters; it will no longer ferment with acids, nor turn black with galls, nor green with ſyrup of violets.

It appears from the whole, that the Pyrmont-waters poſſeſs a pure, extremely penetrating, and elaſtic mineral ſpirit, and that in a very large proportion, and to this their virtues are principally to be attributed. This mineral ſpirit, while it remains engaged in a calcarious earth, imitates the properties of an alcaline ſubſtance; and, when joined with a ſubtile martial earth, it emulates the properties of vitriol, giving the ſtools a black colour, and turning a tincture of galls into ink: and, while this remains in the water in thoſe forms of an alcaline or vitriolic principle of ſo great ſubtility, it cannot but give them very great virtues in ſtrengthening the tone of the viſcera, opening obſtructions, and ſtimulating in a proper manner the excretory ducts, ſo as to make them duly perform their office; but as ſoon as by the ſtanding of the water open, or by any other accident, this ſubtile element is evaporated, all the virtues of the water muſt be gone with it.

The great quantity of this powerful ſpirit, contained in the waters, makes them more fit for the robuſt and ſtrong conſtitutions, when depraved by illneſs, than for the weak and tender ones; but even the tendereſt people may take them, only obſerving to take but a ſmall doſe, or to dilute them with an equal quantity of common water immediately before the taking them.

Hoffman alſo recommends the Pyrmont-water mixed with equal quantities of milk, on his own experience, in ſcorbutic and gouty caſes. *Hoffm. Opera.*

Near the famous well at Pyrmont, is a ſtone quarry under ground, from ſome parts of which a ſulphureous ſteam comes out, which commonly riſes to a ſmall height. Animals held in this ſteam are ſoon ſuffocated, but recover, if quickly taken out. When a man ſtands in this ſteam, but with his head over it, it proves an excellent ſudorific. Dr. Seip propoſes to perform cures in ſeveral diſeaſes with it.

Imitation of PYRMONT-*water.*— This medicinal water may be imitated very nicely by art in the following manner: take a quart of the pureſt and lighteſt water, add to it thirty drops of a ſtrong ſolution of iron made in ſpirit of ſalt, a drachm of oil of tartar per deliquium, and thirty drops of ſpirit of vitriol, or a little more or leſs, as is found neceſſary, not to let the alcali of the oil of tartar prevail too ſtrongly, though it muſt prevail a little. Shake all briſkly together, and on taſting it will be found extremely to reſemble the true Pyrmont-water.

The baſis on which this is founded, is the analyſis and trial of the true Pyrmont-water, by which it is found to contain a ſubtile aqueous fluid, a volatile iron, and a predominant alcali, all joined together into one briſk pungent ſpirituous water. The artificial Pyrmont thus made, if the proportions are carefully minded, will extremely reſemble the natural, and will have the ſame effects as a medicine. *Shaw's Lectures.*

PYRO'BOLUS, in natural hiſtory, the name given by many authors to the ſtone more generally called pyrites; others have called it ſiderites, pyrobalanus, pyropus, and othonua, and the Greeks mylias.

PYROCTOGO'NIUM, in natural hiſtory, the name given by Dr. Hill to a genus of foſſils, uſually comprehended by authors, with many other bodies of a different figure and ſtructure, under the general name pyrites.

The characters of the Pyroctogonium are theſe: it is a compound, inflammable, metallic body, of a regular octohedral figure, or compoſed of eight planes.

There is only one known ſpecies of this genus, which is a very ſingular and elegant foſſil, being compoſed of eight triangular planes; theſe being the ſides of two quadrilateral pyramids, with broad baſes, which, being joined baſe to baſe, conſtitute the Pyroctogonium.

This figure is very regular and determinate in the perfect ſpecimens of the body, but there is ſcarce any foſſil which is more ſubject to imperfections and accidental variations. Its moſt perfect ſtate is when the two pyramids of which it is compoſed are placed evenly one over-againſt the other; but this is rarely the caſe, they are often placed unevenly, or ſlanting; their planes are frequently of very irregular lengths and breadths, and not unfrequently the ſpecimens are found mutilated and imperfect, and very often a number of them cohering in a cluſter one with another, and very much mutilating or injuring one another's figure. They are found of all the ſizes between that of a pin's head and an inch in diameter; but the large ones are ſcarce, and the moſt uſual ſtandard is a third of an inch. They are naturally of ſmooth and poliſhed ſurface, and of the colour of wrought iron; when broken, they are bright and ſparkling, and of a paler colour than without. When nicely examined as to their internal ſtructure, they are found to be compoſed, like the marcaſites, of a number irregularly arranged foliaceous flakes or plates.

It is found very frequently in Cornwall, Devonſhire, and moſt other of our countries where there are mines. It is ſometimes met with looſe in the earth, ſometimes lodged in the bodies of marcaſites, or in the ſolid foſſils, and varies ſometimes from its iron colour to a duſky yellow. It is ſometimes alſo found with many ſpecimens connected into a maſs; theſe are ſeldom uniform in ſize, and cohere in various directions, often injuring one another's figure. Sometimes alſo, as in the caſe of the cryſtals, they form a large maſs, of which the outer ſurface only is concreted into or covered with regular figures, the whole inner part being a confuſed ſubſtance.

Maſſes of this kind are not unfrequently found of a regularly orbicular figure, and beſet all over with regularly figured Pyroctogonia of various ſizes. *Hill's Hiſt. of Foſſ.*

PYRO'LA, *winter-green*, in botany, a genus of plants, whoſe characters are:

The leaves are alternate; the flower is roſaceous, pentapetalous, ſhaped like a hat, with a recurvated piſtil, and diſpoſed in a ſpike; the fruit is roundiſh, ſtriated, umbilicated, quinquecapſular, and full of ſmall ſeeds.

The leaves, which are the only part uſed, and that not often, are cooling and drying, and a good vulnerary, both for inward and outward wounds and hæmorrhages, ulcers in the kidnies or bladder, as, alſo, againſt making bloody water, and the exceſs of the catamenia. *Miller's Bot. Off.*

PYROLA'MPIS, *the glow-worm*, a ſmall inſect, remarkable for its ſhining in the night.

The male and female differ greatly in this ſpecies of inſect.

The male has wings, and is a ſmall fly; the female has no wings, but is a large crawling worm. The body of the male is oblong, and ſomewhat flatted; the wings are ſhorter than the body; the head is broad, dun, and flat; the eyes are large and black. This has no light iſſuing from it, and is not commonly ſuppoſed to be at all of kin to the glow-worm; but a very different inſect.

The female is what we expreſly call by this name. This is a very ſlow-paced animal, without wings, and ſomewhat reſembling a caterpillar; the head is ſmall, flat, hard, and black, and ſharp towards the mouth; it has ſhort antennæ, and ſix moderately long legs: the body is flat, and compoſed of twelve rings, whereas the body of the male conſiſts only of five; it is of a duſky colour, with a ſtreak of white down the back. It is often ſeen in the day-time, but is not known till in the dark; at which time it is eaſily diſtinguiſhed by the glowing light, or lambent flame, that is ſeen near the tail, iſſuing from the under part of the body.

PYRO'METER *, in mechanics, a machine for meaſuring the degree of expanſion of metals by heat.

* The word is derived from the Greek πῦρ, fire, and μετρέω, to meaſure.

The following Pyrometer is that of the ingenious Mr. John Ellicot.

A A (*plate* XXXV. *fig.* 12.) is a flat piece of braſs, which, for farther ſtrength, is ſcrewed down to a thick piece of mahogany: upon this plate are ſcrewed three pieces of braſs, two of which, marked B B, ſerve as ſupports for the flat iron bar C; and which, on account of its uſe, I ſhall call the ſtandard bar. The upper part of the third piece of braſs is a circle about three inches diameter, divided into 360 equal parts or degrees: within the circle is a moveable plate, divided likewiſe into 360 parts, and a ſmall ſteel index. The braſs circle in the fig. is marked D, and the moveable plate *d*. Upon the ſtandard bar the bar of metal is laid, on which the experiment is to be made, as E.

F is a lever two inches and a half in length, faſtened to an axis, which turns in two pieces of braſs ſcrewed to one of the ſupports marked B: to the end of this lever is faſtened a chain, or ſilk line, which after being wound round a ſmall cylinder; to which the index in the braſs circle D is faſtened, paſſes over a pulley, and has a weight hung to the end of it: upon the axis, to which the lever is fixed, is a pulley, $\frac{1}{4}$ of an inch in diameter, to which a piece of watch-chain is faſtened; the other end of this chain is hooked to a ſtrong ſpring, marked G, which ſpring bears againſt one end of the metal E.

H is a lever exactly of the ſame form and dimenſions with the former; but the chain faſtened to the pulley on its axis is hooked to the ſtandard bar. The line faſtened to the end of this lever, after being wound round a cylinder, to which the moveable plate is fixed, paſſes over a ſmall pulley, and has a weight hung to the end of it; or rather the ſame line paſſing under a pulley, to which the weight is hung, has its other end faſtened to the lever F: thus one weight ſerves for both levers, as in the figure.

From this deſcription it is plain, that, whenever the bar E is lengthened, it gives liberty to the weight to draw the lever F upwards by its action on the ſpring G; and the index will, at the ſame time, by means of the ſilk line, be carried forward in the circle; and as the bar ſhortens, it will return back again; the ſame motion will be communicated to the ſtandard bar.

The lengthening the bar the $\frac{1}{20}$ of an inch will carry the index once round the braſs circle, which is divided into 360 degrees; therefore, if the metal lengthens the 7200th part of an inch, the index will move one degree.

To make an experiment with this inſtrument, lay a bar of any kind of metal, as E, on the ſtandard bar; then heat the ſtandard bar to any degree of heat with a lamp, and mark the degree of its expanſion, as marked by the moveable plate: obſerve alſo the degree of expanſion of the metal E, by the heat communicated to it from the ſtandard bar, as marked on the braſs circle by the index: let the inſtrument ſtand, till the whole is thoroughly cold; then removing the bar E, lay a bar of any other metal in its place, and heat the ſtandard bar to the ſame degree of heat as before, which is ſeen by the moveable plates marking the ſame degree of expanſion. Then the index will ſhew the degree of expanſion of the ſecond metal, as it did of the firſt; and, by this means, the degrees of expanſion of different metals, by the ſame degree of heat, may be exactly eſtimated.

PYRO'PHORUS, the name uſually given to that ſubſtance called by ſome black phoſphorus.

It is made in this manner: take four or five parts of alum, and one part of wheat-flower, calcine this together to a brown or blackiſh maſs; powder this, and put it into a phial, ſtop it looſly with a paper, and ſet in a ſand heat, ſo as to make it continue glowing hot for ſome time; after this, remove the whole from the fire, ſuffer it to cool gradually, and finally ſtop the bottle very cloſe down.

A little of this powder being poured out of the bottle, and expoſed to the open air, immediately takes fire, and appears like a glowing coal; but the powder muſt be freſh made to have a good effect, for the ſun's rays, or the moiſture of the air being admitted to it, gradually take away its virtue.

Almoſt any animal or vegetable ſubſtance may be ſubſtituted inſtead of wheat-flower in this proceſs, and it will ſucceed equally well; but no other ſalt will do in the place of alum. *Shaw's Lectures.*

PY'RUS, *the pear-tree*, in botany, a genus of trees, whoſe characters are:

The flower conſiſts of ſeveral leaves, which are placed in a circular order, and expand in form of a roſe; whoſe flower cup afterwards becomes a fleſhy fruit, which is more produced towards the foot-ſtalks than the apple, but is hollowed like a navel at the extreme part: the cells in which the ſeeds are lodged, are ſeparated by ſoft membranes, and the ſeeds are oblong. See PEAR.

Q.

QUADRANGULA'RIS *piſcis*, the *ſquare-fiſh*, in zoology, the name of a fiſh, which, in its moſt uſual ſize, is about fifteen inches long, four inches in the middle, and three inches and an half over. The forehead is ſquare, a little hollow, and, by the eminency of the eyebrows, two inches and an half over. The noſe blunt, and not very ſteep, with two holes in the place of noſtrils, and the mouth very ſmall. The back is a little convex toward the tail, and on the ſides a little obtuſely angled; as is alſo the belly, which is plain and flat, and a little riſing towards the tail. It has five fins, two near the gills, two near the tail, and the tail-fin, which is conſiderably long. Part of the head and tail are covered with a ſoft ſkin, the reſt of the body with a kind of cruſt, adorned all over with little round knots, reduced for the moſt part into hexagonal figures, and ſubdivided into equilateral triangles. *Grew. Muſ. Reg. Soc.*

QUA'DRANS, a word uſed by ſome authors to expreſs a fourth part of a pound, that is, three ounces troy weight, or four of the avoirdupois.

Hadley's QUA'DRANT (*Dict.*)— Though the late Mr. Hadley was undoubtedly the inventor of it, yet the principle upon which his invention turns, had not eſcaped the ſagacity of Sir Iſaac Newton, long before, as appears from a paper in his hand-writing found among the papers of the late Dr. Halley. But this was totally unknown to Mr. Hadley, and ſeemed to have been forgot by Dr. Halley himſelf. The account of Sir Iſaac's invention is inſerted in the *Philoſophical Tranſ.* N°. 465, and is as follows.

P Q R S, *Plate* XXXV. *fig.* 8, denotes a plate of braſs accurately divided, in the limb D Q, into $\frac{1}{2}$ degrees, $\frac{1}{2}$ minutes, and $\frac{1}{6}$ minutes, by a diagonal ſcale; and the $\frac{1}{2}$ degrees, $\frac{1}{2}$ minutes, and $\frac{1}{6}$ minutes, counted for degrees, minutes, and $\frac{1}{6}$ minutes. A B is a teleſcope, three or four feet long, fixed on the edge of the braſs plate. G is a ſpeculum, fixed on the ſaid braſs plate perpendicularly, as near as may be to the object glaſs of the teleſcope, ſo as to be inclined 45 degrees to the axis of the teleſcope, and intercept half the light which would otherwiſe come through the teleſcope to the eye. C D is a moveable index, turning about the center C, and, with its fiducial edge, ſhewing the degrees, minutes, and $\frac{1}{6}$ minutes, on the limb of the braſs plate P Q; the center C muſt be over-againſt the middle of the ſpeculum G. H is another ſpeculum, parallel to the former, when the fiducial edge of the index falls on 00° 00′ 00″; ſo that the ſame ſtar may then appear through the teleſcope, in one and the ſame place, both by the direct rays and by the reflected ones; but, if the index be turned, the ſtar will appear in two places, whoſe diſtance is ſhewed, on the braſs limb, by the index.

By this inſtrument the diſtance of the moon from any fixed ſtar is thus obſerved: view the ſtar through the perſpicil by the direct light, and the moon by the reflected, or, on the contrary, and turn the index till the ſtar touch the limb of the moon, and the index ſhall ſhew, upon the braſs limb of the inſtrument, the diſtance of the ſtar from the limb of the moon; and, though the inſtrument ſhake, by the motion of your ſhip at ſea, yet the moon and ſtar will move together, as if they did really touch one another in the heavens; ſo that an obſervation may be made as exactly at ſea as at land. And by the ſame inſtrument may be obſerved, exactly, the altitudes of the moon and ſtars, by bringing them to the horizon; and thereby the latitude, and times of obſervations, may be determined more exactly than by ways formerly practiſed. In the time of obſervation, if the inſtrument move angularly about the axis of the teleſcope, the ſtar will move in a tangent of the moon's limb, or of the horizon; but the obſervation may notwithſtanding be made exactly, by noting when the line, deſcribed by the ſtar, is a tangent to the moon's limb, or to the horizon. To make this inſtrument uſeful, the teleſcope ought to take in a large angle: and, to make the obſervation true, let the ſtar touch the moon's limb, not on the outſide of the limb, but on the inſide.

Mural QUADRANT. Mr. Gerſten has lately given us a deſcription of a new aſtronomical mural Quadrant, which he ſays is free from many of the uſual inconveniencies attending the uſe of ſuch inſtruments. See *Phil. Tranſ.* N°. 483.

QUADRA'TO, or QUADRO, in the Italian muſic, is a name given to the note B, when it comes in the natural or diatonic order, and is thus marked ♮. It is a ſemitone minor higher than the B mol, or ♭, and in reſpect of that may be called ſharp.

QUA'DRATURE *of the ellipſis.* — The ellipſis, is a curve whoſe preciſe Quadrature in definite terms is not yet effected. We have here therefore, as in the circle recourſe, to a ſeries.

Let A C (*Plate* XXXV. *fig.* 9.) $= a$, G C $= c$, P C $= x$. Then will

$$y^2 = c^2 = (a^2 - x^2) : a^2$$
$$y = c\sqrt{(a^2 - x^2)} : a$$

But $\sqrt{[a^2 - x^2]} = a - \frac{x^2}{2a} - \frac{x^4}{8a^3} - \frac{x^6}{16a^5} - \frac{5x^8}{128a^7} - \frac{7x^{10}}{256a^9}$, &c. in infinitum. Therefore, $ydx = c\,dx \frac{cx^2dx}{2a^2} - \frac{cx\,dx}{8a^4} - \frac{cx^6dx}{16a^6} - \frac{5cx^8dx}{128a^8} - \frac{7cx^{10}dx}{256a^{10}}$, &c. in infinitum.

if then for x be put a, the quadrant of the ellipſis will be $ac - \frac{1}{8}ac - \frac{1}{40}ac - \frac{1}{112}ac - \frac{5}{2152}ac - \frac{7}{2816}ac$, &c. in infinitum. Which ſame ſeries exhibits the intire area of the ellipſis, if a denote the intire axis.

Hence, 1. If $\sqrt{ac} = 1$, the area of the ellipſis $= 1 - \frac{1}{6} - \frac{1}{40} - \frac{1}{112} - \frac{5}{1152} - \frac{7}{2816}$, &c. in infinitum: whence it is evident that an ellipſis is equal to a circle whoſe diameter is a mean proportional between the conjugate axis of the ellipſis. 2. Hence, alſo, an ellipſis is to a circle whoſe diameter is equal to the greater axis, as ac to a^2; that is, as c to a, or as the leſs axis to the greater. Hence, laſtly, having the Quadrature of the circle, we ſhall likewiſe have that of the ellipſis, and on the contrary.

QUADRATURE *of the parabola.*— For the parabola we have a quadratrix or tranſcendent curve, which gives its ſquares. But it may be likewiſe had thus:

$$ax = y^2$$
$$a^{1:2}x^{1:2} = y$$
$$ydx = a^{1:2}x^{1:2}dx$$

$\int ydx = a^{1:2}x^{3:2} = \frac{2}{3}\sqrt{ax^3} = \frac{2}{3}\sqrt{x^2y^2} = \frac{2}{3}xy$.

Hence, the parabolic ſpace is to the rectangle of the ſemiordinate into the abſciſſe, as $\frac{2}{3}xy$ to xy; that is, as 2 to 3.

Note, If a curve be not ſuppoſed deſcribed, but only an equation to it given, ſo as it does not appear, for inſtance, where the origin of x is to be fixed, we are to put $x = o$ in the integral, and, expunging what are multiplied by x, add to it the remainder, if there be any, under the contrary ſign; to have the Quadrature ſought.

QUADRATURE *of the hyperbola.*— For this, too, we have a quadratrix, invented by Mr. Perks.

The analytical Quadrature was firſt given by N. Mercator, of Holſtein, the firſt inventor of infinite ſeries's. But, Mercator finding his ſeries by diviſion, Sir Iſaac Newton and Mr. Leibnitz improved upon his method; the one ſeeking them by the extraction of roots, the other by a ſeries preſuppoſed.

Mercator's QUADRATURE *of the hyperbola between its aſymptotes.*—Since, in an hyperbola within the aſymptotes, $a^2 = by + xy$; or if $a = b = 1$, which may be ſuppoſed, ſince the determination of b is arbitrary.)

Then will
$$1 = y + xy$$
$$1 : (1 + x) = y$$

That is, the diviſion being actually performed,

$$y = 1 - x + x^2 - x^3 + x^4 - x^5 + x^6, \text{ \&c.}$$
$$ydx = dx - xdx + x^2dx - x^3dx + x^4dx - x^5dx + x^6dx, \text{ \&c.}$$
$$\int ydx = x - \tfrac{1}{2}x^2 + \tfrac{1}{3}x^3 - \tfrac{1}{4}x^4 + \tfrac{1}{5}x^5 - \tfrac{1}{6}x^6 + \tfrac{1}{7}x^7, \text{ \&c.}$$

in infinitum.

QUADRATURE *of the cycloid.*— Since T P (*Plate* XXXV. *fig.* 10.) = P M; in the triangle P M T, the angles M and T will be equal; and conſequently, T P Q = 2 M. But the meaſure of the angle A P Q is the half arch A P; which likewiſe meaſures the angle T P A. Therefore A P Q = T M P = M m S, by reaſon M Q and mq are parallel. Wherefore, ſince the angles at S and Q are right-angles, we have

$$AQ : QP :: MS : mS.$$

Let, then, A Q $= x$, A B $= 1$; then will P Q $= \sqrt{(x - xx)}$ and mS $= dx\sqrt{(x - xx)} : x$. But it is ſhewn, that $\sqrt{(x - xx)} = x^{1:2} - \frac{1}{2}x^{3:2} - \frac{1}{8}x^{5:2} - \frac{1}{16}x^{7:2}$, &c. in infinitum. Therefore, $dx\sqrt{(x - xx)} : x =$ (the numerators of the exponents being diminiſhed by two units in the diviſion by x) $x^{-1:2}dx - \frac{1}{2}:x^{1:2}dx - \frac{1}{8}x^{3:2}dx - \frac{1}{16}x^{5:2}dx$, &c. in infinitum. Whoſe ſum $2x^{1:2} - \frac{1}{3}x^{3:2} - \frac{1}{20}x^{5:2} - \frac{1}{56}x^{7:2}$, &c. in infinitum, is the ſemiordinate of the cycloid Q M referred to the axis A P. Hence, Q M dx, or the element Q M S q of the cycloidal ſpace A M Q $= 2x^{1:2}dx - \frac{1}{3}x^{3:2}dx - \frac{1}{20}x^{5:2}dx - \frac{1}{56}x^{7:2}dx$, &c. in infinitum. Whoſe ſum $= \frac{4}{5}x^{3:2} - \frac{2}{15}x^{5:2} - \frac{1}{70}x^{7:2} - \frac{1}{252}x^{3:2}$, &c. in infinitum, expreſſes the ſegment of the cycloid A M Q.

If, then, $mS = gG = dx\sqrt{(x - xx)} : x$ be multiplied into G M = A Q = x; we ſhall find the element G M H G of the area A M G = $dx\sqrt{(x - xx.)}$ Which being the ſame with the element of the ſegment of the circle A P Q, the ſpace A M G will be equal to the ſegment of the circle A P Q; and, conſequently, the area A D C equal to the ſemicircle A P B.

Hence, ſince C B is equal to the ſemiperiphery of the circle, if that = p and A B = a; the rectangle B C D A = ap; and the ſemicircle A P B; and conſequently, the external cycloidical ſpace A D C = $\frac{1}{4}ap$. Therefore the area of the ſemicycloid A C B = $\frac{3}{4}ap$, and A M C B P A = $\frac{1}{2}ap$. Conſequently, the area of the cycloid is triple of the generating circle.

QUADRATURE *of the logiſtic, or logarithmic curve.*— Let the ſubtangent P T, *Plate* XXXV. *fig.* 11, = a, P M = x — P p = dx; then will

$$ydx : dy = a$$

$$ydx = ady$$

$$\int ydx = ay$$

Wherefore the indeterminate ſpace H P M I is equal to the rectangle of P M into P T.

Hence, 1. Let Q S = z; then will the indeterminate ſpace I S Q H = az; and, conſequently, S M P Q = $ay - az$ $= a(y - z)$; that is, the ſpace intercepted between the two logiſtic ſemiordinates is equal to the rectangle of the ſubtangent into the difference of the ſemiordinates.

2. Therefore the ſpace B A P M, is to the ſpace P M S Q as the difference of the ſemiordinates A B and P M to the difference of the ſemiordinates P M and S Q.

QUADRATURE *of Des Cartes's curve*, which is defined by the equation, $b^2 : x^2 :: b - x : y$.

Since, $b^2y = bx^2 - x^3$

$$y = (bx^2 - x^3) : b^2$$

$$ydx = (bx^2dx - x^3dx) : b^2$$

$$\int ydx = x^3 : 3b - x^4 : 4b^2$$

QUADRATURE *of all curves comprehended under the general equation*, $y = x\sqrt[m]{(x + a)}$

Since $y = (x + a)^{1:m}$

$$ydx = dx(x + a)^{1:m}$$

To render the element integrable, ſuppoſe,

$$(x + a)^{1:m} = v$$

Then will $x + a = v^m$

$$dx = mv^{n-1}dv$$

$$ydx = mv^m dv$$

$$\int ydx = \frac{mv^m}{m+1} + 1 = \frac{m}{m+1}(x+a)\sqrt[m]{(x+a.)}$$ Let $x = o$:

The remainder $\frac{m}{m+1}a\sqrt[m]{a}$. Whence, the area of the curve $\frac{m}{m+1}(x + a)\sqrt[m]{(x + a)} - ma\sqrt[m]{a}$.

QUADRATURE, in aſtronomy (*Dict.*)— When the moon is in her Quadrature, ſhe exhibits that phaſis which we call the half-moon, i. e. ſhe ſhines with juſt half her face; and is ſaid to be biſected, or dichotomiſed. See PHASIS and DICHOTOMY, in the Dictionary.

In the moon's progreſs from the ſyzygies to her Quadrature, her gravity towards the earth is continually increaſing by the action of the ſun; and her motion retarded for the ſame reaſon.— Her motion, then, in her orbit is ſloweſt as her gravity to the earth is greateſt when in the Quadratures.

In her receſs from the Quadratures to the ſyzygies, the gravity continually decreaſes, and the velocity increaſes.

The ratio is thus: as radius is to the ſum, or difference of one and an half the co-ſine of double the diſtance of the moon from the ſyzygy, and half the radius; ſo is the addition of gravity in the Quadratures to the diminution or increaſe thereof in any other ſituation.

Hence, the moon's orbit is more convex in the Quadratures, than in the ſyzygies; and hence the circular figure of the moon's orbit is changed into an oval, whoſe greater axis goes through the Quadratures; and hence, alſo, the moon is leſs diſtant from the earth at the ſyzygies, and more at the Quadratures.

It is no wonder, therefore, that the moon approaches nearer the earth when her gravity is diminiſhed; that exceſs not being the immediate effect of this diminution, but of the inflexion of the orbit towards the Quadratures.

QUADRI'GA, in ſurgery, otherwiſe called CATAPHRACTA, is a ſtrong bandage made uſe of in fractures of the ſternum. It is compoſed of a double-headed roller about ſix Paris ells long and three or four fingers broad.

QUADRI'GÆ, among the Romans, chariots drawn by four horſes, which were harneſſed all a-breaſt, and not two and two.

QUADRI'LLE, a well known game at cards; and which has been, in ſeveral caſes, the object of mathematical computations. *De Moivre's Doctrine of Chances, 2d. edit.*

QUADRI'SETÆ, *the four-haired fly*, a term uſed by the writers, in natural hiſtory, to expreſs thoſe flies of the ſeticaude or hair-tailed kind, which have four hairs or briſtles growing from the tail, as the others have three, two, or one.

QUA'DRULA, in natural hiſtory, a word ſometimes uſed in the ſame ſenſe as teſſela, and ſpoken of the cubic pyrites. Sometimes it is uſed alſo as the name of thoſe light ſpangles of ſhining matter that are mixed among ſand. Theſe are generally fragments of talc, and are of various colours, white, yellow, and blackiſh.

Solinus has uſed the word Quadrula to expreſs the fragments of yellow talc that are found in that ſand called ammochryſos, or golden ſand. He miſtakes theſe ſhining particles for maſſes of real gold, and makes the ſand itſelf a kind of precious ſubſtance ranked among the gems, and brought from Perſia; but in this he does not agree with the reſt of the ancients.

QUA'DRUPED (*Dict.*)— Quadrupeds are divided by Mr. Ray into thoſe which are hoofed, ungulata, and clawed or digitate, unguiculata.

Hoofed QUADRUPEDS are either,

1. Whole-hoofed, ſolidipeda, μονόχηλα, μόνυχα, ſolidungula: as the horſe, aſs, the onager or wild aſs; the mule and the zebra of Africa, or the fine ſtriped Indian or African aſs, almoſt like a mule in form and ſtature.

Of the whole-hoofed kind, Ariſtotle has obſerved, that no one hath two horns—(he might have ſaid any horns) no one hath the talus or aſtragalus, nor have the males any appearance of breaſts.

2. Cloven-footed, and that either, 1, into two diviſions only; as the δίχηλα, or biſulcate kind, which are again ſubdivided into ſuch as are, firſt,

Ruminant, μηρυκαζόντα, that is, ſuch as chew the cud; and theſe either have hollow and perpetual horns, as the bull, ſheep, and goat-kind; or deciduous horns, as the hart and deer-kind, which uſually ſhed their horns annually. See RUMIMANT, in the Dictionary.

Of the bull-kind are reckoned theſe: the common bos or bullock, of which the male is taurus, the female vacca: the German urus, urochs, or aurochs: the biſon, the bonaſus, the bubalus, or bufalo: the bos Africanus of Bellonius, Obſ. l. ii. c. 50, which he takes to be the bubalus of the ancients.

Of the ſheep-kind, beſides the common ſort, are reckoned the Arabian ovis laticauda, whoſe tail is ſometimes of thirty pounds weight; the ovis ſtrepſiceros Cretica Bellonii; the ovis Africana, with ſhort hair inſtead of wool; the ovis Guineenſis, or Angolenſis of Marcgrave, *Hiſt. Braſil.*

Of the goat-kind, are, beſides the common capra domeſtica, the ibex, or German ſteinbock, found in the tops of the Alps; the rupicapra, French chamois, or German goms; the gazella Africana or antelope; the gazella Indica; the capra ſylveſtris Africana Grimmii; the capra mambrina, or Syriaca of Geſner; the buſelaphus, or moſchelaphus Caii in Geſner; the tragelaphus Caii in Geſner, &c.

Of the hart or deer-kind, are reckoned, the cervus ἔλαφος, or red deer; the cervus platyceros or palmatus, the fallow deer; alce or the elk; rangifer, the rain-deer; the axis Plinii, according to Bellonius; the caprea Plinii, the cuguacu-etc, and cuguacu-zapara of Marcgrave; the caprea Groenlandica.

Secondly, of cloven-footed animals into two parts only, and which do not chew the cud, there is only the hog and ſwine-kind: under this head, beſides the common ſwine, are reckoned the wild boar, or ſwine; the porcus Guineenſis Marcgravii; the porcus Indicus, called babyrouſſa; the tajaca or aper Mexicanus moſchiferus of Dr. Tyſon, called by Marcgrave tajaca cunagoara, by others quauhtla coymalt, and quapizotl, and by Acoſta, and ſome others, zaino.

2. There are ſome Quadrupeds, whoſe hoof is cloven into four diviſions; and theſe ſeem to be not ruminant: as the rhinoceros, the hippopotamus, the tapijerete of Braſil, the capy-bara of Braſil, and the animal moſchiferum.

Clawed or digitate QUADRUPEDS.— Of this kind, there are, firſt, a ſort whoſe claws are not divided or ſeparated, but adhering to one another, covered with one common ſkin, but with obtuſe nails, ſticking out round the margin of the foot; as the elephant, which is anomalous, and not clearly referable to this kind, or to that of cloven-footed Quadrupeds.

A ſecond ſpecies of this digitate-kind of Quadrupeds, which has only two claws, is that of camels; and, though theſe have no horns, they both ruminate, and have alſo the four ſtomachs of horned ruminant animals.

Of the camel or dromedary there are two ſorts; one having but one bunch on the back, the other two.

To this kind alſo belong the Peruvian glama, which ſome have reckoned among the ſheep-kind; as alſo the pacos, the ovis Indica, or Peruviana vulgo, much leſs than the glama.

A third ſpecies of this unguiculate kind includes ſuch animals as the Greeks called πλατυώνυχα, and ἀνθρωπομόρφα, which have the foot divided into many claws, with broad nails on them; as the ape and monkey kind.

Of theſe, ſome have no tails, and are called ſimiæ, or apes: others have tails, and are called monkeys, cercopitheci; and ſuch as have either long or ſhort tails, if they are of a larger ſize, are called papiones or baboons.— There are great numbers and varieties or this ſpecies of Quadrupeds; of which naturaliſts have deſcribed theſe: viz. the orang outang or homo ſylveſtris of Dr. Tyſon, deſcribed by him in a particular diſcourſe: the guarita of Braſil, Marcgravii; the cagui of Braſil, greater and leſſer; the cay of the ſame region, deſcribed by Lerius; the caitaia of the ſame country; the cercopithecus barbatus Guineenſis, two or three ſorts of it; the cercopithecus Angolenſis major; the cercopithecus non barbatus Cluſii; the cercopithecus Cluſ. called ſagouin: laſtly, if apes and monkeys have their ſnouts very prominent like dogs, they are called cynocephali.

A fourth ſpecies of this unguiculate kind, is when, though the claws are many, yet they are not covered at the end with broad flat nails, like the monkeys or apes; but are rather like the talons of hawks, &c. crooked and ſharp-pointed.

Theſe, in reſpect of their teeth, may be divided into ſuch as have many dentes primores, or inciſores, that is, cutting teeth, in each jaw, of which there are two ſorts; a greater, which either have a ſhort, round head, as the cat-kind; or a leſſer ſort, having a long ſlender body, with very ſhort legs, as the weaſel or vermin-kind.— There are alſo ſome of this ſpecies of Quadrupeds, which have only two large remarkable teeth in each jaw: theſe are the hare-kind, and live only upon herbs, graſs, &c.

Of the cat-kind of Quadrupeds are reckoned to be the lion, the tyger, the pardalis, which male is pardus, and female panthera, the leopard; the lupus cervarius, or lynx; the catus pardus, or cat-a-mountain; the common cat, and the bear.

Of the dog-kind are reckoned the wolf; the lupus aureus or jackall; beſides the common dog, of which kind they enumerate, the maſtiff; the canis Venaticus graius, Græcus, or Scoticus, the greyhound; graius Hibernicus, or the Iriſh greyhound; the canis Venaticus ſagax, indagator, ſpectator ferarum, &c. the hound; canis Venaticus Hiſpanicus or Aviarius, the ſpaniel for land or water; vertagus or tumbler; canis οἰκυρὸς, or domeſticus, the houſe-dog; canis melitæus, or the lap-dog; canis Getulus or Iſlandicus, the ſhock: and of all theſe ſorts there are many varieties of mongrels, and hybridous breeds.

Another ſort of the dog-kind is the fox; the animal zibethicum, or civet-cat, as it is corruptly called, but, by it's teeth and ſnout, is plainly of the dog-tribe; the American coati, rackoon, or rattoon; the yzquiepate; the carigueya, maritucaca, carigoy, ropoza, or poſſum; the taxus or meles; the badger, grey, or pate; the lutra or otter; the phoca, ſea-calf, or ſeale; the equus marinus, morſe, or ſea-horſe, miſtaken by ſome for the hippopotamus; the Dutch call him walras, the Danes and Iſlanders roſmarus; laſtly, the manati or vacca marina, the ſea-cow.

Of the vermin, or weaſel-kind of Quadrupeds, is firſt, the muſtela vulgaris, the common weaſel, in Yorkſhire called foumart or fitcher, γαλέη; the viverra Indica, called quel and quirpele; and another ſort called mungo and mungathia, of a reddiſh grey: the muſtela, ermin, or ſtoat, if white: and muſtela ſylveſtris, the ferret; putorius, the pole-cat; martes or foyna, the martin or martlet; muſtela zibellina, the ſable; laſtly, the genetta; and the ichneumon Bellonii.

Of the bare kind of Quadrupeds, are firſt, lepus, or the common hare: cuniculus, the rabbet or coney: tapeti, or Braſil coney, and the aperea of Braſil; the hyſtrix, or porcupine, and the hyſtrix Americanus, or cuanda of Braſil; caſtor, fiber, or the beaver; ſciurus vulg. or ſquirrel: the Virginian, Zeylandic, Barbary, and American flying ſquirrel; mus domeſticus, major and minor, the common rat and mouſe: to theſe alſo may be referred mus major aquaticus, the water-rat; the muſk-rat, mus avellanarum, major and minor; the dormouſe or ſleeper, mus noricus, Cricetus, Alpinus ſeu Marmotta; the cavia cobaya, or cuniculus Americanus, the Guinea-pig; the agati and paca of Brazil; the mus Norwegicus, or leming; the glis Geſneri, or the rell; the mus Indicus, &c.

Anomalous QUADRUPEDS.— To theſe ſeveral kinds the following anomalous ones muſt alſo be added.

1. Such four-footed viviparous animals as have a longiſh ſnout, with their feet divided into many claws and toes, and having teeth; as the echinus terreſtris, or common urchin, or hedge-hog; erinaceus Indicus albus; tatu or armadillo prima of Marcgrave; tatuete of Braſil, or the ſecond ſpecies of the armadillo, according to Marcgrave; tatu apara, his third ſpecies of armadillo; tatu Muſtelinus, Soc. Reg. Muſ. the weaſel-headed armadillo; talpa, the mole, warp, or mold-warp; mus araneus, ſhrew, hardyſhrew, ſhrew-mouſe.

2. Quadrupedous and viviparous animals with a longiſh ſnout, having their feet divided into many claws or toes, but without teeth; as the tamandua-guacu of Braſil, Marcgravii; urſus formicarius Cardani, the great ant-bear; the tamanduais of Braſil, or Marcgrave's leſſer ant-bear.

3. Anomalous flying Quadrupeds, with a ſhorter ſnout, and their feet divided as above; being of the bat-kind, or flittermice; of which there are ſeveral ſizes and different forms.

4. There is one very anomalous animal which has but three claws on each foot; and that is the aſs, or ignavus of Marcgrave, the ſloth or ſluggard.

5. Viviparous and ſanguineous Quadrupeds, breathing with lungs, but having only one ventricle in the heart; as the rana aquatica, the frog or froſh; rana arborea, ſeu ranunculus viridis, the ſmall tree or green frog; bufo, ſive rubeta, the toad; teſtudo, the tortoiſe, in Greek, χελώνη; of theſe there are land and water ones, and many different ſpecies in foreign parts.

6. Oviparous Quadrupeds, with a long tail ſtretched out horizontally, are the lizard kind; as lacertus omnium maximus, the crocodile; cordylus, ſive caudiverbera, uramaſtix Græcis, larger than the green lizard; tapayaxin Novæ Hiſpaniæ; lacertus orbicularis of Hernandez; lacertus vulgaris, the common eft, ſwift, or newt; lacertus viridis, the green lizard; lacertus fucetanus Adrovandi, at Rome and Naples called the tarantula: lacertus Indicus, called ſenembi and inguana; lacertus Braſilienſis, called tejuguacu, and temapara by Marcgrave; the taraguira, ameira, toraguico, Acuraba Americima, Curapopepa, Teiunham, &c. of Marcgrave; the lacertus Indicus; the ſcincus, or crocodilus terreſtris; the ſeps, or lacerta chocidica, a kind of footed ſerpent; ſtellio, the ſwift, or ſpotted lizard; ſalamandra terreſtris; ſalamandra aquatica, the water eſt; lacerta volans Indica; and the chamælion, or camelion.

Alated QUADRUPEDS. Among the many fabulous things with which natural hiſtory has been loaded, ſtories of flying Quadrupeds ſeem to claim a very high rank; the gryphon, the Quadruped dragon, and a great many other imaginary animals, having been introduced ſo ſeriouſly among the deſcriptions of real animals, that too many have been taught to believe them. Scheuchzer, in his Phyſica ſacra Jobi, has done much towards diſcountenancing ſuch relations, and Hyacinthus Gemma, who has written expreſly de ſabuloſis animalibus, has added much on the ſame occaſion: yet all is not done. The world have late hiſtories of lemmas and baſiliſks, which never exiſted but in the imagination of the relator, or in the ſubtle contrivances of the fabricator; as is evidently the caſe in the baſiliſks, which we find in the muſæums of the curious, and which are all made out of the wray-fiſh. And the generality of readers are ſo fond of any thing that is marvellous, that theſe things are ſure to be remembered, while perhaps all the truths in the book are forgotten.

Though moſt of the ſtories of alated or flying Quadrupeds are falſe, yet, there are evidently ſome animals which ſhew, that this property is not denied to all Quadrupeds. We have bats in every part of this kingdom, and the Eaſt and Weſt-Indies are not without them; and whoever accurately examines this creature, will find that it has nothing of a bird but that one property of flying; and that what are called its wings, and ſerve it in the office of wings, are, in reality, only its fore-feet extended, and webbed with a peculiar kind of membrane.

There is a ſpecies of flying lizard very common in Java, and called by many the flying dragon. Bellonius had led the world into a great error in regard to this animal, having miſtaken it for a two-legged creature, and deſcribed and figured it as ſuch; but Bontius, and others ſince his time, have ſet us right about it from their own obſervation, and Piſo, as well as many others, have deſcribed it truly as a Quadruped.

Theſe creatures are properly enough called flying animals, as they can ſuſpend themſelves a long time in the air, and move about in it at pleaſure; but leſs accurate writers have added to the numbers of flying Quadrupeds the common ſquirrel, and ſeveral other creatures which live in woods, and being very light in their bodies, and very ſtrong in their legs, can leap or throw themſelves forward to a great diſtance, and by this means paſs from one tree to another. Of this kind the moſt eminent is that ſpecies called the flying ſquirrel, which has a ſort of membrane which it expands on each ſide to catch the air, and ſupport it from falling in its leaps; which by this means it makes very long, and ſeems to fly, eſpecially when it throws itſelf from the top of a very high tree to a low ſhrub.

Upon the whole, the ſtandard of the flying or alated Quadrupeds ſeems to be properly enough reducible to this: that the words flying and alated are not ſynonymous terms, and that there are three kinds of flying among the Quadruped claſs. The firſt abſolute and ſwift, flying as perfect as in birds; this peculiarly belongs to the bat, which is the only alated or winged Quadruped, properly ſpeaking. 2. An imperfect flying by means of certain membranes ſerving as wings, but imperfectly, and not turning quick, or enduring long flights; ſuch is the flying of the lizard, which is not properly an alated animal. And, laſtly, the imperfect flying of the ſquirrel kind, which even in that ſpecies called, by way of eminence, the flying ſquirrel, is not properly flying, but only long leaping;

the creature being able to turn but very little out of a right-line, and only to ſuſpend itſelf during a ſhort time in a leap from a high place to a lower. *Phil. Tranſ.* N°. 427.

QUADRUPLATO'RES, among the Romans, were informers, who had the fourth part of the confiſcated goods for their pains. *Pitiſc. in voc.*

QUÆ'RENS *non invenit plegium*, a return made by the ſheriff upon a writ directed to him with this clauſe, viz. Si A. fecerit B. ſecurum de clamore ſuo proſequendo, &c. F. N. B. 38. *Blount. Cowel.*

QUAIL, in ornithology, the name of a well known bird of paſſage, frequenting the corn fields, and ſometimes the meadows. They begin to ſing in the month of April, and make their neſts in May, building on the ground.

Quails are to be taken by means of the call, during their whole wooing time, which laſts from April to Auguſt. The proper times for uſing the call are at ſun-riſing, at nine o'clock in the morning, at three in the afternoon, and at ſun-ſet; for theſe are the natural times of the Quail's calling. The notes of the cock and hen Quail are very different, and the ſportſman who expects to ſucceed in the taking them, muſt be expert in both; for, when the cock calls, the anſwer is to be made in the hen's note; and when the hen calls, the anſwer is to be made in the cock's. By this means, they will come up to the perſon, ſo that he may, with a great eaſe, throw the net over them and take them. If a cock Quail be ſingle, on hearing the hen's note he will immediately come; but, if he have a hen already with him, he will not forſake her. Sometimes, though only one Quail anſwers to the call, there will three or four come up; and then it is beſt to have patience, and not run to take up the firſt, but ſtay till they are all entangled, as they will ſoon be.

The Quail is a neat cleanly bird, and will not run much into dirty or wet places: in dewy mornings they will often fly inſtead of running to the call; and in this caſe, it is beſt to let them go over the net, if it ſo happens that they fly higher than its top, and the ſportſman then changing ſides, and calling again, the bird will come back, and then will probably be taken in the net.

The calls are to be made of a ſmall leather purſe, about two fingers wide, and four fingers long, and made in the ſhape of a pear; this is to be ſtuffed half full of horſe-hair, and at the end of it is to be placed a ſmall whiſtle, made of the bone of a rabbit's leg, or ſome other ſuch bone: this is to be about two inches long, and the end formed like a flageolet, with a little ſoft wax. This is to be the end faſtened into the purſe, the other is to be cloſed up with the ſame wax, only that a hole is to be opened with a pin, to make it give a diſtinct and clear ſound. To make this ſound, it is to be held full in the palm of the hand, with one of the fingers placed over the top of the wax; then the purſe is to be preſſed, and the finger is to ſhake over the middle of it, to modulate the ſound it gives into a ſort of ſhake. This is the moſt uſeful call, for it imitates the note of the hen Quail, and ſeldom fails to bring a cock to the net, if there be one near the place.

The call that imitates the note of the cock, and is uſed to bring the hen to him, is to be about four inches long, and above an inch thick; it is to be made of a piece of wire turned round and curled, and covered with leather; and one end of it muſt be cloſed up with a piece of flat wood, about the middle of which there muſt be a ſmall thread or ſtrap of leather, and at the other end is to be placed the ſame ſort of pipe, made of bone, as is uſed in the other call. The noiſe is made by opening and cloſing the ſpiral, and gives the ſame ſound that the cock does when he gives the hen a ſignal that he is near her.

QUA'KERS, a religious ſect, who made their appearance in England, during the time of the interregnum.

They took their origin from George Fox, an illiterate perſon, born at Draiton in Leiceſterſhire; and by profeſſion a ſhoe-maker.

The accounts of thoſe times tell us, that as he wrought at his trade, he uſed to meditate much on the ſcriptures; which, with his ſolitary courſe of life, improving his natural melancholy, he began at length to have viſions; and, in conſequence thereof, ſet up for a preacher.

The new prophet propoſed but few articles of faith; dwelt moſtly on morality; preached mutual charity, the love of God, and a deep attention to the inner motions and ſecret workings of the ſpirit.—He would have a ſimple worſhip, and religion without any ceremonies; making it a principal point to wait, in profound ſilence, the motion and direction of the holy ſpirit.

The genius of the times, the novelty of the doctrine, and the great appearance of devotion in the man, ſoon gained him diſciples; and ſome unuſual ſhakings and convulſions which they were ſeized withal, at their firſt meetings, procured them the appellation Quakers.

They profeſs a great auſterity of behaviour; a ſingular probity and uprightneſs in their dealings; a demureneſs and gravity of countenance; a coldneſs and ſparingneſs of diſcourſe, to have time to weigh what they ſay; a great deal of frugality in their tables, and of plainneſs in their dreſs.

They declaim much againſt the intereſted views of the Engliſh miniſters; blame all war, and ſet aſide all uſe of oaths, as prohibited under the goſpel.

According to the genius of riſing ſects, an eager zeal at firſt led them to ſome extravagancies: they would run about the ſtreets naked, and were frequently in priſon for interrupting the miniſters in ſervice time.

One of their company, Naylor, is ſaid to have had the impiety to allow his followers to call him ſon of God, ſon of juſtice, and king of Iſrael; to ſtrew garments before him, and hale him at his entry into Briſtol, with *Hoſanna* ſon of David. He had his trial for the ſame, was whipped for blaſphemy, and excommunicated by the reſt.

Beſides other penalties inflicted on them, they were laughed at, and rallied in writing, and expoſed on the theatre: but they deſpiſed alike both the preſs and the priſon, and formed their ſect, maugre all oppoſition of both; and under the direction of Fox, Dewſbury, and others, grew, from a looſe, undiſciplined multitude, into a regular body, with ſtated laws and polity; which they retain with great œconomy to this day.

The modern Quakers retain nothing of the extravagancies charged on their leaders; having approved themſelves a ſober, quiet people, of exemplary morals, and remarkably charitable and friendly to each other.

Their doctrines are not eaſily collected; at leaſt, not eaſily repreſented out of their own terms, which appear ſomewhat ambiguous.

They hold Chriſt to be a light which hath lighted every man; and that whoever will ſoberly and ſeriouſly turn into himſelf with a ſincere deſire to know and practiſe his duty, will not fail to find there a ſufficient director; a ray from the fountain of light illuminating the underſtanding, and aſſiſting to diſtinguiſh good from evil.

They add, that ſuch as follow the directions and convictions of this light, ſhall be holy and acceptable to God; and that this was the end of Chriſt's coming into the world.— That, ſo far as they follow this light, they ſhall be infallible; and that it is not opinions, ſpeculations, or notions of what is true, or ſubſcription of articles or formula's of faith, how ſoundly ſoever worded, that make a man a true believer or chriſtian; but a conformity of mind and practice to the will of God, according to the manifeſtation and dictates of this divine principle of light within them.

Our Saviour's injunction about baptiſm they underſtand, in a figurative ſenſe, of a converſion and change of the heart; and wholly neglect the outward ſign.— Water-baptiſm, they hold, was only John's; that it was no more than a type or figure, fitted for the infant-ſtate of the goſpel; and therefore now uſeleſs, in a diſpenſation, which is ſpiritual and inward.

The ſame they hold of the ſupper; alledging, that both allude to old Jewiſh practices, and were uſed as types or ſignifications of a near and accompliſhing work.—They add, that the communion of ſaints conſiſts only in a participation of the ſame divine principle, ſhewing itſelf in an unity of ſpirit.

As to miniſtry and ordinances, they deny that any are to be uſed of man's wit, or will, or carnal invention, or imitation; or other than what the inward principle directs them to.— Accordingly, they have no perſons ſet apart for the miniſtry; but without diſtinction of quality or ſex, every one who is of a ſober life, and approved converſation, and believes him or herſelf called or moved thereto, is permitted to ſpeak and propheſy in their aſſemblies.

They own the ſcriptures to be given by divine inſpiration, and allow them the appellation of the form of ſound words; but refuſe to call them the word of God, as being a denomination properly attributed to Chriſt alone.— They add, that what makes them more ſcrupulous in this reſpect, is, that people are apt to be hereby led to think that, if they have the ſcriptures, they have all; and ſo look for no farther word or light.

They acknowledge the holy three that bear record in heaven, father, word, and ſpirit; but reject the ſchool-terms, trinity, diſtinct, perſons, hypoſtaſes, &c. as not ſcriptural, and as apt to convey too groſs ideas.

They have been even charged with denying the incarnation, our Saviour's humanity, divinity, plenary ſatisfaction, and the reſurrection of the dead: but this is injurious to them; and all that can be juſtly ſaid, is, that they do not allow of them in the ſame ſenſe, or ſpeak of them in the ſame terms, as is commonly done among others.—They allow the incarnation, and that the Godhead dwelt bodily in Jeſus; and yet many of them ſay, there is no Chriſt but what is within them: whence it ſhould ſeem their notion of the incarnation only implied this, that the light, which they call the Chriſt within, dwelt in the man Jeſus Chriſt fully.— Their reaſoning, here, is, that, Chriſt, as God, not being diviſible, the meaſure or manifeſtation of the ſpirit of Chriſt in us is a manifeſtation of the ſame Chriſt which dwelt bodily and fully in the man Jeſus Chriſt.

They are ſilent as to the hypoſtatical union; and ſome of them are charged with allegoriſing away the whole hiſtory of the crucifixion, the reſurrection, and aſcenſion; though their beſt and moſt approved writers have been very explicit in their acknowledgment of the reality of the hiſtory.

They decline the uſe of modes or forms of civility; expreſſing their reſpect to their ſuperiors no other way but by obeying all juſt laws under their government.

The ſyſtem of quakeriſm is laid down in fifteen theſes, by Robert Barclay, in a well writ Apology addreſſed to king Charles II. Their hiſtory, writ in low Dutch by William Sewel, and ſince tranſlated into Engliſh, traces them from the beginning to the year 1717.—A hiſtory of this people was alſo publiſhed, anno 1695, by Gerard Croeſe; but that author is by them accuſed as having miſrepreſented facts, and in many reſpects done them injuſtice.

As to diſcipline and polity; the affairs of the communion are all managed under a democratical government, by rules eſtabliſhed by common conſent; and this principally at their meetings, whereof they have many kinds; viz. monthly, quarterly, yearly, ſecond day's meetings, meetings of ſufferings, &c.

Their monthly and quarterly meetings are held in their reſpective counties.—To theſe deputies are ſent from the ſeveral particular meetings.—Here inquiry is made into the ſtate of each meeting; who ſtand faſt to the rules and orders, and who backſlide; who pay tithes, and church rates, and who ſuffer for non-payment of either; who are married by prieſts, &c. and accordingly they proceed to cenſure, or incourage.—Here, too, they excommunicate, and here receive again into communion; of all which things exact regiſters are kept.

From theſe meetings appeals lie to their yearly ones, which are always held in London, and conſiſt of three orders or claſſes; viz. repreſentatives ſent from the quarterly meetings; correſpondents for the ſeveral counties and foreign countries; and miniſters, or preachers.—Hither are tranſmitted accounts of what has been tranſacted in all the monthly and quarterly meetings over all the world.—Here are meaſures concerted, and directions given as to behaviour about tithes and rates, providing for the poor, compoſing differences, &c.—Here public accounts are audited, and proper inſtructions given to the deputies to be obſerved at their return, and a yearly epiſtle of admonitions diſpatched to be read in all the monthly and quarterly meetings throughout the world.

The ſecond day's meeting, is a ſtanding committee conſiſting of the principal preachers in and about the city, who meet every Monday, to concert particular caſes and exigencies relating to the body, happening between the yearly meetings; particularly to examine, approve, licenſe, &c. all books printed in their behalf.

The meeting of ſufferings is held every week, and conſiſts of the correſpondents for each county.—Its buſineſs is to receive complaints from ſuch as have ſuffered for non-payment of tithes and rates, and to procure them relief, either by ſending them money, for which they have a ſettled fund, or by ſolliciting their cauſes above, or both.

QUALIFICA'TIONS *of members of parliament.* A knight, baronet, or any other under the degree of a baron, may be elected knight, citizen, or burgeſs.

An alien, though made a denizen, cannot ſit in parliament; even perſons naturaliſed by act of parliament are uſually reſtrained from ſitting as members. Perſons under the age of twenty-one years are not capable of being elected members of parliament. The election is void, and minors, though choſen, preſuming to ſit and vote, are under the ſame penalties as if they had ſat and voted without being choſen.

None of the judges of the King's-bench, Common-pleas, or barons of the Exchequer, that have judicial places, can be choſen knights, citizens, or burgeſſes of parliament. 4 Inſt. 47.

None of the clergy can be elected knight, citizen, or burgeſs of parliament; becauſe they are of another body, the convocation.

A perſon attainted of treaſon or felony is not eligible; for he ought, according to the writ, to be idoneus, diſcretus, & ſufficiens.

The king cannot grant a charter of exemption to any man, to be freed from election of knight, citizen, or burgeſs of the parliament.

For the incapacities of ſheriffs, mayors of towns, and the reaſons why they may or may not be elected knights, citizens, or burgeſſes, *vid.* 4 *Inſt.* 48. *Bro. Abr. Tit. Parliament. Cromp. Juriſd.* 3. 16. *Ruſhw. Collect. Townſh. Coll.*

QUA'LITY *of curvature*, in geometry, is uſed to ſignify its form, as it is more or leſs inequable, or as it is varied more or leſs in its progreſs through different parts of the curve.

QUA'NTITY (*Dict.*)—Mr. Machin, in the poſtſcript to the ſolution of Kepler's problem, inſerted in the *Phil Tranſ.* N°. 474, ſays, That he takes a mathematical Quantity, and that for which any ſymbol is put, to be nothing elſe but number with regard to ſome meaſure which is conſidered as one. For we cannot know preciſely and determinately, that is, mathematically, how much any thing is but by means of number. The notion of continued Quantity, without regard to any meaſure, is indiſtinct and confuſed; and although ſome ſpecies of ſuch Quantity, conſidered phyſically, may be deſcried by motion, as lines by points, and ſurfaces by lines, and ſo on; yet the magnitudes or mathematical Quantities are not made by that motion, but by numbering according to a meaſure.

Accordingly, all the ſeveral notations that are found neceſſary to expreſs the formations of Quantities, do refer to ſome office or property of number or meaſure; but none can be interpreted to ſignify continued Quantity as ſuch.

Thus ſome notations are found requiſite to expreſs number in its ordinal capacity, or the numerus numerans, as when one follows or precedes another, in the firſt, ſecond, or third place from that upon which it depends; as the Quantities x', x'', x, x', x''; referring to the principal one x.

So, in many caſes, a notation is found neceſſary to be given to a meaſure as a meaſure; as, for inſtance, Sir Iſaac Newton's ſymbol for a fluxion $\dot{x}$; for this ſtands for a meaſure of ſome kind, and accordingly he uſually puts an unit for it, if it be the principal one upon which the reſt depend.

So ſome notations are expreſly to ſhew a number in the form of its compoſition, as the index to the geometrical power x^n, denoting the number of equal factors which go to the compoſition of it, or what is analogous to ſuch.

But that there is no ſymbol or notation but what refers to diſcreet Quantity, is manifeſt from the operations, which are all arithmetical.

And hence it is, there are ſo many ſpecies of mathematical Quantity as there are forms of compoſite numbers, or ways in the compoſition of them; among which there are two more eminent for their ſimplicity and univerſality than the reſt; one is the geometrical power, formed from a conſtant root; and the other, though well known, yet wanting a name, as well as a notation, may be called the arithmetical power; or the power of a root uniformly increaſing or diminiſhing.

QUA'RRY, (*Dict.*)—For Quarries of free-ſtone, they firſt open a hole in manner of a well; twelve or fourteen feet in diameter; and the rubbiſh, drawn out with a windlaſs in large oſier baſkets, they heap up all around; placing their wheel, which is to draw up the ſtones, thereupon.

As the hole advances, and their common ladder becomes too ſhort, they apply a particular ladder for the purpoſe—When they have got through the earth, and are arrived at the firſt bank, or ſtratum; they begin to apply their wheel and baſkets to diſcharge the ſtones as faſt as they dig through them.

They uſually find ſeven of theſe different ſtrata, or beds of ſtones, of different heights, and ſerving for different purpoſes; though the number, as well as order wherein they follow, is various.

As to the drawing of the ſtone, i. e. the freeing it from the bed, they find that common ſtones, at leaſt the ſofter kinds, as they lie, have two grains; a cleaving grain running parallel with the horizon, and a breaking grain perpendicular thereto.—After uncoping, i. e. clearing the earth from off it, they obſerve by the grain where the ſtone will cleave, and there drive in a good number of wedges till they have thus cleft it from the reſt of the rock.

This done, they proceed to break it: in order to which, applying the ruler to it at both ends, (ten, e. gr. or twelve inches apart, according to the uſes the ſtone is intended for) they ſtrike a line, and by this cut a little channel with their ſtone-ax; and in the channel ſet five or ſix wedges (ſuppoſing the ſtone three or four feet) driving them in very carefully, with gentle blows, and ſtill keeping them equally forward.

Having thus broke the ſtone in length, (which they are able to do to half an inch of any ſize) applying a ſquare to the ſtraight ſide, they ſtrike a line, and proceed as before to break it in breadth.

This method of drawing is found vaſtly preferable to that where the ſtones are broken at random.—One load of the former is found to do the buſineſs of a load and an half of the latter.

But it may be obſerved, that, this cleaving grain being generally wanting in the harder ſtones, to break up theſe in the Quarries, they have great heavy ſtone-axes wherewith they work down a deep channel into the ſtone, and into this channel, a-top, lay two iron bars, driving their iron wedges between theſe bars.

Some in drawing of ſtone, eſpecially the very hard kind, make uſe of gun-powder, and with very good effect.—In order to which, making a ſmall perforation pretty deep into the body of the rock, ſo as to have that thickneſs of rock over it judged proper to be blown up at once; at the farther end of the perforation they diſpoſe a convenient quantity of gun-powder, filling up all the reſt with ſtones and rubbiſh ſtrongly rammed in, except a little ſpace for the train.—By this means is the rock blown in ſeveral pieces, moſt of them not too unweildy for a workman to manage.

In ſeveral parts of England we find ſea-ſhells buried in hard ſtone, and under great beds of earth.

Near Broughton, in Lincolnſhire, all the Quarries abound with them. At the eaſt end of the town there is a Quarry of a ſoft ſtone, which they dig through to get at a bed of clay, which is of peculiar glutinous quality, and hardens like mortar in drying; this is uſed for cementing other ſtones together, and in this are innumerable fragments of ſhells of cockles, ſcallops, ſea-echini, and corals; and among theſe fragments there are found ſome whole ſhells of their natural colours, and often wholly unhurt; though ſome of them are bruiſed and preſſed quite flat by the great weight of earth that lies upon them. On the ſouth ſide of the town there is a Quarry of a blue ſtone, which was doubtleſs in the times before the deluge a blue clay, of the ſame nature with that juſt mentioned. This contains in its body vaſt numbers of the ſame ſorts of ſhells, and of many other kinds; but they are all ſo firmly bedded in the ſtone, that it is not eaſy to get them out whole: but there is this very remarkable, that they only lie in the ſuperficial part of the ſtone, the ſtratum being very thick, but not one ſhell found in it beyond the depth of two feet from the ſurface.

The ſurface of this ſtratum of ſtone is not even and ſmooth, but is waved and ridged irregularly, like a bed of ſnow, or like the waves of the ſea in the time of a ſmall wind. This has juſt the appearance that the ſurface of a maſs of half hardened matter muſt have, if the wind blew fiercely upon it from one quarter; and, by the direction of theſe undulations, it is eaſy to ſee from what quarter the wind blew at that time. In that part of the ſtone which forms this undulated roughneſs, there are as many ſhells as any where elſe; and theſe lie partly buried and partly ſtanding out of the ſtone, juſt as we ſee the freſh-water ſhell-fiſh lie half in and half out of the mud of the bottom of a pond or river that is dried up in ſummer.

It is very obſervable, that, in this caſe, as much of the ſhell as is within the ſtone is perfectly well preſerved, and as hard as ſtone; whereas that part which ſtands out is either wholly decayed, or at the beſt of the nature of a rotten ſhell, which falls to pieces on being touched with the hands. The part of the ſhell within the ſtone is uſually converted into a maſs different from the ſhell in all things but figure; but that which ſtands out always preſerves the true texture of the natural ſhell, and is made up of many flakes and cruſts as the natural ſhells of the kind to which it belongs are.

Among the ſhells buried in the ſubſtance of the ſtone, ſome have their ſhell perfect on them, others have only a thin cruſt of a whitiſh ſtony matter in the place of it, and others are wholly naked, and have no ſhell nor any covering at all: theſe are properly only caſts of ſtone in the places where ſhells once were, all the matter of the ſhells themſelves having been diſſolved and waſhed away. In ſome of theſe there is a thick white ſubſtance in the place of the ſhell, between the caſt and the bed of ſtone: theſe come out the moſt eaſy and perfect of any, and the matter which ſupplied the place of the ſhell remains faſtened to the bed of the ſtone; others ſeparate themſelves very perfect after froſty nights.

Some of the cockles and other bivalves are found cloſed, others are found half open, as ſhell-fiſh naturally open their ſhells when deſerted by the water. In theſe the cavity is always filled with the matter of the ſtratum, and both petrified together. In ſome places they lie in heaps together in the ſtone, and there they uſually enter into and injure one another. Some are found ſhut ſo cloſely, that the matter of the ſtone-bed could not get into their cavity; and, of theſe, ſome are at this time wholly empty, others are filled, or partly filled, with cryſtals and ſpars: theſe bodies muſt have been in them only from the cryſtalline and ſparry matter riſing through the earth in vapour, and penetrating the very ſubſtance of the ſhells after their being lodged in the ſtone.

In this Quarry there is alſo found a very remarkable ſhell, reſembling a ram's horn, bent in the ſame manner, and with the ſame lineations. This is wholly different from the common cornu ammonis claſs, and has an operculum to cloſe its mouth with, in the manner of the wilks and other ſuch ſhells. This operculum is often found entire with the ſhell, or near it, in the ſame bed of ſtone.

This ſpecies of foſſil ſhell is found in prodigious numbers together, and uſually lies near the ſurface of the bed of ſtone, a part being buried in the ſtone, and a part ſtanding out of it; many of them ſtand more than half-way out, and the ſhell of theſe is ſo much more durable than that of the common kinds, that it is uſually very firm and ſtrong, even in ſuch places where the other kinds moulder all away. Theſe are uſually found entire, but in ſome places they are cruſhed flat, and otherwiſe bruiſed and injured.

From theſe and the like obſervations made on the whole ſurface of the earth, and to great depths in its bowels, wherever men have dug on any occaſion, ariſe plain proofs of the univerſality of the deluge; and from many of theſe obſervations it ſeems very plain, that in the time of the deluge the earth ſuffered great violence in many parts, that the bottoms of ſeas were in ſome places raiſed into mountains, and in others the tops of mountains ſunk into ſeas, and the beds of ſhells ſtill preſerved in the foſſil world were very often cruſhed and bruiſed by large maſſes of earth and pieces of rock thrown upon them.

Some think that it appears from the conſideration of the Quarries and ſtrata of earth, &c. in the preſent world, that the antediluvian earth had ſeas and ſhores, mountains and plains, rivers and vallies, as ours has; and that waters from within the earth were let out upon its ſurface, and the whole cruſt of the then world ſubſided under theſe; that the contents of the ſeas, ſuch as ſhells, corals, and the like, were after this toſſed variouſly about over the ſurface of this drowned world, and left in different parts of it; and that this preſent earth afterwards partly aroſe out of the common flood, as iſlands are now formed in ſome ſeas, and partly was deſerted by the waters, when called off again by the ſame almighty hand that brought it on: and, as the ſtrata of the earth were at that time ſoft, it is no wonder that matter then ſoft enough to let in the ſhells, &c. afterwards hardened, together with the ſhells it had received, into ſtone; and that in proceſs of time the ſtony particles, eternally floating in the air and waters that prevade all the ſtrata, depoſited their ſmall parts in the interſtices of theſe ſhells, and finally the whole became ſtone.

It is no wonder that all ſorts of marine productions, ſhells, parts of ſea-fiſhes, corals, and the like, are found at this time in beds and Quarries, in hills and mountains, and alſo in the bowels of the earth; for it is certain that they were produced in the antediluvian ſea, and were either elevated with the hills and mountains in the time of the deluge, or they fell into holes, clifts, and chaſms in the earth, which muſt be formed in vaſt numbers during the time of that terrible cataſtrophe, and in theſe they remain buried to this time; while others, lodged on what was then the ſurface, became afterwards covered with more ſtrata, depoſited from what was ſtill ſuſpended in the waters, and ſo were buried at great depths from the preſent ſurface; when others rolling about among the laſt ſediments of the ſame waters, while yet ſo unfixed as to be carried away with their violence, were finally left on or near the ſurface.

The Quarries about Broughton ſeem to have been but little diſturbed, and to have been originally the mud which formed the bottom of ſome large freſh-water lake; for the ſhells, found in greateſt plenty of all there, are freſh-water ſhells. Theſe ſeem to have remained in their original mud while turned to ſtone; and the other ſhells, natives of the ſea, which are buried there among them, ſeem to have been ſome of that immenſe number and variety that muſt have rolled along the bottom of that bed of waters; and the viſcid nature of the clay detained many of theſe among its own proper inhabitants, and preſerved them together in its ſtrong ſtate.

Beſides the parts of animals, theſe Quarries have vegetable matters alſo in them: the leaves and branches of whortles are not uncommon, and pieces of wood turned black and reſembling charcoal are alſo found there. Theſe have been preſerved in the ſame manner with the leaves of fern on the ſlate of our coal-pits, and the plants and fiſhes found in hard ſtone in many of the German mines. Many of theſe vegetable remains are alſo found in looſe nodules of ſtone reſembling pebbles: theſe are not leſs eaſily accounted for than the reſt; for it is not ſtrange to conceive, that leaves and pieces of plants might be, in that general confuſion, received into lumps of clay, which might afterwards be rolled into roundneſs by the motion of the water, and finally received into chaſms of the earth, and there petrified. *Phil. Tranſ.* N°. 266.

QUA'RTAN (*Dict.*) —*Continual* QUARTANS, in medicine, the name given to a ſpecies of compound fever, which has the paroxyſms of a common Quartan; but in which the heat never goes wholly off, but continues till the time of the ſucceeding fit. In all reſpects, except the regular returns of the paroxyſms, this diſeaſe greatly reſembles a hectic.

Signs of it. Every fourth day there is a regular paroxyſm, which begins with a coldneſs and ſhivering: this, however, does not return exactly to an hour, as the ſimple Quartan does in its fits; but uſually the ſucceeding fit anticipates the time of the former. When the cold fit is over, there comes on a violent day burning; the heat is much greater the firſt day than the ſucceeding ones, but continues in ſome degree till the fourth day, when the cold fit returns again, and the patient is ſeldom able to keep long together out of bed in the whole time. There is a continual thirſt, and dryneſs of the mouth, and the ſaliva is very little in quantity and very frothy; the appetite is bad, and the patient has uſually more inclination to ſalted and cold foods than any other; the head is diſordered rather than aking, and there is a continual deſire to ſleep, but what ſleep the patient has, is troubled and unſound, and gives very little refreſhment; the urine, during the whole courſe of the diſeaſe, reſembles, that of hectical patients, and is reddiſh and turbid, depoſiting, after a time, a roſe-coloured ſediment.

Perſons ſubject to it. This diſeaſe is frequently brought upon perſons who have had a common Quartan, by the injudicious treatment of that diſtemper, and particularly by the taking hot medicines in it before the approach of the fit; the too free uſe of aſtringents has alſo in many caſes changed that diſeaſe into this. People of a middle or more advanced age are more ſubject to it than youth; and, of theſe, ſuch are principally ſeen to be afflicted with it, as are of a melancholic habit and ſedentary life.

Prognoſtics in it. This diſeaſe, though in itſelf leſs dangerous than many others, yet very eaſily changes, under improper management, into a hectic, and ſometimes into a dropſy. This is the caſe not unfrequently, when it is treated with large repeated doſes of aſtringents; on the other hand, when it is treated with vomits and a hot regimen, it eaſily paſſes into an acute and dangerous inflammatory fever.

Method of cure. Towards the time of the fit there ſhould be given powders compoſed of the digeſtive ſalts, ſuch as vitriolated tartar, with crabs-eyes, ſaturated with lemon juice. So long as the heat continues violent, the perſon is to be kept quiet, and to drink plentifully of warm and weak liquors; and in the following days, when the heat is obſerved to be decreaſed, gentle purges are to be given, with gentle aperitives and reſolvents, ſuch as the decoctions of dandelion and ſuccory roots; and, towards evening, a gentle doſe of ſome anodyne, as the ſtorax pill and the like. The common violent methods by vomits, bleeding, ſtimulating purges, and hot alexipharmics, have no place in the cure of this diſeaſe; but, on the contrary, violently diſturb nature, and add to the complaints. Abſorbents in large quantities are alſo to be avoided, leſt the viſcid matter which is the cauſe of the diſeaſe ſhould be increaſed by their effects: and, when the patient is happily cured, he is not immediately to abſtain from medicines, ſince relapſes are very frequent. Digeſtives and ſtomachics, taken for ſome weeks after, is the way to prevent them. *Jonker's Conſp. Med.*

QUARTA'RIUS, a meaſure among the antients, being the fourth part of a ſextary, and nearly equal to a quarter of a pint of our wine-meaſure.

QUA'RTER-*chord*, in mining, is ſeven yards and a quarter, which the miner hath croſs-ways of his vein on either ſide, for liberty to lay his earth, ſtones, and rubbiſh on, and to waſh and dreſs up his ore. *Houghton's Compl. Miner in the Explan. of the Terms.*

QUARTER *of a ſhip*, is that part of the ſhip's hull which lies from the ſteerage room to the tranſom.

Cloſe-QUARTERS, in a ſhip, thoſe places where the ſeamen quarter themſelves, in caſe of boarding, for their own defence and clearing the decks.

QUA'RTERING *the men*, in the ſea language, the diſpoſing of the ſhip's company at the time of an engagement in ſuch a manner, that each may know where his ſtation is, and what he is to do: as, ſome to the maſter, for the management of the ſails; ſome to aſſiſt the gunners, to traverſe the ordnance; ſome for plying the enemy with ſmall ſhot; ſome to fill powder in the powder-room; others to carry it from thence to the gunners in cartridges, &c.

QUEEN-*bee*, a name given by late writers to what uſed to be called the king-bee, or king of the bees; a large and long-bodied bee, of which kind there is only one found in every ſwarm, and which is always treated with the greateſt reſpect by the reſt.

This is, indeed, the parent of the ſwarm, and from the fœcundity of this one female, a whole hive is eaſily and ſoon repeopled.

It is to be obſerved, that the autumn and winter ſeaſons deſtroy a great number of the bees; ſo that a hive, which was full in the ſummer, is often found ſo thinly peopled before the end of winter, that the bees ſeem only a few inhabitants in a very large city: by Midſummer again this ſame hive ſhall, however, be found ſo well filled with inhabitants, that there ſhall be a neceſſity of ſending out a colony in the name of a new ſwarm, and yet the hive will remain as full as it can well hold. This increaſe might well appear very amazing, if all the remaining bees of the hive were ſuppoſed to be females, and to join in it; but how much more ſo when it muſt be acknowledged, that it is all owing to one female, and that this Queen-bee, or bee-mother, alone, has given origin to ſuch an immenſe progeny?

The form of this bee, and there being only one ſuch in a hive, naturally led all who ſaw it into an opinion of ſomething ſingular in its nature, and the antients determined that it muſt be the king over the reſt: they made it an abſolute monarch, and have ſuppoſed that all the buſineſs of the hive was done by its immediate orders; and that the ſeveral parties of bees allotted to work in the making the combs, in the filling their cells, in the ſtopping the crevices of the hives, and in carrying away the filth, &c. had all their ſeveral ſtations allotted them by this wiſe and provident monarch. This was giving great talents to the monarch-bee; but this was mere fancy, and it is plain, that, if this creature rules, it is over a people who all perfectly well know their ſeveral buſineſs: but it rather appears, that there is no ſovereignty at all, but that this creature is reſpected in a very high degree by the reſt as the common parent of the whole nation.

There were not wanting among the antients, however, ſome who believed this large bee to be a female, and theſe pretend that ſhe brought forth only females like herſelf, which ſucceeded her in her reign. They had a very different opinion as to the origin of the common bees, not ſuppoſing them generated of animal parents like themſelves, but produced out of corruption, and born of the fleſh of a bull or cow. Among the later writers this opinion, notwithſtanding the ſanction of the poet Virgil, has been laughed out of the world; yet it was long before the true origin of bees, even after this, was known. The author of the female monarchy, though well apprized of this great bee being of the female ſex, yet ſuppoſed that ſhe only produced young ones like herſelf; and pretended that the common bees copulated together for the production of other bees like themſelves: this, however, has been ſince found to be wholly erroneous, the female, or Queen-bee, giving birth to all, and theſe common bees being of no ſex at all. Many of the authors who have not given into the idle opinion of the bees being bred of putrid fleſh, have yet given them an origin not leſs idle and ridiculous. They pretend that the bees are exempted from the pain of producing either eggs or young; and that their offspring are formed of the juices of flowers, the different kinds, as the drones, females, &c. owing their riſe to juices of different kinds. Theſe, and a number of other falſe notions, have been propagated in regard to bees; but their true origin could not well be found till we were in a condition to ſee what paſſes at certain times within the receſſes of the hive, which is done by the uſe of that excellent invention the glaſs hive. By this, and by the help of diſſections, we may eaſily inform ourſelves perfectly of the true ſtate of the caſe. The parts of generation are the ſubjects of our enquiry for this purpoſe, and, though the bodies of theſe animals are ſo ſmall, theſe are uſually ſufficiently large to be diſtinguiſhed, often taking up more room in the abdomen than all the other parts together. Thus, if the large long-bodied bee be opened, the abdomen will be found to contain vaſt numbers of oblong bodies, which any one acquainted with inſects will eaſily diſtinguiſh to be eggs: vaſt numbers of theſe are large enough to be obſervable by the naked eye, but, when the aſſiſtance of glaſſes is called in, there are diſcerned a vaſt number of other ſmaller eggs, which exceed all computation. It is eaſy to determine from this, that this creature, ſo long eſteemed a male, is in reality a female, and is in condition to give birth to a very numerous poſterity.

In order to diſtinguiſh this, however, a proper time muſt be choſen for the diſſection, and the moſt proper of all is when the creature is juſt ready to depoſit her eggs. This is in the months of April and May, and the moſt certain time of all is when ſhe is in a hive where a new ſwarm have been received about ten days before: if ſhe be diſſected at other times, the eggs are leſs viſible; and, particularly in winter, there requires a good glaſs to ſhew the rudiments of them. This is a diſagreeable experiment, indeed, becauſe it is always the deſtruction of a future ſwarm; all the eggs we ſee in the diſſected female being what would have produced bees to labour for our benefit.

When the body of one of the drones is opened, there is found, inſtead of theſe vaſt numbers of eggs, a part ſeeming proper for a male organ of generation; and in the abdomen a number of veſſels running in ſeveral windings and contortions, and filled with a milky humour. Theſe ſeem deſtined for the important uſe of impregnating the eggs in the belly of the female, and it is very natural to determine from this that theſe are the males.

The common bees, when diſſected, at whatever time of the year, never ſhew the leaſt marks of any ſex at all. The inteſtines of theſe bees are found at times to be more or leſs diſtended with honey, and with rough wax; but there are never diſcovered any eggs, nor any of the winding ſeminal veſſels, ſo that it is plain they have no ſhare in propagating the ſpecies: and the obſervation of the ſwarms from time to time, with the aſſiſtance of glaſs hives, gives proof to what the diſſections ſeem to make ſufficiently certain without this evidence.

The female bee reſides within the center of the hive, always living in one of the ſpaces between the combs; if ſhe occaſionally comes out to the ſurface, and is ſeen walking over the edge of a comb, ſhe is to be well obſerved at thoſe times; for her only buſineſs is the laying her eggs in ſome of the empty cells of that part of the comb, which done, ſhe always retires again.

In order to ſee the female, or mother bee, employed in this operation, we are to obſerve in the morning hours, between ſeven and ten, what paſſes in a glaſs-hive into which a ſwarm have been received a few days before. The ſpeed with which the common bees labour in making their combs on this occaſion is almoſt incredible, and they ſeem not only to labour to have cells to depoſit their honey in, but to know that the parent bee is at this time loaded with eggs for the production of a numerous progeny, and that ſhe has an immediate neceſſity of cells for the depoſiting them in. This neceſſity is ſo urgent, that ſhe is often forced to depoſit them in cells not yet finiſhed; though the bees labour ſo vigorouſly, that they often will erect a whole large comb in one day. If the hive be narrowly watched at theſe times in the morning hours, the female bee will be ſoon found employed in her work, and will be ſeen dropping her tail by turns into ſeveral cells every day. If the combs be examined a day or two after this, they will alſo be found to contain the eggs; one of theſe is placed in each cell, and appears in form of an oblong white body, fixed either to the ſolid angle of the baſe, or to one of the angles compoſed by the rhombs which form the triangular baſe of the cell, and is always attached in ſuch a manner, that it lies nearly in an horizontal poſition.

The flat glaſs hives are the moſt favourable for the making theſe obſervations, ſince in thoſe the combs are ſo narrow and ſo numerous, that the whole is taken in view at a time, from one ſide or the other; and there are always ſeveral combs to be made choice of for the operation; in the morning hours of April and May, the female mother-bee will be uſually ſeen walking very ſoberly over one or other of theſe combs, attended by a guard of about twenty of the common bees, all placing themſelves in ſuch a manner, that their faces are turned towards her, and all paying her the greateſt marks of homage and adoration. As ſhe walks along in this ſtate, ſhe examines every cell as ſhe paſſes over, and ſuch as ſhe finds yet empty, and fit for her purpoſe, ſhe reſts at: and, introducing the hinder part of her body at the top, plunges it ſo deep in that her tail touches the bottom. Then ſhe depoſits one egg and no more, and this is at that time covered with a glutinous matter, which faſtens it to the place where it is laid: from this cell the female paſſes to ſeveral others, where ſhe depoſits her eggs in the ſame manner.

Some authors who have written of the polity of bees, have repreſented the time of the female bee's laying her eggs as a ſeaſon of feſtivity and rejoicing in the hive; but this does not at all appear to be the caſe; the few bees which attend her on this occaſion ſeem the only ones that know any thing of the matter, and their behaviour ſavours more of homage and reſpect than of joy: they are continually ſtroking and bruſhing her clean with their legs and with their trunks, and offer her from their own mouths the fineſt honey, when ſhe has occaſion for food. The reſt are all employed in their proper offices, and the work of the hive goes on as uſual; and, indeed, it is well that it does ſo, for this time of rejoicing would be of very bad conſequence to the affairs of the hive, if carried on as ſuppoſed, ſince the female bee is thus employed, more or leſs, during the whole ſummer months.

When the female bee has laid ſix or ſeven eggs, ſhe always takes a time of reſpite or repoſe; and, during this time, the bees which form her levee are doubly buſy in their careſſes, ſome bruſhing her head and breaſt with their trunk, but ſeveral being always employed together to cleanſe the hinder rings of the body, which have been fouled by being thruſt into the cells. When this is done, ſhe begins again; but Mr. Reaumur obſerves, that he never could ſee a female lay more than ten or twelve eggs at one time: he ſuppoſes that his preſence diſturbed the creature, and finally drove her into the inner parts of the hive, where ſhe might continue her works in cells leſs expoſed. It is not difficult to compute the number of eggs which the female lays every day, from the ſwarm which is ready to leave the hive at the end of May: this ſwarm uſually amounts to at leaſt twelve thouſand, and, as the hive out of which theſe depart is not the leſs peopled by their loſs, it is evident that they were all the produce of the eggs depoſited by the female in the preceding months of April, with a part of March, and a few of the firſt days of May. On a moderate computation on theſe principles it will appear, that the female bee cannot lay leſs than two hundred eggs every day, for a long ſpace of time together; and this, though ſeemingly a monſtrous increaſe, is yet much leſs than that of ſome other of the winged inſects, in one of which, a two-winged fly, that author counted no leſs than twenty thouſand living worms, all ready to be depoſited by the parent, and to become flies of the ſame kind.

It has been ſtrongly objected againſt this ſyſtem, that, though the female bee lays eggs, ſhe is not the only one that lays; and many will not give up the opinion of the common bees alſo laying ſome eggs, though but a few in number; obſerving, that, if each of theſe lay only four or five eggs, it would be enough to give birth to a whole ſwarm, without ſuppoſing that this prodigious fœcundity belonged to the female bee alone: but this is running into the old error of the female producing only females like herſelf; whereas, if we obſerve the cells in which we ſee the female depoſit her eggs, we ſhall in the ſequel find the common bees produced from theſe eggs, and iſſuing out of theſe cells: this is a ſufficient proof to any fair reaſoner, ſince it appears very plain, that, if the female produces them, they do not produce one another. It is alſo evident, that not only theſe common or working bees, but alſo the drones, or male bees, are produced from the eggs of this ſame female; and there is this remarkable forecaſt in the female, that ſhe always depoſits the eggs which are to give origin to theſe, in peculiar cells, proper for the reception of the worms which are to be hatched from them. It is obſerved, in examining a hive, that there are always ſome combs, or ſome parts at leaſt of combs, the cells of which are much larger than thoſe of the other parts or combs: theſe large cells are deſtined for the reſidence of the larger worms, which are to produce the drones or male bees. It has been obſerved as a miraculous ſingularity by ſome, that the female bee always knows before-hand, whether the egg ſhe is going to lay will produce a male or a common bee; and that, according to this knowledge, ſhe never depoſits the eggs for a male in a ſmaller cell, nor that of a common bee in a large one; but there is, in reality, leſs wonder in this than is ſuppoſed, for the eggs of which the drones are to be hatched are much larger while in the body of the female than thoſe of which the common bees are to be produced, and the whole occaſion of this choice in regard to the placing of them is, that, when the creature finds a large egg coming forth, ſhe ſeeks one of the large cells to depoſit it in; and, when the common ſmall eggs are coming, ſhe contents herſelf with the common cells.

It is very natural to believe, that the female bee lays a third kind of eggs; and that, beſides producing many thouſand common, or working bees, and many hundreds of the males or drones, ſhe ought to lay one egg at leaſt capable of producing a female like herſelf, which is to be the mother of a future progeny, and the Queen of the preſent race; ſince, without ſuch a one for their leader, the young brood would never leave the hive in the nature of a colony, and ſettle themſelves elſewhere. What we thus perceive ought to be the caſe, is alſo found in reality to be ſo, and the female, beſides the other kinds of eggs, is found by a ſtrict obſervation to lay alſo eggs of this kind. We might perhaps only expect one female bee to be produced for each ſwarm, but, as nature has ſeemed everywhere prodigal in the manner of the increaſe of her works, ſo it is in this caſe alſo. What millions of ſeeds are produced on a common elm-tree, for one that ſtrikes and ſucceeds ſo well as to grow up to be a tree? And, of the number of young produced from the ſpawn of a carp, how few live to the ſize of a parent? Thus it alſo is in regard to the female bees: nature, though it has allotted only one of this kind, as abſolutely neceſſary to the new ſwarm, yet has given abundance of chances for that one to ſucceed, by the female's uſually laying at leaſt ten eggs for the production of the female offſpring, and often not leſs than twenty: there are, indeed, ſome ſeaſons when not one female is produced; but in theſe ſeaſons there is no ſwarm going out from the old hive, the creatures being informed by nature, that they have no buſineſs for combs and cells when they can have no offſpring to rear in them.

The working bees are not only very obedient to, and very careful of their Queen, or female parent; but they are alſo very ſollicitous about her progeny. This is very evident in the ſtructure of the cells, which they prepare for the reception of thoſe eggs which are to be hatched into females. It has been before obſerved, that they prepare larger cells for the eggs which are to become drones, or male bees, than for thoſe which are to produce workers like themſelves. The large cells deſtined for the drones are, however, of the ſame ſhape and figure with the others, differing only in ſize; but this is not the caſe with thoſe deſtined for the female offſpring: theſe are not only very large, but very clumſily contrived, for the ſake of ſtrength; their ſides being much thicker than thoſe of the reſt, and their figure oval. The bees are extremely ſparing of their wax on all other occaſions, but for the conſtruction of theſe royal cells, as they may not improperly be called, they are as remarkably profuſe: one of the royal cells will weigh more than an hundred and fifty of the common kind. The bees are no more ſparing of the room than of the materials in the conſtruction of theſe royal habitations: they are often placed near the center of a comb, and a vaſt number of other cells are deſtroyed for their baſe; often alſo they hang down from the reſt of the comb, in form of ſtalactitæ from the roofs of ſubterraneous caverns.

A cell of this kind, when firſt formed, repreſents an acorn cup; but it is ſoon lengthened beyond the poſſibility of retaining that figure, and it remains thus till the creature is hatched from the chryſalis or nymph ſtate, and comes out of it; after which the bees, to loſe no room in the hive, form other common cells upon it, and the only remaining mark of the female cell, is the appearance of a knot in the place where it once ſtood.

The number of cells deſtined to receive the eggs which are to produce female bees are ſo few, and they are commonly placed in ſuch cloſe parts of the hive, that there is no great probability of the ſeeing the female employed in laying her eggs in them: there is no reaſon to doubt the fact, however, ſince, when we know that ſhe lays eggs for the production of the male and the working bees, there is no wonder that ſhe ſhould alſo lay ſome for the production of females like herſelf.

It might ſeem much harder to conceive how ſo vaſt a number of bees ſhould be produced from this one, as we know are produced from her; but, when one of the females is opened, the vaſt number of eggs diſcovered in each of her ovaries makes the prodigious increaſe no way wonderful.

Swammerdam obſerved, that the number of veſicles in the ovary of the female bee was aſtoniſhingly great; he eaſily counted an hundred and fifty in each ovary, and could count about ſeventeen eggs in each veſicle large enough to be diſtinctly viſible; each ovary contains, therefore, two thouſand five hundred and fifty eggs, and both ovaries five thouſand one hundred. When we find ſo many eggs at once diſtinguiſhable by their ſize, it will be eaſy to conceive, according to the common courſe of nature in the propagation of inſects, that there may be more than as many too ſmall to be yet diſtinguiſhable; and, at that rate, the number of twelve thouſand bees, which is the quantity that compoſes a moderate ſwarm, is not wonderful for the product of the eggs of one female for one ſeaſon. *Reaumur's Hiſt. Inſ.*

QUE'RCUS, *the oak*; ſee the article OAK.

QUERCUS *marina*, *the ſea oak*, in botany, the name of one of the broad-leaved dichotomous ſea-fucuſes.

It is not agreed among the late botaniſts what was the ſea-oak of Theophraſtus; and the moſt ancient botaniſts, Cluſius and Cæſalpinus, ſuppoſe it to have been a ſpecies of the ſhrubby coralline; but that ſeems by no means to have been the caſe, ſince Theophraſtus ſays his ſea-oak had a long, thick, and fleſhy leaf, when we may more naturally conclude it to have been of the fucus claſs. *Park. Herb.* 294. *Gen.* 1378, *&c. Dale, Pharmac.*

QUERQUE'DULA, in zoology, the name by which authors call the teal.

This is the ſmalleſt of all the duck kind. Its beak is black, and its head and the upper part of its neck of a reddiſh brown; but there runs on each ſide of the head a green ſtreak from behind the eyes quite to the back park, and between theſe there is a black ſpot under the eyes; there is a white line which ſeparates the reddiſh colour from the green. The lower part of the neck, the ſhoulders, and the ſides are very beautifully variegated with black and white ſtreaks. The breaſt and belly are of a duſky greyiſh white. The wings have ſome white in them, and the legs are of a pale brown. There is a black ſpot on the rump in the male, which is wanting in the female. The head alſo in that ſex is leſs beautifully coloured. *Ray's Ornithol.*

QUERQUEDULA *criſtata*, the creſted teal, given by Bellonius and ſome others to a ſpecies of duck, remarkable for a tuft of feathers of an inch and a half long, hanging down from the back part of its head, and thence called the tufted duck, but more known among authors by the name capo negro. *Bellonius de Avib.*

QUICK.—By the word Quick are generally underſtood all live hedges, of whatever ſort of plants they are compoſed, to diſtinguiſh them from dead hedges: but, in the more ſtrict ſenſe of this word, it is applied to the hawthorn, or meſpilus ſylveſtris; under which name the young plants, or ſets, are commonly ſold by the nurſery gardeners, who raiſe them for ſale.

In the choice of theſe ſets, thoſe which are raiſed in the nurſery, are to be preferred to ſuch as are drawn out of the woods; becauſe the latter have ſeldom good roots; though, as they are larger plants than are commonly to be had in the nurſery, many people prefer them on that account: but from long experience I have found, that thoſe hedges which have been planted with young plants from the nurſery, have always made the beſt hedges. Indeed, if perſons would have patience to wait for theſe from ſeed, and to ſow the haws in the place where the hedge is deſigned, theſe unremoved plants will make a much ſtronger and more durable fence, than thoſe which are tranſplanted: but I am aware that moſt people will be for condemning this practice, as being tedious in raiſing; but, if the haws are buried one year in the ground, to prepare them for vegetation; before they are ſown, it will not be ſo long before this will become a good fence, as is generally imagined. Nay, from ſome trials of this kind, which I have made, I have found, that thoſe plants which have remained where they came up from ſeed, have made ſuch progreſs as to overtake, in ſix years, plants of two years growth, which were tranſplanted at the time when theſe ſeeds were ſown.

And, if the hedges are raiſed from ſeed, it will not be amiſs to mix holly berries with the haws, and, if ſo, theſe berries ſhould alſo be buried one year, to prepare them, ſo that then both will come up together the following ſpring; and this mixture of holly with the Quick will not only have a beautiful appearance in the winter, but will alſo thicken the hedge at the bottom, and make it a better fence.

But, where the hedge is to be planted, the ſets ſhould not be more than three years old from the haws; for, when they are older, their roots will be hard and woody; and, as theſe are commonly trimmed off before the ſets are planted, ſo they very often miſcarry; and ſuch of them as do live, will not make ſo good progreſs as younger plants, nor are they ſo durable; for theſe plants will not bear tranſplanting ſo well as many others, eſpecially when they have ſtood long in the ſeed-bed unremoved. *Miller's Gard. Dict.*

QUI'ETISM, the ſentiments of the Quietiſts, a religious ſect which made a great noiſe towards the cloſe of the laſt century.

Molinos, a Spaniſh prieſt, who died at Rome in the priſon of the inquiſition, paſſes for the author of Quietiſm; and yet the Illuminati in Spain had taught ſomething like it before.

The name is taken from a ſort of abſolute reſt, and inaction, which the ſoul is ſuppoſed to be in, when arrived at the ſtate of perfection, which in their language is called the unitive life.—To arrive at this, a man is firſt to paſs through the purgative way; that is, through a courſe of obedience, inſpired by the fear of hell: hence, he is to proceed into the illuminative way, before he arrive at perfection; to go through cruel combats, and violent pains; i. e. not only the uſual drineſſes of the ſoul, and the common privations of grace, but infernal pains: he believes himſelf damned; and the perſuaſion that he is ſo, continues upon him very ſtrongly ſeveral years: St. Francis des Sailes, ſays the Quietiſts, was ſo fully convinced thereof, that he would not allow any body to contradict him therein.—But the man is, at length, ſufficiently paid for all this, by the embraces of God, and his own deification.

Theſe ſentiments of the Quietiſts, with regard to God, are wonderfully pure and diſintereſted.—They love him for himſelf, on account of his own perfections, independently of any rewards or puniſhments: the ſoul acquieſces in the will of God, even at the time when he precipitates it into hell; inſomuch that, inſtead of ſtopping him on this occaſion, B. Angelo de Foligny cried out, 'Haſte, Lord, to caſt me into hell: do not delay, if thou haſt abandoned me, but finiſh my deſtruction, and plunge me into the abyſs.'

At length, the ſoul, after long travail, enters into reſt, into a perfect quietude.—Here it is wholly employed in contemplating its God; it acts no more, thinks no more, deſires no more; but lies perfectly open, and at large, to receive the grace of God, who by means thereof drives it where it will, and as he will.

In this ſtate, it no longer needs prayers or hymns, or vows; prayers where the ſpirit labours, and the mouth opens, are the lot of the weak and the imperfect: the ſoul of the ſaint is, as it were, laid in the boſom, and between the arms of its God; where, without making any motion, or exerting any action, it waits, and receives the divine graces.—It, then, becomes happy: quitting the exiſtence it before had, it is now changed, it is transformed, and, as it were, ſunk and ſwallowed up in the divine being, inſomuch as not to know or perceive its being diſtinguiſhed from God himſelf. *Fenel Max. des Saints.*

QUINQUEFO'LIUM, *cinquefoil*, in botany, a genus of plants, whoſe characters are:

The root is fibrous and perennial: the leaves grow by more than threes, at the top of the pedicle, round one center: the calyx is monophyllous, not caduceous, and, as it were octophyllous, or decaphyllous, expanded like a ſtar, and furniſhed with very numerous ſtamina, proceeding from the compaſs of the baſe of the ovary: the flower is roſaceous, pentepetalous, and more rarely tetrapetalous, the petals ſtanding round the baſe of the ovary: the ovary is a ſeminal head, involved in a calyx, hemiſpherical, and has ſeveral eggs, furniſhed with a long erected tube. The common cinquefoil, or five-leaved graſs, has a large ſpreading, thick, woody root, covered with a dark-brown bark, and full of ſmall fibres, ſending forth many ſlender creeping ſtalks, which lie on the ground, emitting ſmall fibrous roots from the joints, by which it eaſily propagates itſelf; at every joint grows the leaves, five ſet together upon one long foot-ſtalk, which are narrow, veiny, ſerrated about the edges, the two outermoſt being the ſhorteſt: amongſt theſe come forth the flowers, conſiſting of five round yellow leaves, with ſeveral ſtamina in the middle, ſet, alſo, on long foot-ſtalks; and, after them, ſmall, brown, naked ſeed: it grows every-where by hedges and way-ſides, flowering all ſummer. The leaves and root are uſed.

They are reſtringent and drying, and ſerviceable againſt all kinds of fluxes and hæmorrhages: the powder of the root, given to the quantity of a drachm, two or three times a day, is ſaid to cure agues. The ſame is, alſo, accounted good againſt malignant diſtempers, and is an ingredient in Venice-treacle: it is frequently uſed in gargles for ſore mouths and ulcerated gums, and to faſten looſe teeth. *Miller's Bot. Off.*

QUINQUERTIO'NES, among the Romans, an appellation given to thoſe who had gained the victory in the quinquertium or penthathlon.

QUINQUER'TIUM, among the Romans, was the ſame with the Grecian pentathlon, comprehending the five exerciſes of running, leaping, throwing, darting, and wreſtling.

QUI'NTAIN, QUINTENA, in ancient cuſtoms, a poſt driven into the ground, with a buckler fixed to it, for the performance of military exerciſes on horſeback, throwing of darts, breaking of lances, &c.

Matth. Paris deſcribes the Quintain as a kind of mark, formed like a man from the navel upwards, holding a ſhield in his left hand, and in his right a ſword or ſtick; the whole ſo fitted as turn round on its foot, and ſo as that, a cavalier running a-tilt againſt it with a lance, if he hit it in the breaſt, it whiſked round, and, unleſs he were very dexterous, ſtruck him with the ſword held in the other hand.

In other places, a-top of a poſt, was erected a ſlender beam fitted to turn round a ſpindle; at one of whoſe ends was a ſlope or flat board, and at the other a bag of ſand, or dirt.—The ſport was, with a long ſtaff, or wooden lance, to ride a-tilt at the board, and to be either ſo ſkilful or lucky to eſcape the blow of the ſand-bag.

This ſome take to be the ſame with the arietum levatio, frequently prohibited in our ſynods and epiſcopal conſtitutions.

The cuſtom is ſtill retained in Shropſhire, and ſome other counties, among the nuptial ſolemnities.—He that breaks the moſt poles againſt the Quintain has the prize, which was anciently a peacock, now a garland.

Some derive the word from an ancient game called quintus; others from a man of the name Quintus.

The Vallus and Paſſus, mentioned in Cæſar, are taken, by Vigenere, for a kind of Quintain, or wooden man fixed up as an adverſary, or man of ſtraw, to prove one's dexterity againſt.

Mention is made of this exerciſe in the code, de aleatoribus, and in the paratitles of Cujas on the ſame — Juvenal ſpeaks of women engaging therein:

Aut quis non vidit vulnera Pali?

QUINTAIN was alſo a right which the lord had to oblige all the millers, watermen, and other young people unmarried, to come before his caſtle every three years, and break ſeveral lances, or poles, againſt a poſt, or wooden man, for his diverſion.

QUINTE'SSENCE (*Dict.*)—Quintessence *of wine*, a term uſed by Glauber, to expreſs an eſſential oil of wine, which he directs to be made by a careful diſtillation, and which he is very fond of, as having a power to meliorate, improve, and even to ſpecificate the poorer wines into the nature of thoſe from which it was obtained.

This is one of the ſchemes of Glauber, generally eſteemed an impracticable one, though very plauſible in theory; but though, in general, there is a diſagreeable flavour in the Quinteſſence drawn after this method, which is different from the true flavour of the wine, and ſpoils the liquor it is added to; yet, by proper care, there is a poſſibility of ſucceeding ſo far as to render this extraneous flavour almoſt imperceptible, and produce an oil that will mend poor wines extremely, and give a truly vinous flavour to ſuch as are in themſelves taſteleſs; but whatever may be done by this method, may alſo be done with much more certainty, and much leſs trouble, by the concentration of wines by freezing. This may be eaſily practiſed in the wine countries; and by this means Burgundy, Champaign, and other the moſt valuable wines, may be reduced into thick extracts and robs, by the means of which wines may be made in England; a very ſmall quantity of theſe concentrated wines being ſufficient to convert the whole of any of the poor taſteleſs and inſipid wines, which are of themſelves of little or no value, into the very wine from which the rob was made, and that in ſuch perfection, that the niceſt judge cannot find out the difference.

Theſe robs of wine, made and preſerved upon the ſpot, would alſo be of infinite uſe, in the wine countries, as they might be kept to improve the wine of bad years. *Stahl, de Concentr. Vin.*

QUOD (*Dict.*)—Quod *ei deforceat*, in law, a writ for tenant in tail, tenant in dower, by courteſy, or for term of life, having loſt their lands by default againſt him that recovers or his heir.

Quod *permittat*, in law, a writ that lies where a man is diſſeized of his common of paſture, and the diſſeizor aliens, or dies ſeized, and his heir enters; then, if the diſſeizee die, his heir ſhall have this writ.

R.

RA′BBIT, *cuniculus*, in zoology, a well known animal of the hare kind.

The female or doe Rabbit goes with young thirty days, and then ſhe kindles; and, if ſhe take not buck preſently, ſhe loſes her month, or at leaſt a fortnight, and often kills her young and eats them.

In England they begin to breed at a year old, but in ſome places much ſooner; and they continue breeding very faſt from the time when they begin, four, five, ſix, or ſeven times a year being common with them. They have uſually from four to ſeven in a litter, and hence it is that a ſmall number at firſt will ſoon ſtock a whole warren, if left to breed a little while undiſturbed. The does cannot ſuckle their young till they have been at buck again; this therefore is to be done preſently, elſe there is a fortnight loſt of the time for the next brood, and the preſent brood alſo probably loſt. When the buck goes to the doe, he always firſt beats and ſtamps very hard with his feet, and, when he has copulated with her, he falls backwards, and lies as it were in a trance; in this ſtate it is eaſy to take him, but he ſoon recovers from it.

The buck Rabbits, like our boar cats, will kill the young ones, if they can get at them; and the does in the warrens prevent this, by covering their ſtocks, or neſts, with gravel or earth, which they cloſe ſo artificially up with the hinder part of their bodies, that it is hard to find them out. They never ſuckle the young ones at any other time than early in the morning, and late at night, and always, for eight or ten days, cloſe up the hole at the mouth of the neſt, in this careful manner, when they go out. After this, they begin to leave a ſmall opening, which they increaſe by degrees, till at length, when they are about three weeks old, the mouth of the hole is left wholly open, that they may go out: for they are at that time grown big enough to take care of themſelves, and to feed on graſs.

People who keep Rabbits tame for profit, breed them in hutches, but theſe muſt be kept very neat and clean, elſe they will be always ſubject to diſeaſes. Care muſt be taken alſo to keep the bucks and does apart till the latter have juſt kindled, then they are to be turned to the bucks again, and to remain with them till they ſhun and run from them.

The general direction for the chuſing of tame Rabbits is, to pick the largeſt and faireſt; but the breeder ſhould remember that the ſkins of the ſilver-haired ones ſell better than any other.

The food of the tame Rabbits may be colewort and cabbage leaves, carrots, parſneps, apple rinds, green corn, and vetches, in the time of the year; alſo vine leaves, graſs, fruits, oats, and oatmeal, milk-thiſtles, ſow-thiſtles, and the like; but with theſe moiſt foods they muſt always have a proportionable quantity of the dry foods, as hay, bread, oats, bran, and the like, otherwiſe they will grow pot-bellied, and die. Bran and grains mixed together have been alſo found to be very good food. In winter they will eat hay, oats, and chaff, and theſe may be given them three times a day; but when they eat green things, it muſt be obſerved that they are not to drink at all, for it throws them into a dropſy. At all other times a very little drink ſerves their turn, but that muſt always be freſh. When any green herbs, or graſs, are cut for their food, care muſt be taken that there is no hemlock among it, for, though they will eat this greedily among other things, when offered to them, yet it is ſudden poiſon to them.

Rabbits are ſubject to two principal infirmities. Firſt, the rot, which is cauſed by the giving them too large a quantity of greens, or from the giving them freſh gathered with the dew or rain hanging in drops upon them. It is over moiſture that always cauſes this diſeaſe; the greens therefore are always to be given dry, and a ſufficient quantity of hay, or other dry food, intermixed with them, to take up the abundant moiſture of their juices. On this account the very beſt food that can be given them, is the ſhorteſt and ſweeteſt hay that can be got, of which one load will ſerve two hundred couples a year; and out of this ſtock of two hundred, two hundred more may be eat in the family, two hundred ſold to the markets, and a ſufficient number kept in caſe of accidents.

The other general diſeaſe of theſe creatures is a ſort of madneſs: this may be known by their wallowing and tumbling about with their heels upwards, and hopping in an odd manner into their boxes. This diſtemper is ſuppoſed to be owing to the rankneſs of their feeding; and the general cure is the keeping them low, and giving them the prickly herb, called tare-thiſtle, to eat.

The general computation of males and females is that one buck Rabbit will ſerve for nine does; ſome allow ten to one buck, but thoſe who go beyond this always ſuffer for it in their breed.

The wild Rabbits are to be taken either by ſmall cur dogs, or by ſpaniels bred [illegible] to the ſport; and the place of hunting thoſe who ſtraggle from their burrows is under cloſe hedges, or buſhes, or among corn-fields and freſh paſtures. The owners uſe to courſe them with ſmall greyhounds, and, though they are ſeldom killed this way, yet they are driven back to their burrows, and are prevented from being a prey to others. The common method is by nets, called purſe nets, and ferrets. The ferret is ſent into the hole to force them out, and the purſe net, being ſpread over the hole, takes them, as they come out. The ferrets mouths muſt be muffled, and then the Rabbit gets no harm. For the more certain taking of them, it may not be be improper to pitch up a hay net or two, at a ſmall diſtance from the burrows that are intended to be hunted: thus very few of the number that are attempted will eſcape.

Some who have not ferrets ſmoak the Rabbits out of their holes with burning brimſtone and orpiment. This certainly brings them out into the nets, but then it is a very troubleſome and offenſive method, and is very detrimental to the place, as no Rabbit will, of a long time, afterwards come near the burrows which have been fumed with theſe ſtinking ingredients.

RA′CA, or RACHA, a Syriac term, found in the goſpel of St. Matthew, ch. v. 22. and preſerved in moſt tranſlations.

Father Simon obſerves that the Greek tranſlator of St. Matthew's goſpel retained the Syriac Raca which he found in the original, by reaſon it was very common among the Jews. And St. Jerom, Luther, the Engliſh tranſlators, thoſe of Geneva, Louvain, Port-Royal, &c. ſtill preſerve it in their reſpective languages.

F. Bouhours chuſes rather to expreſs the ſenſe thereof in a ſort of paraphraſe, thus: he that ſays to his brother 'homme de peu de ſene, man of little underſtanding,' ſhall deſerve to be condemned by the tribunal of the council, &c.

Moſt tranſlators, except the Engliſh, and F. Simon, for Raca write Racha: but the former orthography ſeems the beſt founded; all the copies having Raca, and all the Greek ones ῥακὰ, or, with Heſychius, ῥακκὰ, which is the ſame: all we mean, but St. Irenæus, and Beza's copy, now at Cambridge, which have ῥαχὰ — In effect, the origin of the word ſhews it ſhould be Raca; as coming from the Syriac רקא, Raca, of the Hebrew רק rek, empty, ſhallow.

RACHI′TIS, in medicine, a diſeaſe generally called the rickets. See RICKETS, Dictionary and Supplement.

RA′CING, the riding heats for a plate or other premium.

The firſt thing to be conſidered in this ſort of gaming is the chuſing a rider; for it is not only neceſſary that he ſhould be very expert and able, but he muſt be alſo very honeſt. He muſt have a very cloſe ſeat, his knees being turned cloſe to the ſaddle ſkirts, and held firmly there, and toes turned inwards, ſo that the ſpurs may be turned outwards to the horſe's belly; his left hand governing the horſe's mouth, and his right the whip. During the whole time of the race he muſt take care to ſit firm in the ſaddle, without waving or ſtanding up in the ſtirrups. Some jockies fancy this is a becoming ſeat; but it is certain, that all motions of this kind do really incommode the horſe. In ſpurring the horſe, it is not to be done by ſtriking the calves of the legs cloſe to the horſe's ſides, as if it were intended to preſs the wind out of his body; but, on the contrary, the toes are to be turned a little outwards, that, the heels being brought in, the ſpurs may juſt be brought to touch the ſides. A ſharp touch of this kind will be of more ſervice towards the quickening a horſe's pace, and will ſooner draw blood, than one of the common coarſe kicks. The expert jockey will never ſpur his horſe until there is great occaſion, and then he will avoid ſtriking him under the fore-bowels between the ſhoulders and girth; this is the tendereſt part of a horſe, and a touch there is to be reſerved for the greateſt extremity.

As to whipping the horſe, it ought always to be done over the ſhoulder on the near ſide, except in very hard running, and on the point of victory; then the horſe is to be ſtruck on the flank with a ſtrong jerk; for the ſkin is moſt tender of all there, and moſt ſenſible of the laſh.

When a horſe is whipped and ſpurred, and is at the top of his ſpeed; if he claps his ears in his pole, or whiſks his tail, it is a proof that the jockey heats him hard, and then he ought to give him as much comfort as he can, by ſawing the ſnaffle backwards and forwards in his mouth; and by that means forcing him to open his mouth, which will give him wind, and be of great ſervice. If there be any high wind ſtirring in the time of riding, the artful jockey will let his adverſary lead, holding hard behind him, till he ſees an opportunity of giving a looſe; yet, in this caſe, he muſt keep ſo cloſe behind, that the other horſe may keep the wind from him; and that he, ſitting low, may at once ſhelter himſelf under him, and aſſiſt the ſtrength of the horſe. If the wind happen to be in their back, a juſt contrary method is to be taken with it; the expert jockey is to keep directly behind the adverſary, that he may have have all the advantage of the wind to blow his horſe along, as it were, and at the ſame time intercept it in regard to his adverſary.

When running on level carpet ground, the jockey is to bear his horſe as much as the adverſary will give him leave, becauſe the horſe is naturally more inclined to ſpend himſelf on this ground: on the contrary, on deep earths, he may have more liberty, as he will there ſpare himſelf.

In riding up hill the horſe is always to be favoured, by bearing him hard, for fear of running him out of wind; but, in running down hill, if the horſe's feet and ſhoulders will bear it, and the rider dare venture his neck, he may have a full looſe. If the horſe have the heels of the reſt, the jockey muſt always ſpare him a little, that he may have a reſerve of ſtrength, to make a puſh at the laſt poſt.

A great deal depends on the jockey's knowing the nature of the horſe that is to run againſt him, for, by managing accordingly, great advantages are to be obtained; thus, if the oppoſite horſe is of a hot and fiery diſpoſition, the jockey is either to run juſt behind him, or cheek by joul with him, making a noiſe with his whip, and by that means forcing him on faſter than his rider would have him, and conſequently ſpending him ſo much the ſooner; or elſe keep juſt before him, in ſuch a ſlow gallop, that he may either over-reach, or by treading on the heels of the fore horſe, endanger tumbling over.

Whatever be the ground that the adverſary's horſe runs worſt on, the cunning jockey is to ride the moſt violently over; and, by this means, it will often happen that, in following, he either ſtumbles or claps on the back ſinews.

The ſeveral corrections of the hand, the whip, and the ſpur, are alſo to be obſerved in the adverſary, and in what manner he makes uſe of them; and when it is perceived by any of the ſymptoms, of holding down the ears, or whiſking the tail, or ſtretching out the noſe like a pig, that the horſe is almoſt blown, the buſineſs is to keep him on to this ſpeed, and he will be ſoon thrown out or diſtanced. If the horſe of the opponent looks dull, it is a ſign his ſtrength fails him; and, if his flanks beat much, it is a ſign that his wind begins to fail him, and his ſtrength will ſoon do ſo too.

After every heat for a plate, there muſt be dry ſtraw, and dry cloths, both linen and woollen, ready to rub him down all over, after taking off the ſweat with what is called a ſweat knife; that is, a piece of an old ſword-blade, or ſome ſuch thing. Some adviſe the ſteeping the cloths in urine and ſalt-petre the day before, and letting them be dried in the ſun for this occaſion. After the horſe has been well rubbed with theſe, he ſhould be chafed all over with cloths wetted in common water till the time of ſtarting again. When it is certainly known that the horſe is good at the bottom, and will ſtick at the mark, he ſhould be rid every heat, to the beſt of his performance; and the jockey is, as much as poſſible, to avoid riding at any particular horſe, or ſtaying for any, but to ride out the whole heat with the beſt ſpeed he can. If, on the contrary, he has a fiery horſe to ride, and one that is hard to manage, hard-mouthed and difficult to be held, he is to be ſtarted behind the reſt of the horſes with all imaginable coolneſs and gentleneſs; and, when he begins to ride at ſome command, then the jockey is to put up to the other horſes; and, if they ride at their eaſe, and are hard held, they are to be drawn on faſter; and, if it be perceived, that their wind begins to rake hot, and they want a ſob, the buſineſs is to keep them up to that ſpeed: and, when they are come within three quarters of a mile of the poſt, then is the time to puſh for it, and uſe the utmoſt ſpeed in the creature's power. When the race is over, the horſe is immediately to be cloathed up, and rode home, and immediately on his coming into the ſtable the following drink is to be given him: beat up the yolks of three eggs, and put them into a pint and half of new milk made warm; let there be added to this three-penny worth of ſaffron, and three ſpoonfuls of ſallad oil, and let the whole be given with a horn. After this, he is to be rubbed well down, and the ſaddle-place rubbed over with warm ſack, and the places where the ſpurs touched, with a mixture of urine and ſalt, and afterwards with a mixture of powder of jet and Venice turpentine; after this, he ſhould have a feed of rye bread, then a good maſh, and, at ſome time after theſe, as much hay and oats as he will eat. His legs after this ſhould be bathed ſometimes with a mixture of urine and ſalt-petre.

RA'DISH, *raphanus*, in botany, a genus of plants, whoſe characters are: The flower conſiſts of four leaves, which are placed in form of a croſs: out of the flower cup riſes the pointal, which afterwards turns to a pod in form of an horn, that is thick, ſpongy, and furniſhed with a double row of roundiſh ſeeds, which are ſeparated by a thin membrane.

There are ſeveral ſpecies of Radiſh, but we ſhall only mention that which is commonly cultivated in kitchen-gardens for its root; of which there are ſeveral varieties, as the ſmall-topped, the deep-red, and the long-topped ſtriped Radiſh; all which are varieties ariſing from culture. The ſmall-topped ſort is moſt commonly preferred by the gardeners near London, becauſe they require much leſs room than thoſe with large tops, and may be left much cloſer together; and, as the forward Radiſhes are what produce the greateſt profit to the gardener, ſo theſe being commonly ſown upon borders near hedges, walls, or pales, if they are of the large-topped ſort, they will be apt to grow moſtly at top, and not ſwell ſo much in the root as the other, eſpecially if they are left pretty cloſe.

The ſeaſons for ſowing this ſeed are various, according to the time when they are deſired for uſe; but the earlieſt ſeaſon is commonly towards the latter-end of October, that the gardeners near London ſow them to ſupply the market; and theſe, if they do not miſcarry, will be fit for uſe in March following, which is full as ſoon as moſt people care to eat them. Theſe (as I ſaid before) are commonly ſown on warm borders, near walls, pales, or hedges, where they may be defended from the cold winds.

The ſecond ſowing is commonly about Chriſtmas, provided the ſeaſon be mild, and the ground in a fit condition to work: theſe are alſo ſowed near ſhelter, but not ſo near pales and hedges as the firſt ſowing. Theſe, if they are not deſtroyed by froſt, will be fit for uſe the beginning of April: but, in order to have a ſucceſſion of theſe roots for the table through the ſeaſon, you ſhould repeat ſowing of their ſeeds once a fortnight, from the middle of January till the beginning of April; always obſerving to ſow the latter crops upon a moiſt ſoil and an open ſituation, otherwiſe they will run up, and grow ſickly, before they are fit for uſe.

Many of the gardeners near London ſow carrot-ſeed with their early Radiſhes; ſo that many times, when their Radiſhes are killed, the carrots will remain: for the ſeeds of carrots commonly lie in the ground five or ſix weeks before they come up, and the Radiſhes ſeldom lie above a fortnight under-ground: ſo that theſe are often up, and killed, when the carrot ſeed remains ſafe in the ground: but, when both crops ſucceed, the Radiſhes muſt be drawn off very young, otherwiſe the carrots will be drawn up ſo weak, as not to be able to ſupport themſelves, when the Radiſhes are gone.

It is alſo a conſtant practice, with the gardeners, to mix ſpinach-ſeed with their latter crop of Radiſhes; ſo that, when the Radiſhes are drawn off, and the ground cleaned between the ſpinach, it will grow prodigiouſly, and in a fortnight's time will as completely cover the ground, as though there had been no other crop. And this ſpinach, if it be of the broad-leaved kind, will be larger and fairer than it commonly is, when ſown by itſelf; becauſe, where people have no other crop mixed with it, they commonly ſow it too thick, whereby it is drawn up weak; but here the roots ſtand pretty far apart, ſo that, after the Radiſhes are gone, they will have full room to ſpread; and, if the ſoil be good, it is a prodigious ſize this ſpinach will grow to, before it runs up for ſeed: but this huſbandry is chiefly practiſed by ſuch gardeners as pay very dear for their land, and are obliged to have as many crops in a year as poſſible, otherwiſe they could not afford to pay ſuch large rents.

When the Radiſhes are come up, and have got five or ſix leaves, they muſt be pulled up where they are too cloſe, otherwiſe they will draw up to top, but the roots will not increaſe their bulk. In doing of this, ſome only draw them out by hand: but the beſt method is to hoe them with a ſmall hoe, which will ſtir the ground and deſtroy the young weeds, and alſo promote the growth of the plants. The diſtance which they ſhould be left, if for drawing up ſmall, may be three inches; but, if they are to ſtand until they are pretty large, ſix inches are full near enough, and a ſmall ſpot of ground will afford as many Radiſhes at each ſowing, as can be ſpent in a family, while they are good.

Horſe RADISH, a well known plant, belonging to the genus cochlearia.

Horſe Radiſh is propagated by cuttings or buds from the ſides of the old roots. The beſt ſeaſon for this work is in October or February; the former for dry lands, and the latter for moiſt. The manner of doing it is as follows: provide yourſelf with a good quantity of off-ſets, which ſhould have a bud upon their crowns; but it matters not how ſhort they are: therefore, the upper part of the roots which are taken up for uſe, ſhould be cut off about two inches long with the bud to it, which is eſteemed the beſt for planting. Then make a trench ten inches deep, in which you ſhould place the off-ſets at about four or five inches diſtance each way, with the bud upward, covering them up with the mould that was taken out of the trench: then proceed to a ſecond trench in like manner, and continue the ſame until the whole ſpot of ground is planted. After this, level the ſurface of the ground even, obſerving to keep it clear from weeds, until the plants are ſo far advanced, as to be ſtrong enough to over-bear and keep them down. With this management, the roots of the horſe Radiſh will be long and ſtraight, and free from ſmall lateral roots; and the ſecond year after planting will be fit for uſe. It is true, they may be taken up the firſt year, but then the roots will be but ſlender; therefore it is the better way to let them remain until the ſecond year. The ground in which this is planted ought to be very rich, otherwiſe the roots will make but a ſmall progreſs.

Radiſhes have the virtues of the ſcurvy graſs; the root is eſculent, expels phlegm from the inteſtines, and is a carminative. The flowers, leaves, ſeeds, and roots are antiſcorbutic; for which reaſon they are much in requeſt, and are proper for phlegmatic conſtitutions: the expreſſed juice of the roots and ſeeds, taken in a morning with honey, is a very wholeſome medicine, eſpecially if a draught of whey be taken afterwards; for it cleanſes the ſtomach, kidnies, and lungs, and is good againſt an inveterate cough and hoarſeneſs, proceeding from phlegm; but it is not proper in a cough proceeding from an inflammation, nor for thoſe who ſpit blood. The leaves are uſed among other greens. The root contains much of an aqueous and acrimonious ſubſtance; and, the drier it is, the more acrid it becomes; but its acrimony is loſt in boiling. Its aquoſity renders it flatulent, on which account it is ſaid not to be good in hypochondriacal diſorders: the daily uſe of the root, however, is of ſufficient efficacy to cure a great dropſy in the beginning; and it is of excellent ſervice in the ſcurvy. It is alſo aperitive, inciding, and good for the ſtone, the nephritic cholic, a retention of urine, and the menſes, and in the jaundice. The ſeeds are opening; but, taken inwardly by themſelves, they excite a nauſea. *Hiſt. Plant. aſcript. Boerhaave.*

RAGS.— In ſome counties of England, particularly in Oxfordſhire, it is a common thing to uſe old woollen Rags by way of manure upon land. Taylor's ſhreads anſwer this purpoſe, in ſome degree; but the old Rags of cloaths which have been worn by men and women, are much better, which is owing to the ſalts they have imbibed from the perſpiration of the body they uſed to cover. *Plot's Oxfordſhire.*

Rag-*bolts*, in a ſhip, are ſuch as have jags or barbs on each ſide, to keep them from flying out of the hole wherein they are driven.

Rag-*ſtone*, a name given by our artificers to a kind of ſtone, which they uſe for ſetting an edge upon knives, chiſſels, and other tools. It is a greyiſh-coloured ſtone, containing a large quantity of talcky particles, and ſplits eaſily into thin flakes. It is a ſoft ſtone, and is uſed only to finiſh the ſetting an inſtrument after the edge has been prepared by grinding or rubbing the tool upon ſome other ſtone of a coarſer texture. We have this from Newcaſtle and many other parts of the north of England, where there are very large rocks of it in the hills.

Rag-*wort.* — There are two or three ſpecies of this plant cultivated in the gardens of the curious; and one very common in moſt places, which is the maritime kind, remarkable for its white leaves. This had been long uſed to be nurſed up, with great care, in our green-houſes; but of late, ſome ſtraggling ſeeds of it having propagated themſelves on a wall, and there ſtood the winter's cold without hurt, we were taught that the plant did not require the care it had been uſed to be treated with. All the kinds may be propagated by ſowing their ſeeds in March, on a bed of light earth, watering it frequently in dry weather. In May the plants may be taken up, and planted in pots, and ſet in a warm ſituation till October, when the tenderer kinds are to be taken into a green-houſe.

Theſe require much pruning in ſummer to keep them in ſhape, for they grow very faſt, and in winter will die, if they are not often watered. *Miller's Gard. Dict.*

RAIN (*Dict.*) — As to the quantity of Rain that falls, its proportion in ſeveral places at the ſame time, and in the ſame place at ſeveral times, we have ſtore of obſervations, journals, &c. in the Memoirs of the French academy, the Philoſophical Tranſactions, &c. an idea whereof will not be unacceptable. Upon meaſuring, then, the Rain falling yearly, its depth, at a medium, is found as in the following table:

Depth of RAIN *falling yearly, and its proportion in ſeveral places.*

	Inches.
At Townley in Lancaſhire, obſerved by Mr Townley	42½
Upminſter in Eſſex, by Mr. Derham, — ———	19¼
Zurich in Switzerland, by Dr. Scheuchzer, ———	32¼
Piſa in Italy, by Dr. Mich. Ang. Tilli, ——— ———	43¼
Paris in France, by M. de la Hire, ——— ———	19
Liſle in Flanders, by M. de Vauban. ——— ———	24

Proportions of the RAIN *of ſeveral years to one another.*

At Upminſter.			At Paris.	
1700	19 Inch.	03 Cent.	21 Inch.	38 Cent.
1701	18	69	27	78
1702	20	38	17	42
1703	23	99	18	51
1734	15	81	21	20
1705	16	93	14	82

Proportion of the RAIN *of ſeveral ſeaſons to one another.*

1708	Depth at *Piſa.* Inch.	Depth at *Upminſt.* Inch.	Depth at *Zurich.* Inch.	1708	Depth at *Piſa.* Inch.	Depth at *Upminſt.* Inch.	Depth at *Zurich.* Inch.
Jan.	6 41	2 88	1 64	*July*	0 00	1 11	3 50
Feb.	3 28	0 46	1 65	*Aug.*	2 27	2 94	3 15
Mar.	2 65	2 03	1 51	*Sep.*	7 21	1 46	3 02
Apr.	1 25	0 96	4 69	*Oct.*	5 33	0 23	2 24
May.	3 33	0 02	1 91	*Nov.*	0 13	0 86	0 62
Jun.	4 90	2 32	5 91	*Dec.*	0 00	11 97	2 62
Half-year.	28 82	10 67	17 31	Half-year.	14 94	8 57	15 35

Preternatural RAINS (*Dict.*)— We have numerous accounts in in the hiſtorians of our own, as well as other countries, of preternatural Rains, ſuch as the raining of ſtones, of duſt, of blood, nay, and of living animals, as young frogs, and the like. We are not to doubt the truth of what thoſe who are authors of veracity and credit relate to us of this kind, ſo far as to ſuppoſe that the falling of ſtones and duſt never happened; the whole miſtake is, the ſuppoſing them to have fallen from the clouds; but, as to the blood and frogs, it is very certain that they never fell at all, but the opinion has been a mere deception of the eyes. Men are extremely fond of the marvellous in their relations; but the judicious reader is to examine ſtrictly whatever is reported of this kind, and is not to ſuffer himſelf to be deceived.

There are two natural methods, by which quantities of ſtones and duſt may fall in certain places, without their having been generated in the clouds, or fallen as rain. The one is by means of hurricanes; the wind which we frequently ſee tearing off the tiles of houſes, and carrying them to conſiderable diſtances, being equally able to take up a quantity of ſtones, and drop them again at ſome other place. But the other, which is much the more powerful, and probably the moſt uſual way, is for the eruptions of volcano's, and burning mountains, to toſs up, as they frequently do, a vaſt quantity of ſtones, aſhes, and cinders, to an immenſe height in the air; and theſe being hurried away by the hurricanes, and impetuous winds, which uſually accompany thoſe eruptions, and being in themſelves much lighter than common ſtones, as being half calcined, may eaſily be thus carried to vaſt diſtances, and there falling in places where the inhabitants know nothing of the occaſion, they cannot but be ſuppoſed by the vulgar to fall on them from the clouds. It is well known, that, in the great eruptions of Ætna and Veſuvius, ſhowers of aſhes, duſt, and ſmall cinders, have been ſeen to obſcure the air, and overſpread the ſurface of the ſea for a great way, and cover the decks of ſhips; and this at ſuch a diſtance, as it ſhould appear ſcarce conceivable that they ſhould have been carried to; and probably, if the accounts of all the ſhowers of theſe ſubſtances mentioned by authors be collected, they will all be found to have fallen within ſuch diſtances of volcano's; and, if compared as to the time of their falling, will be found to correſpond in that alſo with the eruptions of thoſe mountains. We have known inſtances of the aſhes from Veſuvius having been carried thirty, nay, forty leagues, and peculiar accidents may have carried them yet farther. It is not to be ſuppoſed that theſe ſhowers of ſtones and duſt fall, for a continuance, in manner of ſhowers of Rain, or that the fragments are as frequent as drops of water; it is ſufficient that a number of ſtones, or a quantity of duſt, fall at once on a place where the inhabitants can have no knowledge of the part from whence they come, and the vulgar will not doubt their dropping from the clouds. Nay, in the canton of Berne in Swiſſerland, the inhabitants counted it a miracle that it rained earth and ſulphur upon them, at a time that a ſmall volcano terrified them; and, even when the wind was ſo boiſterous, and hurricanes ſo frequent, that they ſaw almoſt every moment the duſt, ſand, and little ſtones, torn up from the ſurface of the earth in whirlwinds, and carried to a conſiderable height in the air, they never conſidered, that both the ſulphur thrown up by the volcano, and the duſt, &c. carried from their feet, muſt fall ſoon after ſomewhere. It is very certain that in ſome of the terrible ſtorms of large hail, where the hail-ſtones have been of many inches round, that, on breaking them, there have been found what people have called ſtones in their middle; but theſe obſervers needed only to have waited the diſſolving of one of theſe hail-ſtones, to have ſeen the ſtone in its center diſunite alſo, it being only formed of particles of looſe earthy matter, which the water, exhaled by the ſun's heat, had taken up in extremely ſmall moleculæ with it; and this only having ſerved to give an opake hue to the inner part of the congelation, to which the freezing of the water alone gave the apparent hardneſs of ſtone.

The raining of blood has been ever accounted a more terrible ſight, and a more fatal omen, than the other preternatural Rains, already mentioned. It is very certain, that nature forms blood no where but in the veſſels of animals, and therefore ſhowers of it from the clouds are by no means to be credited. Thoſe who ſuppoſe that what has been taken for blood, has been actually ſeen falling through the air, have had recourſe to flying inſects for its origin, and ſuppoſe it the eggs or dungs of certain butter-flies diſcharged from them, as they were high up in the air. But this ſeems a very wild conjecture, as we know of no butter-fly whoſe excrements, or eggs, are of ſuch a colour, or whoſe abode is ſo high, or their flocks ſo numerous as to be the occaſion of this.

It is moſt probable that theſe bloody waters were never ſeen falling, but that people, ſeeing the ſtanding waters blood-coloured, were aſſured, from their not knowing how it ſhould elſe happen, that it had rained blood into them. A very memorable inſtance there was of this at the Hague, in the year 1670. Swammerdam, who relates it, tells us, that one morning the whole town was in an uproar on finding their lakes and ditches full of blood, as they thought, and having been certainly full of water the night before, they agreed it muſt have rained blood in the night; but a certain phyſician went down to one of the canals, and taking home a quantity of this blood-coloured water, he examined it by the microſcope, and found that the water was water ſtill, and had not at all changed its colour, but that it was full of prodigious ſwarms of ſmall red animals, all alive, and very nimble in their motions, whoſe colour, and prodigious number, gave a red tinge to the whole body of the water they lived in, on a leſs accurate inſpection. The certainty that this was the caſe did not however perſuade the Hollanders to part with the miracle; they prudently concluded, that the ſudden appearance of ſuch a number of animals was as great a prodigy, as the raining of blood would have been; and are aſſured to this day, that this portent foretold the ſcene of war and deſtruction which Lewis the XIVth afterward brought into that country, which had before enjoyed forty years uninterrupted peace.

The animals which thus colour the water of lakes and ponds are the pulices arboreſcentes of Swammerdam, or the water-fleas with branched horns. Theſe creatures are of a reddiſh yellow, or flame colour; they live about the ſides of ditches, under weeds, and among the mud, and are therefore the leſs viſible, except at a certain time, which is in the end of May or beginning of June; it is at this time that theſe little animals leave their receſſes to float looſe about the water, to meet for the propagation of their ſpecies, and by that means become viſible in the colour they give the water. This is viſible, more or leſs, in one part or other of almoſt all ſtanding waters at this ſeaſon; and it is always at this ſeaſon that the bloody waters have alarmed the ignorant.

Artificial RAI'NBOW, a phænomenon produced by continually throwing water up into the air, as from a fountain, which breaking into ſmall drops, exhibits the appearance of the Rainbow.

RAI'SIN-*brandy*, a name given by our diſtillers to a very clear and pure ſpirit, procured from Raiſins fermented only with water. Thus treated, they yield a ſpirit ſcarce at all diſtinguiſhable from ſome of the wine ſpirits; for there are as many kinds of wine ſpirits as there are of grapes. The coarſer the operation of diſtilling is performed in this caſe, the nearer will be the reſemblance of the wine ſpirit; that is, there will be moſt of this flavour in the ſpirit, when as much as can be of the oil is thrown up with a galloping heat.

The diſtillers are very fond of the wine ſpirit, with which they hide and diſguiſe the taſte of their nauſeous malt, and other ſpirits; and in defect of that ſpirit, this of Raiſins, made in this coarſe manner, will go almoſt as far. It is indeed ſurpriſing how extenſive the uſe of theſe flavouring ſpirits is, ten gallons of Raiſin ſpirit, or ſomewhat leſs of the wine ſpirit, being often ſufficient for a whole piece of malt-ſpirit, to take off its native flavour, and give it an agreeable vinoſity. It is no wonder, therefore, that the diſtillers, and ordinary rectifiers, are ſo fond of this, as it is a good cloak for their defects, and the imperfection of their proceſſes. When Raiſin brandy is intended for common uſe, the fire ſhould be kept ſlower and more regular in the diſtillation, and the ſpirit, though it hath leſs of the high flavour of the grape, will be more pleaſant and more pure. *Shaw's Eſſay on Diſtillery.*

RA'NA, *the frog*, in zoology, a very well known animal of the amphibious kind; the characters of it are, that the body of it, in one part of its life, is furniſhed with a tail.

The feet of the frog are webbed, for the better ſwimming, and it has very ſtrong muſcles in the hinder part of its body, to aſſiſt it in leaping. The lungs of the frog are different from thoſe of all other animals; they are only a ſort of membranaceous bladders, with ſeveral tubercles, by means of which they reſemble the fruit of the firs or pines; theſe, when once inflated, do not immediately become flaccid, as in other animals, but remain in that ſtate as long as the creature pleaſes. The creature can remain a long time under water, and has been kept ſo for ſeveral days by tying it down, and received no hurt from it. It is a very long-lived animal; and even if its belly be opened, and the inteſtines, and all the viſcera, taken out, it will continue its leaping, and all its other motions, as if nothing had happened to it, for a conſiderable time; but, if the nerve of one of the hinder legs be cut, it loſes all power of uſing that limb on the inſtant.

The frog differs from all creatures in the manner of its generation. It no way reſembles any of the quadrupeds in this particular, and though, in ſome ſort, it approaches to the nature of fiſhes, yet it differs from them alſo in many things. The egg of the frog is a ſmall black ſpot, inveloped in a mucilaginous ſubſtance; in this egg is contained the embryo frog, which, on breaking of the egg in hatching, comes forth in form of a tadpole. This young animal is for ſome time nouriſhed by the gelatinous matter which invelopes the egg, but it does not conſume the whole of it; for the particles of water, making way by degrees into it, divide its parts, and it ſoon becomes expanded, frees itſelf from the living animal, and floats on the ſurface of the water, or at a ſmall depth in it, in form of a thin cloud: this, though it now no longer ſerves for food to the young creature, is however of ſome ſervice to it, ſerving it as an aſylum, or place of reſt and ſafety, when tired with ſwimming.

The egg of the frog therefore is, in ſome degree, analogous to that of an inſect of the winged kind, which is to go through a metamorphoſis before it arrives at its perfect ſtate; for it hatches into the tadpole, as the egg of a butterfly into a caterpillar, and arrives at that its ultimate ſtate, after a determinate time ſpent in the other. In this it differs from the generation of fiſhes, the eggs of whoſe ſpawn hatch into perfect fiſhes, which go through no change; and it differs from all in the gelatinous ſubſtance, which invelopes the egg, and ſerves as the firſt food to the fœtus.

The eggs are indeed, when nicely examined, found to be incloſed in a double liquor, a more pellucid and thin one within the gelatinous one, which ſerves as the general covering to the whole ſeries of eggs; and it is this thin one which it principally feeds on, when firſt hatched, and which ſerves to the ſame purpoſes as the white of an egg in the fowl kind.

There is alſo an opinion that the male ſperm of the frog is depoſited on the ſpawn of the female after it is laid. *Ray's Syn. Quad.*

RANU'NCULUS, *crowfoot*, in botany, a genus of plants, whoſe characters are:

The flower conſiſts of ſeveral leaves, which are placed in a circular order, and expanded in form of a roſe; having, for the moſt part, a many-leaved empalement or flower cup: out of the middle of the flower riſes the pointal, which afterwards becomes a fruit, either round, cylindrical, or ſpiked; to the axis of which, as a placenta, adhere many ſeeds, for the moſt part naked.

There are a great variety of ſpecies of Ranunculus; but that called the Perſian Ranunculus, being univerſally admired, we ſhall only give the method of cultivating that beautiful flower.

The beds in which the Perſian Ranunculus roots are planted, ſhould be made with freſh light ſandy earth, at leaſt three feet deep: the beſt ſoil for them may be compoſed in this manner, viz. take a quantity of freſh earth from a rich up-land paſture, about ſix inches deep, together with the green ſward: this ſhould be laid in an heap to rot, for twelve months before it is mixed, obſerving to turn it over very often, to ſweeten it, and break the clods: to this you ſhould add a fourth part of very rotten neat's dung, and a proportionable quantity of ſea or drift ſand, according as the earth is lighter or ſtiffer; if it be light, and inclining to a ſand, there ſhould be no ſand added; but, if it be an hazel loam, one load of ſand will be ſufficient for eight loads of earth: but if the earth is ſtrong and heavy, the ſand ſhould be added in a greater proportion: this ſhould be mixed ſix or eight months before it is uſed; and you ſhould often turn it over, in order to unite their parts well together, before it is put into the beds.

The depth which this ſhould be laid in the beds, muſt be about three feet; this ſhould be below the ſurface, in proportion to the dryneſs or moiſture of the place where they are ſituated; which, in dry ground, ſhould be two feet eight inches below the ſurface, and the beds raiſed four inches above; but in a moiſt place they ſhould be two feet four inches below, and eight above the ground; and, in this caſe, it will be very proper to lay ſome rubbiſh and ſtones at the bottom of each bed, to drain off the moiſture; and, if, upon this, at the bottom of the beds, ſome very rotten neat's dung is laid two or three inches thick, the roots will reach this in the ſpring, and the flowers will be the fairer. This earth I would by no means adviſe to be ſcreened very fine; only, in turning it over each time, you ſhould be careful to break the clods, and throw out all large ſtones, which will be ſufficient; for if it is made very fine, when the great rains in winter come on, it will cauſe the earth to bind into one ſolid lump, whereby the moiſture will be detained, and the roots, not being able to extend their tender fibres, will rot.

The beds, being thus prepared, ſhould lie a fortnight to ſettle, before the roots are planted, that there may be no danger of the earth ſettling unequally after they are planted; which would prejudice the roots, by having hollow places in ſome parts of the bed, to which the water would run and lodge, and ſo rot the roots in ſuch places. Then having levelled the earth, laying the ſurface a little rounding, you ſhould mark out the rows by a line, at about ſix inches diſtance each way, ſo that roots may be planted every way in ſtraight lines; then you ſhould open the earth with your fingers at each croſs, where the roots are to be planted, about two inches deep; placing the roots exactly in the middle, with their crowns upright; then, with the head of a rake, you ſhould draw the earth upon the ſurface of the bed level, whereby the top of the roots will be about an inch covered with earth, which will be ſufficient at firſt. This work ſhould be done in dry weather, becauſe the earth will then work better than if it were wet; but the ſooner after planting there happens to be rain, the better it will be for the roots, for if it ſhould prove dry weather long after, and the earth of the beds be very dry, the roots will be ſubject to mould and decay; therefore, in ſuch a caſe, it will be proper to give a little water to the beds, if there ſhould no rain happen in a fortnight's time, which is very rare at that ſeaſon of the year; ſo that they will ſeldom be in danger of ſuffering that way.

When the roots are thus planted, there will no more be required until towards the end of November; by which time they will begin to heave the ground, and their buds appear; when you ſhould lay a little of the ſame freſh earth, of which the beds were compoſed, about half an inch thick all over the beds, which will greatly defend the crown of the root from froſt: and when you perceive the buds to break through this ſecond covering, if it ſhould prove very hard froſt, it will be very proper to arch the beds over with hoops, and cover them with mats, eſpecially in the ſpring, when the flower buds will begin to appear; for if they are expoſed to too much froſt, or blighting winds, at that ſeaſon, their flowers ſeldom open fairly, and many times their roots are deſtroyed: but this happens more frequently to the Perſian kinds, which are tenderer, than to thoſe ſorts which are pretty hardy; for which reaſon they are commonly planted in open borders, intermixed with other flowers, though in very hard winters theſe are apt to ſuffer, where care is not taken to guard off the froſt.

In the beginning of March the flower ſtems will begin to riſe; at which time you ſhould carefully clear the beds from weeds, and ſtir the earth with your fingers between the roots, being very careful not to injure them; this will not only make the beds appear handſome, but alſo greatly ſtrengthen their flowers. When the flowers are paſt, and the leaves are withered, you ſhould take up the roots, and carefully clear them from the earth; then ſpread them upon a mat to dry, in a ſhady place; after which they may be put up in bags or boxes, in a dry room, until the October following, which is the ſeaſon for planting them again.

RA'PA, *the turnep*; ſee TURNEP.

RAPU'NTIUM, *rampions or cardinal's flower*, in botany, a genus of plants, whoſe characters are:

The flower conſiſts of one leaf, which is of an anomalous figure, hollowed like a pipe, and furrowed or channelled; divided, as it were, into many parts, in the ſhape of a tongue, defended by a vagina or covering, which infolds the pointal: when the flowers decay, the flower-cup turns to a fruit divided into three cells, full of ſmall ſeeds, which adhere to a placenta, which is divided into three parts.

The crimſon Rapuntium is greatly prized by the curious, for the beauty of its rich crimſon flowers, which exceed all the flowers I have yet ſeen, in the deepneſs of its colour: and theſe commonly, when their roots are ſtrong, produce large ſpikes of theſe flowers, which continue a long time in beauty, and make a moſt magnificent ſhew amongſt other flowers. The time of their flowering is commonly in July and Auguſt; and if the autumn prove very favourable, they will ſometimes produce good ſeeds in England. Theſe plants are natives of Virginia and Carolina, where they grow by the ſides of rivulets, and make a moſt beautiful appearance; from whence the ſeeds are often ſent into England. Theſe ſeeds commonly arrive here in the ſpring; at which time they ſhould be ſown in pots filled with light earth, and but juſt covered over; for, if the ſeeds are buried deep, they will not grow. Theſe pots ſhould be placed under a frame, to defend them from cold, until the ſeaſon is a little advanced; but they ſhould not be placed on an hot-bed, which will alſo deſtroy the ſeeds.

When the weather is warm, towards the middle of April, theſe pots ſhould be placed in the open air, in a ſituation where they may have the morning ſun till twelve o'clock, obſerving to water them conſtantly in dry weather; and, when the plants are come up, and are grown pretty ſtrong, they ſhould be tranſplanted each into a ſmall pot filled with freſh light earth, and placed in the ſame ſituation, obſerving to water them in dry weather; and, in winter, they ſhould be placed under an hot-bed-frame, where they may be ſheltered from ſevere froſts; but, in mild weather, they ſhould be as much expoſed to the open air as poſſible.

The March following theſe plants ſhould be put into larger pots filled with the ſame freſh earth, and placed, as before, to the morning ſun; obſerving to water them in dry weather, which will cauſe them to flower ſtrong the autumn following.

Theſe plants are alſo propagated by parting of their roots: the beſt ſeaſon for which is, either ſoon after they are paſt flower, or in March; obſerving to water and manage them, as hath been directed for the ſeedling plants, both in winter and ſummer. *Miller's Gard. Dict.*

RATAFI'A, a fine ſpirituous liquor, prepared from the kernels, &c. of ſeveral kinds of fruits, particularly cherries and apricocks.

Ratafia of cherries is prepared by bruiſing the cherries, and putting them into a veſſel wherein brandy has been kept; then adding to them the kernels of cherries, with ſtrawberries, ſugar, cinnamon, white pepper, nutmegs, cloves; and to 20 pounds of cherries 10 quarts of brandy.—The veſſel muſt be left open 10 or 12 days, then ſtopped cloſe, for two months before it be tapped.

Ratafia of apricocks is prepared two ways; viz. either by boiling the apricocks in white wine, adding to the liquor an equal quantity of brandy, with ſugar, cinnamon, mace, and the kernels of apricocks; infuſing the whole for 8 or 10 days; then ſtraining the liquor, and putting it up for uſe: or by infuſing the apricocks, cut in pieces, in brandy, for a day or two; paſſing it through a ſtraining bag, and putting in the uſual ingredients.

RA'TTLE-*Snake*, in natural hiſtory, a very dreadful ſpecies of ſerpents, whoſe bite is fatal, if not timely remedied, and which is diſtinguiſhed from all other ſerpents by the rattle in its tail. This is compoſed of ſeveral ſcaly ſubſtances, and is ſaid to increaſe by the creature's age, every year adding one ſcale to it. It moves over the rocks and mountains with prodigious ſwiftneſs; but is leſs nimble on even ground, than many other ſnakes.

It grows to four or five feet long, and ſometimes, though rarely, to more: one, of more than four feet long, having been diſſected, and accurately deſcribed by Dr. Tyſon, the account that gentleman gives of it may not be unacceptable to the reader: the body where largeſt, which was near the middle, meaſured ſix inches and an half round. Its neck only three inches. Its head was flat, as that of the viper; and, as the jaws are very broad and protuberant, and the noſe ſharp, it ſomewhat reſembles the head of an arrow. At the end of the noſe are placed the noſtrils; and between theſe and the eyes there are two other holes, which may be miſtaken for ears; but they only go into a hollow of the bones of the ſkull, without any perforation into the brain. The viper has nothing of theſe holes. The eyes are round, and wholly reſemble thoſe of the viper. The whole body of the creature greatly alſo reſembles the viper, but for the ſingularity of the Rattle; and over the eyes there are two large ſcales looking like eye-brows.

The ſcales which cover the head are very ſmall; thence they become gradually larger, as they reach towards the middle of the body, and from the middle to the tail they grow leſs and leſs again; and all, in ſhape, much reſemble the broad and flat ſeeds of the common garden parſnip. There is ſome variety in the colours of this creature, whether according to the difference of age or ſex, or from leſſer accidents. The moſt uſual colours are theſe: the ſcales are of a duſky greeniſh, like the feathers of the back of the green-finch, and are variegated with ſmall black ſpots in great numbers; there are alſo four large ones of the ſame colour.

The back is of a mixed colour, of a dead yellowiſh brown, variegated with blotches of black and yellow, and with a number of ſmall dots of the ſame colours; the larger blotches being laid in great regularity, and making a very beautiful teſſelated figure. The ſcales become darker, as they approach the tail, where they are almoſt black; and thoſe on the ridge of the back, all along, are raiſed into a ſort of ſharp prominence in their middle, like the ſcales of a crocodile; thoſe on the ſides are plain and flat. The belly is all along covered with oblong parallelogram ſcales laid tranſverſely; theſe are very bright and gloſſy, and yellow, ſpotted with black.

The head is ſmall, in proportion to the body, but the mouth is capable of opening to a prodigious width. The tongue is wholly like that of the viper, compoſed of two oblong portions, joined towards the baſes, but ſeparate as they approach the end. The teeth are of two kinds, the ſmaller ones deſigned for its eating with, the larger and longer for biting and poiſoning what it ſeizes. Theſe are only placed in the upper jaw; but all the teeth of the mouth are of the canine kind, as the creature, never chewing its prey, has no uſe for dentes molarels, or grinders.

The poiſonous teeth are ſituated on the outſide of the jaw, in the anterior part of the mouth, not fixed in the ſockets of the jaws, as the others, but fixed to two bones. Theſe, in their natural ſtate, are not viſible, even when the creature's mouth is opened, unleſs it be with an intent to wound; for they lie back under a membranaceous covering, and the creature has a power of erecting and wounding with them at pleaſure, as the lion and cat kind can retract or thruſt out their claws. The teeth are crooked, and have a hollow at their bottom; and, at their point, a very plain and evident ſlit, looking like the nib of a writing-pen. The teeth are hollow all the way, from this ſlit to their bottom; and, on preſſing the gums in a dead Rattle-ſnake, the poiſonous juice may be ſeen to aſcend, by degrees, up the teeth, and, at length, to be diſcharged out of the ſlit at the point. This makes it very plain in what manner the poiſon is conveyed into the fleſh, when the creature bites.

The rattle is affixed to the laſt vertebra of the tail, and is compoſed of a ſeries of ſmall bones; that next the tail is uſually of a bluiſh-grey colour, the reſt of a pale brown. Theſe bones are hollow, very thin, hard and dry, and of a brittle texture, and very ſonorous. They are all of the ſame figure, repreſenting, in ſome degree, the os ſacrum in the human ſkeleton, and all are nearly of the ſame ſize. The laſt of theſe is ſeen to have a rigid extremity, in manner of a tail; and all the others have the ſame, though it is not diſtinguiſhable in them, as, in the joining, it runs under two others; and, by means of this ſtructure, they are all moveable with the ſmalleſt force, and the ſound is the more vigorous, as each of theſe tails ſtrikes on two of the hollow joints, when put into motion. The age of the creature is known by the number of joints of this rattle, which are found to be from one to twenty, or more. The uſe of this ſeems not to be to the creature itſelf, but to other animals, that they may be alarmed at the approach of ſo terrible an enemy, and get out of its way in time. Piſo and ſome others affirm, that this rattle, put up a man's fundament, is as fatal a thing as the creature's bite. The power of doing miſchief, which nature has allotted to this animal, ſeems not only by its bite; but, according to the joint accounts of almoſt all authors, it appears to have a power of deſtroying, even by a look.

The charming or faſcination of the Rattle-ſnake, as this is uſually called, has exerciſed the wits of many naturaliſts in vain, and many have diſbelieved the fact. Sir Hans Sloane mitigates the matter, by ſuppoſing the creature firſt to ſeize or bite its prey, which it then ſuffers to eſcape, as far as the poiſon will let it, watching its death, that it may devour it without trouble: and that it is in this poiſoned ſtate that people have ſeen the ſquirrels, &c. dancing about before the Rattle-ſnake, and dying convulſed; all which they have attributed to the power of charming in the eye of the ſnake, not conceiving that it was the effect of the creature's having before bitten them. This, though a very plauſible account, yet, however, wants experience to confirm it, and the general teſtimony of people, who have ſeen the facts, makes againſt it.

The ſame author gives us, however, from Colonel Beverley, the whole proceſs of the charm. The Colonel acquaints us, that ſome company he was with once ſaw a hare, about half-grown, ſitting quietly in an orchard, and, ſtriking at her, ſhe only removed a few yards; when, wondering at the cauſe, they ſaw a Rattle-ſnake, at about ten feet diſtance, eyeing the hare as his deſtined prey. The poor creature was, by this time, in agonies and convulſions, often getting up on her legs, as if intending to run away, but always immediately falling down again; and, growing worſe and worſe, ſoon loſt the uſe of its hinder legs, and, panting vehemently, fell on its ſide. In about half an hour more, the hare ſeemed to have done with all ſtruggles, and to be dead; on which the ſnake uncoiled itſelf, and moved gently towards it, but, the poor hare ſtarting again, he ſtopped; but, when all was again quiet, he moved up to it, and, raiſing his head, looked all over his prey, his colours looking at that inſtant more beautiful than before, and his eyes ſparkling. The hinder part of the hare had been towards the ſnake all this time, and it had periſhed without much looking at its enemy. The ſnake wetted the body all over with his ſlaver; and then, with great difficulty, taking firſt the head into his mouth, ſwallowed that, and afterwards the whole body, ſucking it gently down, but not getting in the ſhoulders without much difficulty.

It is certain, upon the whole, that there is much in this account to favour Sir Hans Sloane's opinion of the hare's having been bitten, though that was not ſeen, ſince the convulſions, and loſs of the uſe of the hinder legs, ſeem a very natural effect of poiſon; but we are aſſured, by perſons who have been eye-witneſſes to the fact, that a bird, hopping about in all this agony and terror, has, on the frightening the Rattle-ſnake away, flown off without any difficulty: ſo that the whole ſeems not yet underſtood.

Rattle-*ſnake root.* See POLYGALA.

RA'VELIN (*Dict.*)—*Plate* XXXI, *fig.* 14, exhibits a plan of a ſquare work, with four Ravelins before the curtins.

RAY (*Dict.*)—It is from the circumſtances of Rays, that the ſeveral kinds of bodies are diſtinguiſhed in optics. A body, for inſtance, that diffuſes its own lights, or emits Rays of its own, is called a lucid, or luminous body.

If it only reflect Rays which it receives from another, it is called an illuminated body.

If it only tranſmit Rays, it is called a tranſparent body.

If it intercept the rays, or refuſe them paſſage, it is called an opake body.

Hence no body radiates, i. e. emits rays, unleſs it be either luminous or illuminated.

It is by means of Rays reflected from the ſeveral points of illumined objects to the eye, that they become viſible, and that viſion is performed; whence ſuch rays are called viſual Rays.

In effect we find that any point of an object is ſeen in all places to which a right line may be drawn from that point: but it is allowed, nothing can be ſeen without light, therefore every point of an object diffuſes innumerable Rays every way. Again, from other experiments it appears that the images of all objects, whence right lines may be drawn to the eye, are painted in the eye, behind the cryſtalline, very ſmall, but very diſtinct.

And laſtly, from other experiments, that each Ray carries with it the ſpecies, or image of the radiating point: and that the ſeveral Rays emitted from the ſame point are again united in one point, by the cryſtalline, and thus thrown on the retina. It is the ſpiſſitude, or cloſeneſs of the Rays emitted from a luminous body, that conſtitutes the intenſeneſs of the light. Yet the direction wherein the Rays ſtrike the eye, has a good ſway. In effect, a perpendicular Ray, ſtriking with more force than an oblique one, in the ratio of the whole ſine to the ſine of the angle of obliquity, as follows from the laws of percuſſion, a perpendicular Ray will affect the eye more vividly than an oblique one in that ratio.

If then the ſpiſſitude of the Rays be equal, the intenſity will be as the direction; if the direction be the ſame, the intenſeneſs will be as the ſpiſſitude. If both differ, the intenſeneſs will be in a ratio compounded of the direction and the ſpiſſitude.

Hence, firſt, If light be propagated in parallel Rays through an unreſiſting medium, its intenſity will not be varied by diſtance.

Secondly, If light be propagated in diverging rays through an unreſiſting medium, its intenſity will decreaſe in a duplicate ratio of the diſtances from the radiant point, reciprocally.

Thirdly, If light be propagated in converging Rays through an unreſiſting medium, its intenſity will increaſe in a duplicate ratio of the diſtances from the point of concourſe, reciprocally.

Fourthly, If the breadth of an illuminated plane be to the diſtance of the radiant point, as 1 to 2000000, it is the ſame thing as if the Rays ſtruck upon it parallel: and hence, ſince the diameter of the pupil of the eye, when largeſt, ſcarce exceeds half an inch; the Rays will fall upon it parallel, as to ſenſe, at the diſtance of 3860 Engliſh feet, which is nearly 6 furlongs.

The effect of concave lenſes, and convex mirrours, is to make parallel Rays diverge; converging Rays become parallel, and diverging Rays to become more divergent.

The effect of convex lenſes, and concave mirrours, is to make diverging Rays become parallel; parallel Rays become convergent, and converging Rays to converge the more.

The Rays of light are not homogeneous or ſimilar, but differ in all the properties we know of, viz. refrangibility, reflexibility, and colour.

It is probably from the different refrangibility, that the other differences have their riſe; at leaſt it appears, that thoſe Rays which agree or differ in this, do ſo in all the reſt.

Thus from the different ſenſations the differently diſpoſed Rays excite in us, we call them, red Rays, yellow Rays, &c.

RE, in grammar, &c. an inſeparable particle, or prepoſition, added at the beginning of words, to vary, double, or otherwiſe modify their meaning.

The modificative Re was firſt introduced by the Latins, from whom it is borrowed, into moſt of the modern tongues: Priſcian derives it from retro, backwards; others rather derive retro from Re; others derive Re from the Greek ῥεῖα, eaſy, or from ῥέω, I flow.

The effect of the Re is various: uſually it ſignifies again, rurſum, ἀνὰ; as in Re-join, Re-ſign, Re-ſume, Re-courſe, Rebound, Re-cite, Re-hear, Re-cogniſe, Re-compare, Re-double, Re-linquiſh, &c.

Sometimes it ſtands for contra, ἀντὶ, againſt, as in Re-luctance, Re-cumbent, Re-cline, &c.

Sometimes for ὑπὲρ, ſuper, over, as in Re-dundant; ſometimes for πόῤῥω, longe, far, as in Re-moving, &c.

REA'LGAR (*Dict.*)—Realgar is of two kinds, native and factitious: the native Realgar is dug out of the ſame mines with orpiment, reſembling cinnabar in colour, and ſmelling like ſulphur and garlic when burnt, and made up in ſolid brittle glebes. The factitious kind is made of orpiment melted and boiled for ſome time in ſubliming veſſels, by which the yellow flowers are raiſed to the upper part of the veſſels, and the maſs remaining at the bottom, being condenſed by cold, becomes of a red colour, like cinnabar, and is called Realgar; which, if it be expoſed to the free air for a long time, becomes covered with a ſaline efflorescence, This Realgar is not to be confounded with the factitious red arſenic.

Realgar is brought from China, in different figures; ſome of which reſemble the figures of little men called pagods; and I am of opinion that it is not cut into theſe figures, but caſt in moulds.

The correction of Realgar, firſt propoſed by Helmont, and afterwards publiſhed by Dallicot, firſt phyſician to the duke of Lorrain, which has been found ſucceſsful in many caſes, is this: put any quantity of Realgar, finely powdered, into a glaſs matraſs, and pour upon it as much of a ſtrong lixivium of tartar and nitre, as will ſwim four fingers breadth above the Realgar. Digeſt them in a ſand-heat for twenty-four hours, ſhaking the matraſs very often. Then pouring off, and preſerving the tincture, pour new lixivium upon the powder, and repeat the whole operation, till almoſt all the Realgar is diſſolved, ſome indiſſoluble metallic parts only remaining. Afterwards mix all the tinctures together, paſs them through cap-paper, and pour, at ſeveral times, as much vinegar of lead to the ſtrained liquor, as will precipitate all that can be ſeparated from it. Then pouring off the clear liquor from the precipitate by inclination, let the powder be waſhed with warm water till it becomes almoſt inſipid; and, when it is well dried, burn a ſufficient quantity of rectified ſpirit of wine upon it; and they calcine it with the tincture of opium extracted with ſpirit of wine. The powder, ſo prepared, is a gentle eſcharotic, of great ſervice in cancerous ſwellings. *Geoffroy.*

RE′ALISTS, Realistæ, a ſect of ſchool philoſophers, formed in oppoſition to the Nominaliſts.

Under the Realiſts are included the Scotiſts, Thomiſts, and all excepting the followers of Ocham.

Their diſtinguiſhing tenet is, that univerſals are realities, and have an actual exiſtence, out of an idea and imagination; or, as they expreſs it in the ſchool language, a parte rei: whereas the Nominaliſts contend that they exiſt only in the mind; and are only ideas, or manners of conceiving things.

Doctor Odo, or Oudart, a native of Orleans, afterwards abbot of St. Martin de Tournay, was the chief of the ſect of the Realiſts; he wrote three books of dialects; where, on the principles of Boethius and the ancients, he maintained that the object of that art is things, not words: whence the ſect took its riſe and name.

REA′SONING (*Dict.*)—The agreement or diſagreement of two ideas does not appear from the bare conſideration of the ideas themſelves, unleſs ſome third be called in, and compared either ſeparately or conjointly therewith: the act, then, whereby from ideas thus diſpoſed and compared, we judge this or that to be ſo or not ſo, is called Reaſoning.

Rohault defines Reaſoning to be a judgment depending on ſome antecedent judgment: thus, having judged that no even number can be compoſed of five uneven numbers; and that ten is an even number; to conclude that ten cannot be divided into five uneven parts, is a ratiocination, or Reaſoning.

This agrees with father Malebranche's doctrine, one of the great points whereof is, that Reaſoning, on the part of the underſtanding, is only a mere perceiving.

That ingenious author endeavours to ſhew, that as to the underſtanding, there is no difference between a ſimple perception, a judgment, and a Reaſoning, except in this, that the underſtanding perceives a ſimple thing without any relation to any thing elſe, by a ſimple perception.—That it perceives the relations between two or more things in a judgment.—And laſtly, that it perceives the relations that are between the relations of things in a Reaſoning. So that all the operations of the underſtanding are no more than mere perceptions.

Thus, for inſtance, when we conclude, that 4 being leſs than 6, twice 2, being equal to 4, are of conſequence leſs than 6; we do no more than perceive the relation of the inequality between the relation of twice two and four, and the relation of 4 and 6.

The manner of proceeding juſtly in Reaſoning, ſo as to arrive with the greater ſafety at the knowledge of truth, makes what we call method.

RECEI′VER (*Dict.*)—It is to be obſerved, that a very ſmall crack in the Receiver, uſed in pneumatical experiments, does not render them uſeleſs; for, upon evacuating the internal air, the external, preſſing the glaſs on all ſides, brings the edges of the glaſs cloſer together. But, in caſe of conſiderable flaws, a plaiſter may be applied, made of quick-lime finely powdered and nimbly ground, with a proper quantity of the ſcrapings of cheeſe, and water enough to bring the mixture to a ſoft paſte, which, when the ingredients are well incorporated, will have a ſtrong and fetid ſcent; and then it muſt be immediately ſpread upon a linen cloth, and applied, left it begin to harden. *Boyle's Works.*

RECLU′SE (*Dict.*)—The word is chiefly uſed for ſuch as thus impriſon themſelves out of devotion, to do penance.—It is ſometimes alſo applied to incontinent wives, whom their huſbands procure to be thus kept in a perpetual priſon in ſome convent.

Recluſes were anciently very numerous: they were then a kind of ſolitaries who ſhut themſelves up in ſome little cell, with a vow never to ſtir out of it.

None were admitted to this oath until they had given ſufficient proofs of their abſtinence, and had leave from the biſhop, or the abbot of the monaſtery where they were ſhut up: for the cells of the Recluſes were always to join to ſome monaſtery.

The prelate's permiſſion being obtained, they were tried for a year in the monaſtery; out of which, during that time, they never ſtirred.

They were then admitted to their vow of ſtability in the church before the biſhop; which being done, and the Recluſe entered his little cell, the biſhop ſet his ſeal on the door.

The cell was to be very ſmall, and very exactly cloſed.—The Recluſe was to have every thing within it neceſſary to life; and, even, if he were a prieſt, an oratory conſecrated by the biſhop, with a window which looked into the church, through which he might make his offerings at the maſs, hear the ſinging, ſing himſelf with the community, and anſwer thoſe who talked to him. But this window was to have curtains before it, both within-ſide and without; ſo that the Recluſe might neither ſee nor be ſeen.

Indeed he was allowed a little garden in his recluſion, to plant a few herbs and take freſh air: adjoining to his cell was that of his diſciples, which he was very rarely without; with a window, through which they ſerved him with neceſſaries, and received his inſtructions.

When it was judged proper to have two or three Recluſes together, their cells were made contiguous to each other, with windows of communication: if any woman would conſult them, or confeſs to them, it was to be in the church, and in the face of all the world.

Where there were two or three Recluſes together, they were never to hold any conference, but on ſpiritual matters; and to confeſs to each other: where there was but one, he was to confeſs and examine himſelf.

If the Recluſe fell ſick, his door was opened for people to come in and aſſiſt him; but he was not allowed to ſtir out on any pretence whatever.

Theſe articles are extracted from the rule, compiled for the Recluſes, by Grimlaic, a prieſt in the IXth century.

There were alſo women Recluſes, who led the ſame life, in proportion. St. Viborade lived a Recluſe at St. Gall, and was there martyred by the Hungarians in 825.

RECH *interni minores*, in anatomy the name of a muſcle which ariſes from the fore-part of the firſt vertebra of the neck, and is inſerted into the anterior appendix of the os occipitis.

RECTIFICA′TION (*Dict.*)—That the Rectification of ſpirits may, in all caſes, proceed with the greateſt exactneſs, a due regard to it muſt be had even from the firſt fermenting the ſubſtances from which they are to be made, and continued through all the ſtages of diſtillation, the low wines, proof ſpirit, and alcohol. The management of the fermented liquor, to this purpoſe, is principally the letting it ſtand to ſubſide after the fermentation is over, and the drawing it off clear and thin, not too rich for the ſtill. The ſtill is not to be over-filled with this. Great care muſt be taken to prevent its burning; and the faints that run laſt muſt be kept ſeparate, not mixed with the reſt of the liquor diſtilled, which is now called the low wines. In the rectifying theſe into proof ſpirit, great caution muſt be uſed that the fire be kept regular, not raiſed by ſudden ſtarts, which always throw up the oil in large quantities, which is to be left behind. In the ſucceeding Rectification of the proof ſpirit into alcohol, the ſame cautious management of the fire is neceſſary; and in both this, and the laſt, the faints are not to be ſuffered to run in among the ſpirit, but to be ſaved ſeparate. They may be all mixed together at laſt, and reduced to a ſpirit fit for burning in lamps; but the keeping them out of the rectified liquor will keep away the coarſeſt and moſt ſtinking part of the oil of the ingredients. By theſe eaſy means, without any additional trouble or charge, we might be furniſhed with a ſpirit greatly exceeding what we commonly meet with. And, in general, the art and myſtery of our ſellers of the ſeveral ſorts of Engliſh brandies ſeem to conſiſt in this prudent management, and in the adding a little of the oleum vini, or oil of wine lees, to the ſpirits thus procured pure: this gives the flavour of foreign brandies, and is ſo extenſive in its uſe, that half an ounce of it is ſufficient for a hogſhead of pure ſpirits.

Malt ſpirit is that which principally requires all this care in the Rectification, becauſe its oil is more nauſeous and offenſive than that of any other ſpirit; but all others will be greatly the better for being treated in the ſame manner; and it is indeed neceſſary that they ſhould for ſome particular uſes. It is remarkable, that no one method of combinatory Rectification, that is, of the Rectification performed by the means of ſalts, and other additions, is ſuited to all the ſeveral kinds of ſpirits; ſcarce indeed will any one way ſerve for any two ſpirits; but this method, by ſimple and careful diſtillation, is equally ſuited to all. Melaſſes ſpirit, cyder ſpirit, wine ſpirit, or brandy, rum, and arrac, are all improved by it, and all of them are then known to be perfectly rectified. When in the ſtate of alcohol, they not only prove totally inflammable in a little veſſel floating upon cold water, but, when poured into the pureſt ſpring water, they have not the leaſt power of making any change in it, nor leave any marks of oilineſs, or that unctuoſity, which, on the mixture of the leſs pure ſpirits, floats on the top, and in certain lights gives the rainbow colours. *Shaw's Eſſay on Diſtillery.*

RE′CTIFIER, in the diſtillery, the perſon whoſe employment it is to take the coarſe malt-ſpirit of the malt-ſtiller, and re-diſtil it to a finer and better liquor. The art of the Rectifier might be intirely ſet aſide, if the malt-ſtiller could make his ſpirit perfect at ſecond operation; which ſeems very practicable, if the malt-ſtillers could be got to forſake their old track. The great things to be recommended for the improvement of their art, would be firſt the brewing in perfection, and ſecondly the keeping their waſh after the manner of ſtale beer, till it has entirely loſt its malt flavour, and required a pungent acid vinoſity; and then thirdly leaving out the lees to diſtil with a well regulated fire. It is ſcarce to be thought how pure a ſpirit is to be obtained from malt this way; but the great art would be, the finding a way to make malt liquors artificially ſtale, bright, and of a fine flavour, though otherwiſe vinous. *Shaw's Lectures.*

RED, (*Dict.*)—To make a deep Red in glaſs, the following method is that moſt practiſed by the glaſs-men: take cryſtal frit twenty pounds, broken pieces of white glaſs one pound, calcined tin two pounds; mix theſe well together and put them into a pot to melt and purify; when theſe are melted, take ſteel calcined, ſcales of iron from the ſmith's anvil, both powdered very fine, of each an equal quantity; put leiſurely an ounce of this mixed powder to the beforementioned metal, mix all well together, and let them ſtand ſix or eight hours in fuſion, to incorporate; take out a proof after this, and, if there be too little of the powder, it will appear of a duſky yellow; then more of the powder muſt be added, and then add three quarters of an ounce of calcined braſs ground to a fine powder; mix them thoroughly together, and the maſs will be of a blood Red; continue ſtirring the whole together, and frequently taking out proofs of the colour; when it is right, work it immediately, otherwiſe it will loſe its colour and become black. The mouth of the pot muſt in this proceſs be left open, elſe the colour will be loſt. *Neri's Art of Glaſs.*

Blown Red, in the porcelain manufacture, a name given to a particularly coloured China ware of a ſpangled red, or to the colour alone that ſpangles it. It is an ornament eaſily introduced into uſe in our own manufactories of porcelain ware, and is done in the following manner: the colour is to be prepared of common copperas, calcined to a Red colour in a charcoal fire, in a crucible, with another luted on the top of it inverted, and with a hole in its bottom. The ſignal of the calcination being finiſhed, is, when the black clouds ceaſe to come up through the hole, and a fine white thin vapour ariſes in their place. The veſſels are to be then ſuffered to cool, and the Red matter in them is to be reduced to a fine powder. While the veſſels to be coloured with this are yet wet, the operator is to provide a glaſs pipe, and, covering one end of it with a piece of fine gawſe, he is to dip this into the powder, and taking it carefully out, with what little is ſticking to it, he is to blow againſt the veſſel at ſome diſtance from it: thus the fineſt part of the powder only will reach the veſſel, and will be laid on in form of glittering ſpangles, very ſmall, but all diſtinct. This is a ſort of colouring much eſteemed by the Chineſe themſelves, and they have a way of uſing the common blue in the ſame manner, but few of the veſſels, thus painted, come over to us. *Obſerv. de la Coutum. de l'Aſie.*

Red-*game*, an Engliſh name of a bird, common in the mountainous parts of Yorkſhire, and ſome other of our northern counties. It is of the ſhape of a partridge, but much larger, and of a mixed colour of red and black, and is feathered down to the ends of the toes.

Indian Red, a name uſed by the colourmen and painters, for a kind of purple ochre, brought from the iſland of Ormus, in the Perſian gulph, and uſed as a Red colour. It is called, among the authors on theſe ſubjects, terra Perſica. *Hill's Hiſt. of Foſſ.*

Red-*land*, in agriculture, a term much uſed by huſbandmen to expreſs a ſandy ſoil of a reddiſh hue, interſperſed for the moſt part with pieces of ſand ſtone of the ſame colour, or ſomewhat deeper.

There are ſeveral varieties of this ſoil, one of which is almoſt entirely made up of ſand; another with an admixture of clay with the ſand, the whole making a looſe loamy earth; and a third, full of fragments, of a poor ſandy iron ore, and often containing ſhining ſpecks of ſelenitæ. *Moreton's Northamp.*

Red-*ſhank*, in zoology, the name of a water bird, called by authors gallinula erythropus, and callidrys. It is about the ſize of the common plover. The back is of a greyiſh or browniſh green, uſually ſpotted with black; its neck grey, and its throat variegated with black and white; the breaſt is white, with a few looſe ſtreaks of black. The wing-feathers are variegated with black, brown, and white; the beak is two fingers breadth long, ſlender, and ſhaped like the beak of the woodcock; reddiſh at the baſe, and blackiſh lower down. Its legs are of a fine beautiful red, and the hinder toe is very ſhort and ſmall. *Ray's Ornithol.*

Red-*ſtart*, in zoology, the Engliſh name of the ruticilla, a very beautiful bird, with a white ſpot on his head and a very fine red tail.

Red-*weed*, in botany, a name given to a plant common in Bermudas, and ſome other places; and called by our firſt travellers to that part of the world the ſummer iſland Red-weed. Its berry is of a fine red colour, and affords a tincture little inferior to that of cochineal, and poſſeſſing all its virtues in medicine; the only misfortune of this, and ſome other very fine vegetable colours, is, that they fade ſoon. The juice of the fruit of the opuntia, or prickly pear, is as fine a dye as can be procured from the cochineal, but it will not ſtand; the inſect feeding on this, however, we find affords a colour of the ſame nature, that will ſtand. The fruit of the Red-weed is in the ſame manner liable to be eaten by inſects as that of the prickly pear, and it is worthy a trial, whether its colour, obtained at ſecond hand from thoſe inſects, will not ſtand as well as the cochineal does, and whether the inſects may not be propagated in a ſufficient abundance to ſerve the markets in the ſame manner. *Phil. Tranſ.* Nº. 40.

Red-*wing*, in zoology, the name of a bird of the turdus, or thruſh kind, called alſo in ſome places the wind-thruſh, or ſwine pipe, and by authors the turdus iliacus, or tylas. It is a little ſmaller than the common thruſh, and is leſs ſpotted. Its back, neck, and head are of the ſame colour with thoſe of the common thruſh; but its ſides, under the wings, and the feathers which line the wings, are of an orange colour, or duſky red; its belly and breaſt are whitiſh, and its throat yellowiſh, with brown ſpots; the wings are of a ſort of cheſnut colour, a little variegated. It feeds on inſects, as worms, and the like; and is a bird of paſſage, coming to us at the ſame time with the fieldfare, and leaving us alſo, when that bird does. It is not well known where they breed, though ſome have gueſſed it to be in the mountains of Germany and Bohemia. They have a bitteriſh taſte, and are leſs valued than the fieldfare. *Ray's Ornithol.*

RE'DDLE, the common Engliſh name for the ſubſtance called, in Latin, rubrica, and uſed in painting and for marking ſheep, &c. *Hill's Hiſt. of Foſſ.*

REDUCTION *of a figure* (*Dict.*)—The great uſe of the proportional compaſſes is in the Reduction of figures, &c. whence they are alſo called compaſſes of Reduction.

There are various methods of reducing figures, &c. the moſt eaſy is by means of the pentagraph or parallelogram; but this has its defects. The beſt and moſt uſual methods of Reduction are as follow:

To Reduce *a figure*: As ABCDE, (*Plate* XLII. *fig.* 1.) into a leſs compaſs: about the middle of the figure, as z, pitch on a point: and from this point draw lines to its ſeveral angles, A, B, C, &c. then drawing the line *a b*, parallel to A B, *b c* parallel to B C, &c. you will have the figure *a b c d e* ſimilar to A B C D E.

If the figure *a b c d e* had been required to be enlarged, there needed nothing but to produce the lines from the point beyond the angles, as z D, z C, &c. and to draw lines, viz. D C, D B, &c. parallel to the ſides *d c*, *d b*, &c.

To Reduce *a figure by the angle of proportion.* — Suppoſe the figure A B C D E (*fig.* 2.) required to be diminiſhed in the proportion of the line A B to *a b* (*fig.* 3.) Draw the indefinite line G H (*fig.* 4.) and from G to H ſet off the line A B: on G deſcribe the arch H I. Set off the line *a b* as a chord on H I, and draw G I. Then with the angle I G H you have all the meaſures of the figure to be drawn. Thus, to lay down the point *c*, take the interval B C, and upon the point G deſcribe the arch K L; alſo, on the point G deſcribe M N; and upon A with the diſtance M N deſcribe an arch cutting the preceding one in *c*, which will determine the ſide *b c*. And after the ſame manner are all the other ſides and angles to be deſcribed.—The ſame proceſs will alſo ſerve to enlarge the figure.

To Reduce *a figure by a ſcale.* — Meaſure all the ſides of the figure, e. gr. ABCDE (*fig.* 2.) by a ſcale, and lay down the ſame meaſures, reſpectively, from a ſmaller ſcale in the proportion required.

To Reduce *a map, deſign, or figure, by ſquares.*—Divide the original into little ſquares, and divide a freſh paper of the dimenſions required, into the ſame number of ſquares; which will be larger or leſs than the former, as the map is to be inlarged or diminiſhed.

This done, in every ſquare of the ſecond figure, draw what you find in its correſpondent one in the firſt.

Reduction *to the ecliptic*, in aſtronomy, is the difference between the argument of latitude, as N P (*Plate* XLII. *fig.* 5.) and an arch of the ecliptic N R, intercepted between the plane of a planet, and the node N.

To find the Reduction: the angle of inclination P N R, and the argument of latitude N P being given; find, by the doctrine of ſpherics, the arch N R: ſubtract N R and N P from each other, the remainder is the Reduction.

Reduction, in metallurgy, is the bringing back metalline ſubſtances, which have been changed into ſcoriæ or aſhes, or otherwiſe diveſted of their metallic form, into their natural and original ſtate of metals again. *Cramer's Art of Aſſaying.*

All metals and ſemi-metals may be reduced by proper management, whatever have been their changes, except only zink, which, having been burnt to aſhes, admits of no Reduction. But the mixture of gold and ſilver was never yet radically diſſolved by any experiment, whatever ſome may have imagined. Even ſome earths will turn into metal by the admixture and intimate union of a phlogiſton, or inflammable principle; but theſe metals never need any ſuch principle to aſſiſt their Reduction.

REFI'NERS.—This is a very curious as well as uſeful trade, by which, they not only purify gold and ſilver themſelves, but ſeparate the filings made by the ſeveral operators thereon, from all manner of filth, without which art a great deal would be loſt.

The work is none of the eaſieſt nor cleanlieſt, but there is good pay to the journeymen, who can get three or four ſhillings a day, and no want of ſufficient profit to the maſters, who are not many in number, and will not take an apprentice under ten pounds, (I mean to the bare labouring part) whoſe hours for working muſt be from ſix to eight.

Some of the maſter Refiners deal alſo largely in gold and ſilver, which they ſell out in ſmall parcels for the worker's uſe, by which trade many good eſtates have been obtained; but thoſe in this way ſhould have five hundred or a thouſand pounds to turn about, and ſome extend it to eight thouſand pounds, yet a ſet of utenſils, fit for a bare working Refiner, will not coſt above fifty pounds.

REFI'NING (*Dict.*) — Refining of copper is only performed by giving the mineral matter ſeveral lotions before the melting it, and then giving it ſeveral repeated fuſions.

Refining of tin is performed much after the ſame manner as that of copper.

Though we may diſtinguiſh two kinds of fineneſs of this metal: the one ariſing from its fuſion; that tin, taken firſt out of the furnace wherein it is melted, being always purer than that towards the bottom.

The other kind of fineneſs is that given the tin by adding ſome other metal or mineral to it, to render it more ſonorous, as well as brighter: ſuch is tin of antimony, pewter, &c.

Refining of iron, begins likewiſe by the melting it.

The greater degree of fuſion the mineral has, the more the metal is purified: but this firſt fuſion is not ſufficient.—To render the iron malleable, and fit to endure the file, it muſt be melted a ſecond time; then forged or beaten a long time with huge heavy hammers, wrought by water; then heated in the fire, and at laſt reduced, on the anvil, into bars of ſeveral thickneſſes.

The more the iron is heated in the fire, and the more it is beaten, whether hot or cold, the finer it becomes.

Steel is only iron refined to a great degree by heating it, with ſome other ingredients which cloſe up the pores, and ſoften the grain thereof.

Refining of lead, is performed, like that of moſt other imperfect metals, by frequent meltings, ſtill ſcumming it before it be cold, and caſting in tallow, and other kinds of fat.

They alſo make eſſays of lead; not to refine it, but to ſee if it be pure, and without mixture of any other metal.

Subterranean **RE'GION.**— The earth is not only divided on its ſurface into Regions and countries, but philoſophers, who have had occaſion to diſcourſe of its inner parts, have alſo divided them into three diſtinct Regions, according to their different depths from the ſurface. The temperature of the ſubterranean parts of the globe is diſtinguiſhed according to the diviſion of theſe Regions, but is not ſo regular and preciſe as ſome have ſuppoſed. The firſt Region of earth is very variable both as to bounds and temperature. The ſecond Region ſeems for the moſt part cold in compariſon of the other two; but in ſeveral places, which, by reaſon of their diſtance from the ſurface of the earth, it would be natural to call the middle Region, the temperature of the air is very different at the ſame ſeaſons of the year, which ſhews that it depends on ſomething more than bare depth from the ſurface. The third Region of the earth is univerſally obſerved to be warm, but by no means regularly, or uniformly: the ſame depth in ſome places giving only a moderate warmth, while in others it gives a very conſiderable heat. Borrichius tells us of a certain abbé fond of chemiſtry, and particularly curious in the matter of long digeſtions by regular heat, who found a way of making a furnace pepetually warm, by piercing the earth to a certain depth, and uſing the heat of this third Region of it. His method, we are told, was to bore a hole with a pike twenty feet deep, and pour into it ten or twelve pounds of quickſilver; this made its way into the ſtrata, and through them in a body into the chambers of heat in this third Region, where the heat, having a vent upwards made by this opening, never failed to aſcend in a perpetual and regular ſtream, and gave that regular digeſting heat that no artificial fire could equal. But this is an alchemical ſtory. *Boyle of Coſmical Qualities. Borrich. de Ortu Chem.*

REGLETS, *or riglets*, in printing, are thin rulers, or ſlips of wood of different dimenſions, placed in the chaſe, between the pages, and at the extremes thereof, to keep them aſunder and hold them tight.

The Reglets make the chief part of what they call the furniture of the chaſe.

They are particularly denominated from the place they hold in reſpect of the pages, head-ſticks, foot-ſticks, gutter-ſticks, &c.

The term Reglet is alſo uſed abroad for a ruler of metal, three quarters of an inch long, but which may be lengthened out by joining ſeveral together; uſed to ſeparate the columns, in books that have ſeveral in the ſame page; as alſo for lines to place the notes on in printing of muſic.

Reglet, is alſo uſed for a little thin ſlip of wood uſed by ſome compoſitors to take off the lines from the compoſing-ſtick, and place them on the galley, as faſt as compoſed.

RE'GULUS (*Dict.*) — To procure the Regulus, that is, the mercurial parts of metals, &c. flux powders are commonly uſed; as nitre, tartar, &c. which purge the ſulphurous part adhering to the metal, by attracting and abſorbing it to themſelves.

Regulus is principally uſed for that of antimony, which is a ponderous metallic powder, that, upon fuſing ſome of the mineral in its crude ſtate, ſinks to the bottom, leaving the ſcoria or impurities a-top.

The alchymiſts will have this matter called Regulus, i. e. little king, as being the firſt born of the royal metallic blood; which is really a ſon, but not a perfect man, i. e. not yet a perfect metal for want of time and proper nouriſhment.

Antimony, purified by ſimple fuſion, is called Regulus of antimony, or Regulus antimonii philoſophorum.—But the more common way of reducing it into a Regulus, is with the addition of flux powders, as tartar and nitre.

The ſcoria found at the top of this Regulus is violently emetic, as well as the Regulus itſelf, whereof if cups or drinking veſſels be caſt, the wine put into them will become vomitive.

Of this Regulus caſt in moulds are made thoſe commonly called the antimonial pills, weighing about eight or ten grains each, one of which, being ſwallowed, will operate conſiderably by vomit and ſtool.

Theſe pills having thus performed their office, and been diſcharged the body, will ſerve the ſame purpoſe again and again; whence they have obtained the name of perpetual pills.—The virtue of this Regulus is not however inexhauſtible, as has been imagined; for by repeated infuſions in wine, though the liquor be made violently emetic at firſt, yet by degrees it loſes its force, and at length ceaſes to be vomitive.

The ſeparation of the ſilver out of the Regulus, made from the ſilver ore by means of lead, is to be performed in this manner: put two coppels of the ſame bigneſs, perfectly dry, and capable of containing at leaſt one third more than the Regulus, under a muffle in an aſſay furnace; make a ſtrong fire, and let them be red-hot for a quarter of an hour; then free the Regulus from its ſcoriæ, by ſtriking it gently with a hammer, and put it carefully into one of the hot coppels, and into the other put, at the ſame time, the ſame quantity of granulated lead alone, as was uſed in making the Regulus. When the Regulus boils and ſmoaks, diminiſh the fire a little, and let the coppels be kept moderately, but not violently red-hot. When it has ſtood ſo long, that the ſkin of the litharge, continually produced from the lead, and covering the ſurface of the Regulus, diſappears, and the coppel ſhews the ſcoriæ only of the lead with the pure ſilver, either in fuſion, or hard and bright in the middle, let the coppel continue only a minute or two longer on the fire; then take it out with a pair of tongues, take away the metal in grains, and if any ſcoriæ, or fragment of the coppele adhere to it, wrap it together in a paper, and ſqueeſe it between the cheeks of a vice, or a pair of tongs, to break off that brittle matter without hurting the Regulus. If this Regulus be pure ſilver, it will now be very white; but, if it contain any gold, it will ſhew it by its yellowneſs.

To determine exactly how much ſilver the quantity of ore contained, weigh it nicely in a fine balance, and take out the ſmall reguline lumps from the other coppel, and, weighing that, deduct its weight from that of the other, becauſe ſo much ſilver that owes to the lead uſed in making it, and the remainder is the proportion of ſilver contained in the ore. *Cramer's Art of Aſſaying.*

Martial **Regulus** of antimony, is a mixture of little bits of iron, as the nails of horſe's ſhoes, melted with the Regulus.

In this operation the iron diſſolving and abſorbing the ſulphurous parts of the antimony, more ſtrongly than the fluxes in the former caſe, and turning it into a crocus; the antimony is hereby brought to a greater degree of purity, and rendered more efficacious than in the common Regulus.

The Regulus is ſometimes farther purified by repeated fuſions and detonations, with the addition of freſh antimony, and more nitre, alternately: in which caſe it becomes Regulus antimonii ſtellatus, or ſtarry Regulus of antimony.

Regulus *criſtatus*, the creſted or golden crown wren, the name of a very beautiful little bird, the ſmalleſt of the European birds. Its whole weight is not more than a drachm, and the crown of its head is adorned with a very beautiful ſaffron-coloured, or orange red ſpot, which is called its creſt, and by ſome its crown; and from this golden crown the bird has obtained the name of the Regulus, tyrannus, baſileus, and other appellations of royalty.

RE'LICS, *reliquiæ*, in the Romiſh church, certain remains of the bodies or cloaths of ſome ſaint or martyr, devoutly preſerved in honour to his memory, carried at proceſſions, kiſſed, revered, &c.

The abuſes in point of Relics are moſt flagrant: F. Mabillon, a Benedictin, complains of the great number of ſuſpected Relics expoſed on altars: he owns that, were there to be a ſtrict inquiſition into the Relics, vaſt numbers of ſpurious ones would be found offered every-where to the piety and devotion of the faithful; and adds, that bones are frequently conſecrated, ſo far from belonging to ſaints, that in all probability they do not belong to Chriſtians.

The catacombs are an inexhauſtible fund of Relics; yet it is ſtill diſputed who were the perſons interred therein.

In the eleventh century, a method was introduced of trying ſuppoſed Relics by fire.—Thoſe which did not conſume in the fire were reputed genuine; the reſt not.

It is an ancient cuſtom, which ſtill obtains, to preſerve the Relics in the altars whereon maſs is celebrated.—To this purpoſe, a ſquare hole is made in the middle of the altar, big enough to receive the hand; and herein is the Relic depoſited, wrapped in red ſilk, and incloſed in a leaden box.

The Romaniſts alledge a good deal of antiquity in behalf of their Relics.—The Manichees, it ſeems, out of hatred to the fleſh, which they held an evil principle, are recorded as refuſing to honour the Relics of ſaints; which is eſteemed a kind of proof that the catholics did it in the firſt ages.

Indeed folly and ſuperſtition got into religion but too early.—Even the touching of linen cloaths on Relics, from an opinion of ſome extraordinary virtue derived therefrom, appears to be as antient as the firſt ages; there being a hole made in the coffins of the forty martyrs at Conſtantinople, expreſly for this purpoſe.

RELI'GION (*Dict.*)— The following ſhort account of all the Religions profeſſed by the ſeveral nations, &c. of the known world, will, we preſume, be acceptable to the reader.

1. Religions of Europe.

Sweden. The Swedes are Proteſtants, of the ſect of the Lutherans. The goſpel was firſt planted in this country, A. D. 829.

Denmark. The Danes are likewiſe Lutherans, having embraced the reformation much about the ſame time with their neighbours the Swedes.

Norway. The religion of this country is the ſame with that of Denmark, excepting that, in the northermoſt parts of the kingdom, the knowledge of Chriſtianity is ſo greatly decayed, that the inhabitants, eſpecially the Laplanders, differ but little from mere heathens.

Ruſſia or Muſcovy. The Ruſſians are Chriſtians, according to the doctrines and diſcipline of the Greek church; which they pretend to obſerve in the greateſt purity; but, in truth, they have added thereto a great many ſuperſtitious practices and ridiculous ceremonies. They pay divine worſhip to the Virgin Mary, and the ſaints, and adore crucifixes. Chriſtianity was firſt planted in this country, about the end of the Xth century, by the preaching of ſome Greeks, ſent thither by the patriarch of Conſtantinople.

France. The only eſtabliſhed religion in this country is that of the Romiſh church. But, though the French receive all the deciſions of the council of Trent, in matters of faith; yet, in points of diſcipline and church-government, they claim certain privileges, called the rights of the Gallican church; which they never ſuffer to be infringed by any authority of the ſee of Rome.

Germany. The laws of the empire give free toleration to the exerciſe of three religions; namely, the Lutheran, Calviniſt, and Popiſh.

Hungary. The prevailing religion of this country is that of the Romiſh church, eſpecially ſince it is become ſubject to the emperor: however, the doctrines of Luther and Calvin are zealouſly maintained by multitudes of people.

Holland. No country in Europe can boaſt of more religions than Holland; where an univerſal toleration is granted to all ſects and parties; and this for the ſake of commerce. That publicly profeſſed, and generally received, is the reformed Religion, according to the doctrines of Calvin.

Flanders. This country, being partly ſubject to the empire, and partly to France, poſſeſſes the Romiſh Religion, and that in its groſſeſt errors.

Poland. The Polanders are, for the moſt part, Roman Catholics. Notwithſtanding which, a general toleration is here granted to all Religions; inſomuch that this country ſwarms with Greeks, Armenians, Lutherans, Socinians, Calviniſts, Jews, Quakers, &c. The Lutherans are moſtly found in Pruſſia. Chriſtianity was eſtabliſhed in various parts of Poland, at ſeveral times, and by ſeveral perſons; being ſettled in Poland, properly ſo called, in 963; in Livonia, an. 1200; and in Lithuania, not till the year 1386.

Spain. The Spaniards are the cloſeſt adherents to the church of Rome, in her groſſeſt errors and corruptions; and none are ſuffered to reſide in this kingdom, who profeſs any other belief. For this reaſon the king of Spain is ſtiled the Catholic king. Chriſtianity was firſt planted in Spain, according to an old Spaniſh tradition, by the apoſtle St. James, within four years after the death of Chriſt.

Portugal. The Portugueſe are of the ſame Religion with their neighbours, the Spaniards; with this difference, that they tolerate Jews, and allow ſeveral foreigners, particularly the Engliſh factory at Liſbon, the public exerciſe of their Religion. This country received the goſpel much about the ſame time.

Italy. The Italians, in general, are zealous profeſſors of the Romiſh Religion: indeed, Italy is the very center of popery. The Chriſtian faith was firſt preached in this country by St. Peter, who, it is ſaid, went thither about the beginning of the reign of the emperor Claudius. The beſt ſummary of the Romiſh faith is the creed of Pope Pius IV.

Greece. The eſtabliſhed Religion of this country, which is in ſubjection to the Turk, is Mohammediſm; but the Chriſtians, who are every-where tolerated in the Turkiſh dominions, are far more numerous in Greece, than the Mohammedans. The Religion of the Greek Chriſtians is a ſchiſm or ſeparation from the church of Rome, and conſiſts, principally, in denying the proceſſion of the Holy Ghoſt, purgatory, extreme unction, and confirmation; in adminiſtring the ſacraments in both kinds, and to children of ſeven years of age; and in rejecting the uſe of images. Their clergy, as well as laity, are exceedingly illiterate and ignorant. Chriſtianity was firſt preached in this country by St. Paul, the apoſtle of the Gentiles.

Little Tartary. The Crim-Tartars are, for the moſt part, zealous Mohammedans, excepting ſome few, who continue ſtill Pagans.

The Danubian Provinces. The inhabitants of theſe different provinces are very different in point of Religion, but reducible to three claſſes, viz. Jews, Chriſtians, and Mohammedans.

Scotland. The Religion of this northern part of Great-Britain is Preſbyterianiſm.

England. The church of England pretends to profeſs the reformed Religion, in its choiceſt purity. In reforming their Religion, the Engliſh were not ſo hurried by popular fury and faction, as other nations were; but proceeded in a more prudent, regular, and Chriſtian method, reſolving to ſeparate no farther from the church of Rome, than ſhe had departed from the truth. So that the reformed church of England is the true mean between ſuperſtition and fanaticiſm. Her doctrine is entirely built upon the apoſtles and prophets: her government is truly apoſtolical: her liturgy an extract of the beſt primitive forms; and her ceremonies few, and ſuch as tend only to decency and true devotion. All other ſects and parties, except the Romiſh, are here allowed the free exerciſe of their Religion.

Ireland. The inhabitants of this iſland are partly Papiſts, and partly Proteſtants. The moſt civiliſed parts of the kingdom profeſs the reformed Religion, according to the platform of the church of England. But the far greater part of the native Iriſh ſtill adhere to the Romiſh Religion.

2. Religions of Aſia and Africa.

Tartary. The inhabitants of this vaſt country are partly Pagans, partly Mohammedans, and partly Chriſtians. The Chriſtian faith, it is thought, was planted in this country by the apoſtles, St. Philip and St. Andrew.

China. The prevailing Religion in China is groſs idolatry; and, in ſome parts, the doctrines of Mohammed are profeſſed.

Mogul's empire. The inhabitants of this country are moſtly Pagans; and, next to Paganiſm, the Religion of Mohammed prevails.

The Peninſula of India, within the Ganges. The inhabitants of this tract of land are generally Mohammedans.

The Peninſula of India, beyond the Ganges. The inhabitants of this Peninſula are generally groſs Idolaters.

Perſia. The Perſians are ſtrict Mohammedans, but of the ſect of Ali. Chriſtianity was firſt planted in this kingdom by St. Thomas.

Natolia, or Aſia Minor. The eſtabliſhed Religion of this country is Mohammediſm; but perſons of all profeſſions are tolerated here, and in other parts of the Turkiſh dominions.

Arabia. The Religion of Mohammed is profeſſed in this country, where it took its firſt riſe; that impoſtor being born in Arabia.

Syria. The inhabitants of this part of Aſiatic Turkey are chiefly Mohammedans, with a mixture of Jews and Chriſtians, particularly Greeks, Armenians, and Marionites. Chriſtianity was planted here in the apoſtolic age.

Paleſtine. The inhabitants of this country are a mixture of Mohammedans, Jews, and Chriſtians, who follow their reſpective Religions. Chriſtianity was preached in this country by Chriſt himſelf, and his apoſtles.

The Euphratian provinces. The prevailing Religion in many parts of this country is that of the Armenians. Chriſtianity was planted here by St. Bartholomew the apoſtle.

Egypt, Barbary, Bildulgerid, Zaarah, or the Deſart; the Land of the Negroes: all Mohammedans or Pagans.

Guinea. Paganiſm is the Religion of this country, the profeſſion whereof is attended with many ridiculous ſuperſtitions. In ſome places, on the Gold coaſt, the diabolical cuſtom of human ſacrifices is ſtill in uſe.

Nubia. This ſpacious country was once Chriſtian, having received the goſpel in the earlieſt ages: but, for want of paſtors, the inhabitants fell off from Chriſtianity, and became either ſtrict Mohammedans or groſs Idolaters.

Ethiopia ſuperior, or Abyſſinia. This ſpacious empire contains a great mixture of people, as Pagans, Jews, and Mohammedans, of various nations; but the main body of the natives is Chriſtian.

Ethiopia inferior. The numerous inhabitants of theſe countries are groſs Idolaters.

From the foregoing view of the various Religions of the different countries of the world, it appears, that the Chriſtian Religion, undoubtedly the true Religion, is of a very ſmall extent, if compared with thoſe many and vaſt countries, overſpread with Idolatry or Mohammediſm. This great and ſad truth may be farther evinced by the following calculation, ingeniouſly made by ſome, who, dividing the inhabited world into thirty parts, find, that nineteen of them are poſſeſſed by groſs Idolaters; ſix by Jews and Mohammedans; two by Chriſtians of the Greek church; and three by thoſe of the church of Rome and Proteſtant communion. If this calculation be true, Chriſtianity, taken in its largeſt latitude, bears no greater proportion to the other falſe Religions, than that of five to twenty-five.

REMO'RA, *the ſucking fiſh*, in natural hiſtory, a ſmall oblong fiſh, whoſe body is of a cylindric figure, and tapers off to a thinneſs at the tail. Its mouth is triangular, and the upper part is ſhorter than its under. Its head is flat, and marked with ſtreaks, ſo as to look like the palates of ſome fiſhes: theſe run tranſverſely, and are carried on to the back, making a ſtriated ſubſtance of two fingers breadth, by which it faſtens itſelf to any other ſubſtance, as the body of a larger fiſh, the hulk of a ſhip, or the like. The eyes are ſmall and yellow, with a black pupil. It has no teeth, but in their places a multitude of ſmall prominences. It has two fins under the gills, and two more lower on the body. Beſides theſe, it has two longitudinal fins, one on the back, the other on the belly, running the length of the body to the tail. The whole fiſh is of a greyiſh colour, and it is caught in the Eaſt and Weſt-Indies, and in many other ſeas.

RE'NTAL, a roll wherein the rents of a manor are written and ſet down, and by which the lord's bailiff collects the ſame: it diſtinguiſhes the lands and tenements, and the names of the tenants, the ſeveral rents ariſing, and from what time, uſually a year. *Comp. Court-Keep.* 475.

RE'NTERING *, or FINE-DRAWING, in the manufactories, the ſewing of two pieces of cloth, edge to edge, without doubling them; ſo as that the ſeam ſcarce appears at all: hence alſo called fine-drawing.

* The word is formed from the French, *rentraire*, which ſignifies the ſame thing; and which Menage after Salmaſius derives from the Latin *retrahere* of *re*, in, and *trahere*, by reaſon the ſeam is drawn out of ſight and covered.

Serges, &c. are to be ſewed; cloths fine-drawn.—The author of one of the Lett. Edif. & Cur. ſpeaking of the great dexterity of the fine-drawers in the Eaſt-Indies, aſſures us, that if you tear a piece of fine muſlin, and give it one of them to mend, it ſhall be impoſſible for you to diſcover the place where it is rejoined, even though you had made a mark to know it by.

The dexterity of our own fine-drawers, though inferior to that above-mentioned, is nevertheleſs ſuch, as puts them in a condition to defraud the king, by ſewing a head or ſlip of Engliſh cloth on a piece of Dutch, Spaniſh, or other foreign cloth; or a ſlip of foreign cloth on a piece of Engliſh, ſo as to paſs the whole as of a piece; and by that means avoid the duties, penalties, &c.—The trick was diſcovered in France, by M. Savary, author of the *Diction. de Commerce.*

To renter in tapiſtry, is to work new warp into a piece of tapiſtry damaged, eaten by the rats, &c. and on this warp to reſtore the ancient pattern or deſign.—The warp is to be of woollen, not linen.—Among the titles of the French tapiſtry-makers, is included that of Renterers.

Fine-drawing is particularly uſed for a rent, or hole, happening in the dreſſing or preparing of a piece of cloth, artfully ſewed up or mended with ſilk.

All fine-drawings are reputed defects or blemiſhes, and ought to be allowed for in the price of the piece.—Hence, M. Savary eſtabliſhes is as a rule, which is certainly founded on natural equity, that every manufacturer mark the fine-drawings of his cloths with a piece of packthread tied to the liſt, to direct the draper to the ſpot: and that the draper apprize the taylor or other perſon, to whom he ſells it, of the ſame; that he may not come to damage in the cutting; there being inſtances of drapers condemned to take back their cloth, when cut to pieces, for omitting to mention the fine-drawings, and other flaws.

On this occaſion M. Savary extols the procedure of an Engliſh merchant, who ſending a piece of cloth damaged in one ſpot to his correſpondent at Paris, put a piece of gold in the damaged place, to make up the damage.—But as this example is perhaps the only one of its kind, that author recommends it to the merchant or draper to unfold all the pieces entirely, as they come to him; to diſcover the fine-drawings and other flaws, in order to make the clothier accountable for them.

RE-ORDINA'TION, the conferring orders a ſecond time. Re-ordination is practiſed in England when diſſenting miniſters conform to the church, the biſhops contending that they alone have right to confer holy orders, and that every prieſt or miniſter who does not receive their hands, has no lawful, regular vocation. This proves a great obſtacle to the re-union of thoſe miniſters to the church of England, many of whom are otherwiſe diſpoſed to conform; inaſmuch as Re-ordination implies their former vocation to be null; that they had adminiſtred the ſacraments without any right thereto; and that all their miniſterial acts were invalid.

REPE'LLENT *fluid*, a name given by Dr. Knight to a fluid which he ſuppoſes diſſeminated through the univerſe.

After proving that all the primary corpuſcles of bodies are compounded of attracting and repelling matter, and that the ſmalleſt corpuſcles in nature are ſuch as mutually repel each other, the Dr. adds, ' A ſufficient number of ſuch Repellent corpuſcles, collected together, will compoſe a fluid in all reſpects reſembling pure elementary air, at leaſt as far as we are able to judge from the known properties of that element. The common air, indeed, of our atmoſphere is a fluid far leſs ſimple and homogene than what is here ſuppoſed: it is rather a chaos of all the ſubſtances in nature, and is on that account capable of producing a great variety of phænomena, that can in no wiſe be aſcribed to ſo ſimple a cauſe. If therefore we would make a juſt compariſon between the common air and our repellent corpuſcles, we muſt ſuppoſe them alſo mixed with the ſame variety of other ſubſtances. Our Repellent fluid will be compreſſable and perfectly elaſtic, the diſtance of its particles will render it extremely rare and pellucid, and their diſtance and ſmallneſs together will make it exceed all other fluids in levity. If the air is really more elaſtic at different heights of the atmoſphere, we need only conceive its particles of different ſizes to account for it. The ſmalleſt, and conſequently the lighteſt, will have moſt elaſticity. Thoſe, by the laws of hydroſtatics, will riſe higheſt, and vice verſâ, the groſſeſt and leaſt elaſtic will occupy the loweſt part of the atmoſphere. *Knight's Attempt to demonſtrate that all the Phænomena in Nature may be explained by two ſimple and active Principles, Attraction and Repulſion.*

REPETE'ND, in arithmetic, is uſed for that part of an intermediate decimal fraction, which is continually repeated ad infinitum.

Thus, in the intermediate decimal fraction, 317.45 316 316 316 316, &c. the figures 316 are called the Repetend. *Cunn, Treat. of Fractions.*

Theſe Repetends often ariſe in the reduction of vulgar fractions to decimals; thus $\frac{1}{3} = 0.3333$, &c. $\frac{1}{7} = 0.142857$ 142857, &c. $\frac{1}{11} = 0.090909$, &c.

Single Repetend, is that where one figure only is repeated, as in 0.333, &c.

Compound Repetend, is that where two or more figures are repeated, as in 0. 09 09, &c. or in 0. 142857, 142857, &c.

Decimals with Repetends may always be reduced to vulgar fractions. For either the Repetend begins with the decimal or not:

If the Repetend begins with the firſt place of decimals, make it the numerator of a vulgar fraction, and make the denominator conſiſt of as many nines as the Repetend has figures, then will this vulgar fraction be equal to the decimal.

Thus, if the Repetend be ſingle, as in 0. 3333, the vulgar fraction equal to it will be $= \frac{3}{9} = \frac{1}{3}$. So, if the Repetend be compound, as in 0. 09, 09, &c. the equivalent vulgar fraction will be $\frac{09}{99} = \frac{9}{99} = \frac{1}{11}$.

And in like manner 0. 142857, 142857, &c. $= \frac{142857}{999999} = \frac{1}{7}$.

The reaſon is obvious from this conſideration, that the decimal 0. 333, &c. is $= \frac{3}{10} + \frac{3}{100} + \frac{3}{1000}$, &c. the ſum of which, by the rule mentioned under FRACTION in the Dictionary, will be equal to $\frac{3}{10}$ divided by $1 - \frac{1}{10} = \frac{3}{9} = \frac{1}{3}$, and ſo of the reſt.

If the Repetend does not begin with the firſt place of decimals, but ſome place farther on towards the right as in the decimal 0. 83333, &c. where the Repetend does not begin till the ſecond place of decimals, obſerve, that 0. 8333 +, &c. $= \frac{8}{10} + \frac{1}{10} \times \frac{3}{10} + \frac{3}{10} 2 +$, &c. But $\frac{3}{10} + \frac{3}{10} 2 +$, &c. $= \frac{3}{9} = \frac{1}{3}$, as before; therefore the propoſed decimal is $= \frac{8}{10} + \frac{1}{10} \times \frac{1}{3} = \frac{8}{10} + \frac{1}{30} = \frac{250}{300} = \frac{25}{30} = \frac{5}{6}$.

Thus, alſo, if the decimal 0. 2, 27, 27, &c. were propoſed, we ſhall find it $= \frac{2}{10} + \frac{1}{10} \times \frac{27}{100} + \frac{27}{100} 2 +$, &c. And, $\frac{27}{100} + \frac{27}{100} 2 +$, &c. being $= \frac{27}{99} = \frac{3}{11}$, the decimal will be $= \frac{2}{10} + \frac{1}{10} \times \frac{3}{11} = \frac{2}{10} + \frac{3}{100} = \frac{5}{22}$. The reaſon of which is obvious from what has been ſaid. It may perhaps be worth while to obſerve, that, if the numerator of a vulgar fraction be unity, and the denominator any prime number, except 2 and 5, the decimal equal to the propoſed fraction will always be a Repetend, beginning at the firſt place of decimals; and this Repetend muſt neceſſarily be a ſubmultiple, or an aliquot part of a number expreſſed by as many nines as the Repetend has figures; that is, if the Repetend have ſix figures, it will be a ſubmultiple of 999999; if four figures, it will be a ſubmultiple of 9999, &c. From whence it follows, that, if any prime number be called p, the ſeries 9999, &c. produced as far as is neceſſary, will always be diviſible by p, and the quotient will be the Repetend of the decimal fraction $= \frac{1}{p}$.

REPRESE'NTATIVE *power*, in metaphyſics, a term introduced by Leibnitz, to ſignify that power of the human ſoul, by which it repreſents to itſelf the univerſe, according to the ſituation of the body in the univerſe. See the article IDEA, in the Dictionary.

Wolfius calls this power vis repreſentativa, to denote its being an active power, or rather a force actually exerting itſelf. For he expreſly ſays, quod vis conſiſtat in continuo agendi conatu. And he thinks, that, from this principle of a vis repreſentativa, every phænomenon of the human mind may be accounted for. See his *Pſycholog. Ration. Art.* 529.

But it may be preſumed, that many will find this principle too obſcure to be admitted.

When it is ſaid, that our ideas are Repreſentative of things without us, or of the univerſe; it may be aſked in what ſenſe this is to be underſtood? Do they repreſent it 1°. as a picture does its original? or 2°. as an effect of a cauſe? or 3°. as a ſign repreſents the thing ſignified? The firſt opinion is exploded in part by Locke and the Carteſians, and totally by Dr. Berkeley, late biſhop of Cloyne. The ſecond is admitted by Hobbes, but denied by Leibnitz himſelf, and the idealiſts. The third ſhould ſeem to be the opinion of Leibnitz, but he is not ſufficiently explicit.

Dr. Berkeley admits ideas to be ſigns; but according to him they are arbitrary ſigns, depending on the immediate will of the Deity: hence the viſual language; and ideas only ſignify or ſuggeſt each other, and ſpirits; but not bodies, the exiſtence of which is totally unknown.

REPRODU'CTION (*Dict.*)—It is very well known, that trees and plants are to be raiſed from ſlips and cuttings, and ſome late obſervations have ſhewn, that there are ſome animals which have the ſame property.

The Polype was the firſt inſtance we had of this; but we had ſcarce time to wonder at the diſcovery Mr. Trembley had made, when Mr. Bonett diſcovered the ſame property in a ſpecies of water-worm.

Amongſt the plants that may be raiſed from cuttings, there are ſome which ſeem to poſſeſs this quality in ſo eminent a degree, that the ſmalleſt portion of them will become a complete tree again.

It deſerves enquiry, whether or not the great author of nature, when he ordained that certain inſects, as theſe polypes and worms, ſhould reſemble thoſe plants in that particular, allowed them this power of being reproduced in the ſame degree ; or, which is the ſame thing, whether this Reproduction will or will not take place in whatever part the worm is cut : in order to try this Mr. Bonett entered on a courſe of many experiments on the water-worms which have this property. Theſe are, at their common growth, from two to three inches long, and of a browniſh colour, with a caſt of reddiſh. From one of theſe worms he cut off the head and tail, taking from each extremity only a ſmall piece of the twelfth of an inch in length, but neither of theſe pieces were able to reproduce what was wanting. They both periſhed in about twenty-four hours ; the tail firſt, and afterwards the head. As to the body of the worm from which theſe pieces were ſeparated, it lived as well as before, and ſeemed indeed to ſuffer nothing by the loſs, the head-part being immediately uſed as if the head was thereon, boring the creature's way into the mud. There are, beſides this, two other points in which the Reproduction will not take place ; the one of theſe is about the fifth or ſixth rim from the head, and the other the ſame diſtance from the tail ; in all probability the condition of the great artery in theſe parts is the cauſe of this.

What is ſaid of the want of the reproductive power of theſe parts, relates only to the head and tail ends ; for as to the body, it feels very little inconvenience from the loſs of what is taken off, and very ſpeedily reproduces thoſe parts. Where then does the principle of life reſide in ſuch worms, which, after having their heads cut off, will have, not only the ſame motions, but even the inclinations, that they had before ; and yet this difficulty is very ſmall, compared to ſeveral others, which at the ſame time offer themſelves to our reaſon ? Is this wonderful Reproduction of parts only a natural conſequence of the laws of motion, are there lodged in the body of the creature a chain of minute buds or ſhoots, a ſort of little embryos already formed and placed in ſuch parts where the Reproductions are to begin ? Are theſe worms only mere machines, or are they, like more perfect animals, a ſort of compound, the ſprings of whoſe motions are actuated or regulated by a ſort of ſoul ? And, if they have themſelves ſuch a principle, how is it that this principle is multiplied and is found in every ſeparate piece ? Is it to be granted, that there are in theſe worms not a ſingle ſoul (if it is to be ſo called) in each, but that each contains as many ſouls as there are pieces capable of reproducing perfect animals ? Are we to believe with Malpighi, that theſe ſorts of worms are all heart and brain from one end to the other ? This may be, but yet, if we knew that it was ſo, we ſhould know, in reality, but very little the more for knowing it ; and it ſeems after all, that, in caſes of this kind, we are only to admire the works of the great Creator, and ſit down in ſilence.

The nice ſenſe of feeling in ſpiders has been much talked of by naturaliſts ; but it appears, that theſe worms have yet ſomewhat more ſurpriſing in them in regard to this particular. If a piece of ſtick, or any other ſubſtance, be brought near them, they do not ſtay for its touching them, but begin to leap and friſk about, as ſoon as it comes towards them. There want however ſome farther experiments to aſcertain whether this be really owing to feeling or to ſight ; for, though we can diſcover no diſtinct organs of ſight in theſe creatures, yet they ſeem affected by the light of the ſun or a candle, and always friſk about it in the ſame manner, at the approach of either ; nay, even the moon-light has ſome effect upon them.

A twig of willow, poplar, or many other trees, being planted in the earth, takes root, and becomes a tree, every piece of which will in the ſame manner produce other trees. The caſe is the ſame with theſe worms ; they are cut to pieces, and their ſeveral pieces become perfect animals ; and each of theſe may be again cut into a number of pieces, each of which will in the ſame manner produce an animal. It had been ſuppoſed by ſome, that theſe worms were oviparous ; but Mr. Bonett, on cutting one of them to pieces, having obſerved a ſlender ſubſtance reſembling a ſmall filament to move at the end of one of the pieces, ſeparated it, and, on examining it with glaſſes, found it to be a perfect worm of the ſame form with its parent, which lived and grew larger in a veſſel of water into which he put it. Theſe ſmall worms are eaſily divided, and very readily complete themſelves again, a day uſually ſerving for the production of a head to the part that wants one, and in general, the ſmaller and the ſlenderer the worms are, the ſooner they complete themſelves after this operation. When the bodies of the large worms are examined by the microſcope, it is very eaſy to ſee the appearance of the young worms alive and moving about within them ; but it requires great preciſion and exactneſs to be certain of this ; ſince the ramifications of the great artery have very much the appearance of young worms, and they are kept in a ſort of continual motion by the ſyſtoles and diaſtoles of the ſeveral portions of the artery which ſerve as ſo many hearts. It is very certain, that what we force in regard to theſe animals by our operations, is done alſo naturally every day, in the brooks and ditches where they live. A curious obſerver will find in theſe places many of them without heads or tails, and ſome without either ; as alſo other fragments of various kinds, all which are then in the act of completing themſelves ; but whether accidents have reduced them to this ſtate, or they thus purpoſely throw off parts of their own body for the Reproduction of more animals, is not eaſy to determine. They are plainly liable to many accidents, by which they loſe the ſeveral parts of their body, and muſt periſh very early, if they had not a power of reproducing what was loſt ; they are often broken into two pieces, by the reſiſtance of ſome hard piece of mud, which they enter ; and they are ſubject to a diſeaſe, a kind of grangrene rotting off the ſeveral parts of their bodies, and muſt inevitably periſh by it, had they not this ſurpriſing property.

This worm was a ſecond inſtance, after the polype, of the ſurpriſing power in an animal of recovering its moſt eſſential parts, when loſt ; but nature does not ſeem to have limited her beneficence in this reſpect to theſe two creatures ; Mr. Bonett tried the ſame experiments on another ſpecies of water-worms differing from the former in being much thicker : This worm, when divided in the ſummer ſeaſon, very often ſhews the ſame property ; for, if it be cut into three or four pieces, the pieces will lie like dead for a long time, but afterwards, will move about again, and will be found in this ſtate of reſt to have recovered a head, or a tail, or both. After recovering their parts, they move very little, and, according to this gentleman's experiments, ſeldom live more than a month. It ſhould ſeem that the more difficult ſucceſs of this laſt kind of worm, after cutting, and the long time it takes to recover the loſt parts, if it do recover them at all, is owing to its thickneſs ; ſince we always find, in that ſpecies of worms which ſucceeds beſt of all, that thoſe which are thinneſt always recover their parts much ſooner than the others.

The water inſects, alſo, are not the only creatures which have this power of recovering their loſt parts. The earth affords us ſome already to grow in this manner from their cuttings, and theſe not leſs deſerving our admiration than thoſe of the water ; the common earth-worms are of this kind. Some of theſe worms have been divided into two, others into three or four pieces, and ſome of theſe pieces, after having paſſed two or three months without any appearance of life or motion, have then begun to reproduce a head, or a tail, or both. The Reproduction of the anus, after ſuch a ſtate of reſt, is no long work ; a few days does it, but it is otherwiſe with the head, that does not ſeem to perform its functions in the divided pieces, till about ſeven months after the ſeparation. It is to be obſerved that, in all theſe operations, both on earth and water-worms, the hinder part ſuffers greatly more than the fore-part in the cutting, for it always twiſts itſelf about a long time, as, if actuated by ſtrong convulſions ; whereas the head uſually crawls away without the appearance of any great uneaſineſs.

REPU'LSION (*Dict.*) — The learned Dr. Knight obſerves that we have ſufficient evidence of the exiſtence of Repulſion from facts and experience. ' For, ſays he, all bodies are electrical, or capable of being made ſo : and electrical bodies both attract and repel. Secondly, both attraction and Repulſion are very conſpicuous in all magnetical bodies. Thirdly, Sir Iſaac has ſhewn from experiment, that the ſurfaces of two convex glaſſes repel each other. Fourthly, the ſame great philoſopher has explained the elaſticity of the air by ſuppoſing its particles mutually to repel. Fifthly, the particles of light are, in part at leaſt, repelled from the ſurface of all bodies. Laſtly, it ſeems highly probable that the particles of light mutually repel each other. The air is always rarified by heat ; and that in a greater proportion, as the heat is more intenſe. What then muſt that rarefaction be in the focus of Villette's ſpeculum ? Perhaps a more perfect vacuum would not be produced by the beſt air-pumps. But ſuppoſe half the air ſtill remaining, its expanſive force will be equal to a column of mercury of fifteen inches in height ; whoſe baſis will be equal to an imaginary ſurface ſurrounding the whole focal ſpace. But the atmoſphere will preſs with a force equal to a column of the ſame baſe, and thirty inches in height. What is it that ſupports this extraordinary weight ? A Carteſian will tell us perhaps, that there is no vacuum at all : but that the air is drove out of its place by the ſubtile matter ; which being moved with great rapidity by the matter of the firſt element, i. e. light, and whirled round in a vortex, by its centrifugal force is determined every way to fly off, and ſo counter-acts the preſſure of the air. But how can light, which moves, in this caſe, all of it in one direction, communicate a motion to the ſubtile matter ſo, that it ſhall act in all directions ? Another difficulty ariſes from a defect in the momentum of light : which being ſuppoſed the primum mobile, ought to act with a force equal to ſeveral pounds of mercury. Now as all theſe difficulties vaniſh, if we only admit a Repulſion betwixt the particles of light themſelves, and betwixt them and air, we can have no reaſon to doubt of the fact, eſpecially ſince it is plain, from the arguments above, that there is ſuch a cauſe as Repulſion in nature. ‘ For no cauſe ought to be admitted, but what is really found in nature, and no more than are neceſſary towards explaining the ſeveral phænomena’.

RESPIRATION (*Dict.*)—The alternate motion of the thorax and lungs in Reſpiration is evident, but it is not eaſy to determine the mechaniſm by which theſe motions are performed. Dr. Martin thinks this has not been accounted for in a ſatiſfactory manner, either by Swammerdam, Porelli, Baglivi, Pitcairn, or Boerhaave, and has given us an eſſay on this ſubject in the *Medic. Eſſ. Edinb.* Vol. I. *Art.* 12.

Dr. Hoadley endeavours to prove, that the external intercoſtal muſcles ſerve for inſpiration, while the internal intercoſtals are their antagoniſts, depreſſing their ribs in expiration. He thinks it proved by Dr. Hale's experiments, that there is air in the cavity of the thorax, between the lungs and the pleura, and endeavours to take off the force of Dr. Houſton's aſſerting that he ſaw the lungs and pleura contiguous. He grants, however, that ſometimes there may be little or no air. He accounts for Reſpiration much in the ſame way with thoſe who aſſume the contiguity of the lungs and pleura. He joins with thoſe who think the impetus, which the internal ſurface of the lungs ſuſtains in common Reſpiration, to be very little. The uſes of Reſpiration are, to diſcharge, from the venal blood and chyle, ſuch parts as are unfit to render them arterial blood, and to admit air into the blood. From this doctrine he accounts for the phænomena of the diſeaſes of the lungs. He ſubjoins the picture and deſcription of an ingenious inſtrument for illuſtrating the manner in which Reſpiration is performed.

Organs of RESPIRATION, *in fly-worms.* — Theſe afford us not only great matter of admiration in their general ſtructure, but, by their almoſt endleſs variety in the different ſpecies of theſe creatures, give ample room for the forming claſſes and genera from them.

The firſt claſs of theſe creatures is of thoſe with variable heads, whoſe organs of Reſpiration are principally behind, the large ſenſible ſtigmata, or breathing-holes, being placed there ; and which have no ſcaly legs, nor any regularly formed membranaceous ones ; and which have, under their belly, certain fleſhy protuberances, each ſeeming a portion of a ring, which is inflated at certain times.

Theſe are the characters common to a vaſt claſs of theſe creatures, which are transformed into two-winged flies ; but ſeem never to be the marks of thoſe which are produced from the eggs of the four-winged claſs. *Reaumur's Hiſt. Inſect.*

RESISTENCE (*Dict.*)— Reſiſtence of a globe, perfectly hard and in a medium, whoſe particles are ſo too ; is to the force wherewith the whole motion may either be deſtroyed or generated which it has at the time, when it has deſcribed four thirds of its diameter, as the denſity of the medium to the denſity of the globe.— Hence alſo, infers Sir Iſaac Newton that the Reſiſtence of a globe is, cæteris paribus, in a duplicate ratio of its velocity. Or its Reſiſtence is cæteris paribus, in a duplicate ratio of its diameter. Or, cæteris paribus, as the denſity of the medium. Laſtly, that the actual Reſiſtence of a globe is in a ratio compounded of the duplicate ratio of the velocity, and of the duplicate ratio of the diameter, and of the ratio of the denſity of the medium.

In theſe articles, the medium is ſuppoſed to be diſcontinuous, as air probably is ; if the medium be continuous, as water, mercury, &c. where the globe does not ſtrike immediately on all the particles of the fluid generating the Reſiſtence, but only on thoſe next it, and thoſe again on others, &c. the Reſiſtence will be leſs by half. And a globe in ſuch a medium undergoes a Reſiſtence which is to the force wherewith the whole motion it has, after deſcribing eight thirds of its diameter, might be generated or taken away, as the denſity of the medium to the denſity of the globe.

RESISTENCE *of a cylinder* moving in the direction of its axis, is not altered by any augmentation or diminution of its length, and therefore is the ſame with that of a circle of the ſame diameter moving with the ſame velocity in a right line perpendicular to its plane.

The Reſiſtence of a cylinder moving in an infinite unelaſtic fluid, ariſing from the magnitude of a tranſverſe ſection, is to the force wherewith its whole motion, while it deſcribes four times its length, may be taken away or generated, as the denſity of the medium to that of the cylinder, very nearly.

Hence, the Reſiſtences of cylinders moving length-wiſe, in infinitely continued mediums, are in a ratio compounded of the duplicate ratio of their diameters, the duplicate ratio of their velocities, and the ratio of the denſity of the mediums.

The Reſiſtence of a globe in an infinite unelaſtic medium is to the force whereby its whole motion, while it deſcribes eight thirds of its diameter, might be either generated or taken away, as the denſity of the fluids to the denſity of the globe, quam proximè.

Mr. James Bernoulli demonſtrates the following theorems.

RESISTENCE *of a triangle.*— If an iſoſceles triangle be moved in a fluid according to the direction of a line perpendicular to its baſe ; firſt, with the vertex foremoſt, and then with its baſe ; the Reſiſtence will be as the legs, and as the ſquare of the baſe, and as the ſum of the legs.

The RESISTENCE *of a ſquare* moved according to the direction of its ſide, and of its diagonal, is as the diagonal to the ſide.

The RESISTENCE *of a circular ſegment*, leſs than a ſemicircle carried in a direction perpendicular to its baſis, when it goes with the baſe foremoſt, and when with its vertex foremoſt (the ſame direction and celerity continuing ;) is as the ſquare of the diameter, to the ſame, leſs one third of the ſquare of the baſe of the ſegment. — Hence, the Reſiſtences of a ſemicircle, when its baſe and when its vertex go foremoſt, are to one another in a ſeſquialterate ratio.

RESISTENCE *of a parabola.*—A parabola moving in the direction of its axis, firſt with its baſis, and then its vertex foremoſt, has its Reſiſtences as the tangent to an arch of a circle, whoſe diameter is equal to the parameter, and the tangent equal to half the baſis of the parabola.

The Reſiſtence, if the vertex go foremoſt, may be thus computed :—Say as the ſum (or difference) of the tranſverſe axis, and latus rectum, is to the tranſverſe axis ; ſo is the ſquare of the latus rectum to the ſquare of the diameter of a certain circle, in which circle apply a tangent equal to half the baſis of the hyperbola or ellipſis. — Then ſay again, as the ſum (or difference) of the axis and parameter, is to the parameter ; ſo is the aforeſaid tangent to another right line. And farther, as the ſum (or difference) of the axis and parameter is to the axis ; ſo is the circular arch, correſponding to the aforeſaid tangent, to another arch. This done, the Reſiſtences will be as the tangent to the ſum (or difference) of the right line thus found, and the arch laſt mentioned.

In the general, the Reſiſtences of any figure whatever, going now with its baſe foremoſt, and then with its vertex, are as the figures of the baſe to the ſum of all the cubes of the element of the baſe, divided by the ſquares of the element of the curve line.

All which rules may be of uſe in the conſtruction of ſhips, and in perfecting the art of navigation univerſally : as alſo for determining the figures of the balls of pendulums for clocks, &c.

REST (*Dict.*)—Reſt is either abſolute or relative as place is.

Some define Reſt, the ſtate of a thing without motion ; and hence, again, Reſt becomes either abſolute or relative, as motion is.

Sir Iſaac Newton defines true or abſolute Reſt to be the continuance of a body in the ſame part of abſolute and immoveable ſpace : and relative Reſt to be the continuance of a body in the ſame part of relative ſpace.

Thus, in a ſhip under ſail, relative Reſt is the continuance of a body in the ſame region of the ſhip, or the ſame part of its cavity.— True or abſolute Reſt is its continuance in the ſame part of univerſal ſpace, wherein the ſhip with its cavity and contents are all contained.

Hence, if the earth be really and abſolutely at Reſt, the body, relatively at Reſt in the ſhip, will really and abſolutely move ; and that with the velocity wherewith the veſſel moves. — But, if the earth do likewiſe move, there will then ariſe a real and abſolute motion of the body at Reſt, partly from the real motion of the earth in abſolute ſpace, and partly from the relative motion of the ſhip on the ſea.—Laſtly, if the body be likewiſe relatively moved in the ſhip, its real motion will ariſe partly from the real motion of the earth in immoveable ſpace, and partly from the relative motion of the ſhip on the ſea, and o the body in the ſhip.

Thus, if that part of the earth where the ſhip is, move eaſtward with a velocity of 10010 parts ; and the veſſel be carried by the winds weſtward ten parts ; and at the ſame time a ſeaman aboard walk with a velocity of one part : the ſeaman will be moved really and abſolutely in immoveable ſpace eaſtwards with 10001 parts of velocity ; and relatively on the earth, with nine parts of velocity weſtwards.

It is an axiom in philoſophy, that matter is indifferent as to Reſt, or motion.—Hence, Sir Iſaac Newton lays it down as a law of nature, that every body perſeveres in its ſtate either of Reſt, or uniform motion, except ſo far as it is diſturbed by external cauſes.

The Carteſians will have firmneſs, hardneſs, or ſolidity of bodies to conſiſt in this, that their parts are at Reſt, with regard to each other : and this Reſt they eſtabliſh as the great nexus, or principle of coheſion, whereby the parts are connected together.

Fluidity, they add, conſiſts in a perpetual motion of the parts, &c.—But the Newtonian philoſophy furniſhes us with much better ſolutions.

REST *in muſic* (*Dict.*)—Reſts are ſometimes uſed in melody, that is, in muſic of a ſingle part, to expreſs ſome ſimple paſſion, or even for variety ſake ; but more frequently in harmony, or compoſitions of ſeveral parts, for the ſake of the pleaſure of hearing one part move on while another reſts ; and this interchangeably.

Reſts are either for a whole bar, or more than a bar, or but for a part of a bar. When the Reſt is for a part, it is expreſſed by certain ſigns correſponding to the quantity of certain notes of time ; as minim, crotchet, &c. and is accordingly called minim Reſt, crotchet Reſt, &c.

The characters or figures, whereof, ſee under CHARACTERS of muſic in the Dictionary ; where the notes and correſponding Reſts are found together.

When any one of thoſe characters occurs either on a line or ſpace, that part is always ſilent for the time of a minim, or crotchet, &c. — Sometimes a Reſt is for a crotchet and quaver together; or for other quantities of time, for which there is no particular note: in which caſe the ſigns of ſilence are not many Reſts, but ſuch ſilence is expreſſed by placing together as if multiplied, as many as make up the deſigned Reſt. When the Reſt is for a whole bar, the ſemibreve Reſt is always uſed. —If the Reſt be for two meaſures, it is marked by a line drawn a-croſs a whole ſpace.—For three meaſures it is drawn a-croſs a ſpace and a half; and for four meaſures a-croſs two ſpaces. But, to prevent ambiguity, the number of bars is uſually writ over the ſign.

Some of the more ancient writers in muſic make theſe Reſts of different value in different ſpecies of time.— For inſtance, the character of a minim Reſt, in common time, ſay they, expreſſes the Reſt of three crotches in triple time; in that of the triples $\frac{6}{8}$, $\frac{6}{16}$, $\frac{12}{8}$, $\frac{12}{16}$, it always marks an half meaſure, how different ſoever theſe may be among themſelves.

They add that the Reſt of a crotchet in common time is a Reſt of three quavers in the triple $\frac{9}{8}$; and that the quaver Reſt of common time is equal to three ſemi-quavers in the triple $\frac{9}{16}$. But this variety in the uſe of the ſame character is now laid aſide.

RETI'CULA, Reticule, in aſtronomy, a contrivance for the exact meaſuring the quantity of eclipſes, introduced about fifty years ago by the royal academy of Paris.

The Reticule is a little frame, conſiſting of thirteen fine ſilken threads, equidiſtant from each other, and parallel; placed in the focus of object-glaſſes of teleſcopes; that is, in the place where the image of the luminary is painted, in its full extent. —Of conſequence, therefore, the diameter of the ſun or moon is hereby ſeen divided into twelve equal parts or digits; ſo that, to find the quantity of the eclipſe, there is nothing to do but to number the luminous and the dark parts.

As a ſquare Reticule is only proper for the diameter, not for the circumference of the luminary; it is ſometimes made circular, by drawing ſix concentric equi-diſtant circles, which repreſents the phaſes of the eclipſe perfectly.

But it is evident that the Reticule, whether ſquare or circular, ought to be perfectly equal to the diameter or circumference of the ſtar, ſuch as it appears in the focus of the glaſs; otherwiſe the diviſion cannot be juſt.

Now this is no eaſy matter to effect, by reaſon the apparent diameters of the ſun and moon differ in each eclipſe; nay that of the moon differs from itſelf in the progreſs of the ſame eclipſe.

Another imperfection in the Reticule is, that its bigneſs is determined by that of the image in the focus, and of conſequence will only fit one certain magnitude.

But M. de la Hire has found a remedy for all theſe inconveniences, and contrived that the ſame Reticule ſhall ſerve for all teleſcopes, and all altitudes of the luminary in the ſame eclipſe. —The principle whereon his invention ſtands, is, that two object-glaſſes applied againſt each other, having a common focus, and there forming an image of a certain magnitude; this image will increaſe in proportion as the diſtance between the two glaſſes is increaſed, as far as a certain limit.

If then a Reticule be taken of ſuch a magnitude as juſt to comprehend the greateſt diameter the ſun or moon can ever have in the common focus of two object-glaſſes applied to each other; there needs nothing but to remove them from each other, as the ſtar comes to have a leſs diameter, to have the image ſtill exactly comprehended in the ſame Reticule.

Another improvement is, that whereas the ſilken threads are ſubject to ſwerve from the paralleliſm, &c. by the different temperature of the air; a Reticule may be made of a thin looking-glaſs, by drawing lines or circles thereon, with the fine point of a diamond; which ſhall be ſafe from any alteration of the air.

RE'TINA (*Dict.*)—The Retina is liable to two ſorts of diſeaſes; the firſt is a ſeparation of ſome parts of this membrane from the choroides. At the place where this ſeparation is made, there follows an elevation or fold, which ſtops the light, and hinders its paſſage to that part of the choroides which is covered by this fold; this occaſions a ſort of a ſhade, which the patients ſee in the air. The ſecond diſeaſe of the Retina is an atrophy or waſting of that membrane.

The cauſe of the firſt diſeaſe may, with a great ſhew of reaſon, be thus accounted for, that the blood-veſſels of the Retina become various; for it is eaſily conceived that the dilatation of theſe veſſels may ſeparate the Retina from the choroides, in that part which anſwers the dilated veſſels. I have always obſerved this diſeaſe to proceed from a cold in the head, after ſome violent exerciſe, or whatever elſe may have put the blood into a violent motion. Hence, I infer, that the external cold, by obſtructing the pores of the ſkin, has ſtopped the perſpiration of ſome part of the humours rarefied in the blood-veſſels, on the ſurface of the Retina; which, from the fineneſs of its texture, is damaged by this infraction, after the above-mentioned manner. I call this diſeaſe a ſeparation of the Retina from the choroides. As this membrane fills a conſiderable ſpace in the eye, this ſeparation is often made in ſeveral places; ſo that the ſigns of this diſeaſe anſwer to the number of the parts ſeparated. Its ſigns are certain appearances in the air, more or leſs diſtant from the patient's eyes. They are a kind of ſhadows of different figures, modified according to the ſize and form of the parts of the Retina, which is ſeparated.

As to the prognoſtic, there is no danger of loſing the ſight in this diſeaſe; it is only troubleſome to the patient. As this diſeaſe begins with the ſame ſigns as a cataract, one diſorder may be taken for another; but to prevent the like miſtake, we ſhall propoſe the difference. In a cataract the ſight ſhortens and decays daily; whereas, in the preſent diſeaſe, the ſight continues the ſame both in quickneſs and extent.

Though remedies do not perfectly cure this diſeaſe, and that the perſons, once attacked with it, ſee ſome of theſe ſhades all their life, their number and compaſs in breadth may be ſtill leſſened. The following remedies are of ſervice; ſuch are broths made of crabs, repeated purges, eye-bright, tea drunk in the morning, powder of vipers, wood-lice, and eye-bright mixed together.

In an atrophy of the Retina, as the rays of light are not ſufficiently modified in that membrane, they make too vivid an impreſſion on the choroides, which is very detrimental to it. Hence, enſues a confuſed viſion; ſo that the patients, at the firſt look, can ſee very well; but, if they continue to read any time, or to look at any ſhining object, they feel a ſudden wearineſs in their head, and a dimneſs in their ſight, which obliges them to cloſe their eyes; then opening them a moment after they ſee, as at the firſt look, but for a ſhort time.

Embroiderers, ſtocking-weavers, and ſhoe-makers are ſubject to this diſeaſe; the firſt, becauſe the brightneſs of the gold, ſilver, and other colours damages the ſight by the lively impreſſion it makes on the eye; and the ſhoe-makers, in order to find the hole made by their awl to run the end through it, by this continual attention, fatigue and weaken their ſight ſo much that they are obliged to quit their trade. Theſe people can work but a few days in the week.

There are ſome people, though they do not work at theſe handicrafts, cannot, however, make uſe of their ſight a quarter of an hour, but their head is diſordered; of thoſe I chiefly treat.

No remedies cure this diſeaſe. Nothing avails but reſt and little exerciſe of the ſight. All thoſe perſons who are employed at fine or ſhining work, if they have a mind to continue, muſt make uſe of green ſpectacles.

RE'TORT, (*Dict.*)—The quantity of air riſing from ſome ſubſtances is apt to burſt glaſſes in diſtilling; Dr. Browne Langriſh has therefore given us a new contrivance of applying receivers to Retorts, by which ſuch accidents may be prevented. To his firſt receiver he adapts a ſecond, inſerted into an opening at the top of the firſt, in order to give more room to the rarefied and new generated air. To an opening, at the bottom of each of theſe receivers, he fixes a bottle tied on cloſe by means of a bladder, ſo that they may be removed at any time, and another inſtantly placed in their room, by which means very little of the ſteam will eſcape. He alſo ties on a bladder to an opening, or upper neck of the ſecond recipient; and this bladder, being much thinner and weaker than any of the glaſſes, will always give way firſt, and prevent their burſting. And, even when there is the greateſt danger of this accident, the ſmalleſt pin-hole made through the top of the bladder, as ſoon as the fumes begin to riſe, will be ſufficient to let out the air as faſt as it is generated.

REY *graſs*, in huſbandry, a hardy ſort of graſs, much eſteemed among the farmers for that quality. It will grow on any land, and therefore produces crops where nothing elſe will. It thrives beſt of all on ſowre, clayey, and weeping grounds, and equally endures the ſevereſt droughts of ſummer, and froſts of winter, ſuffering no damage from either. It is the beſt of all winter foods for cattle, the ſhorter it is eaten the better, and it ſprings the earlieſt of any. There is no danger of over-ſtocking it, for, if it be left to grow too much, the ſtalk becomes hard and ſticky. It is beſt for horſes and for ſheep, and very much prevents the rotting of the latter. The beſt way of ſowing it is with clover. The common quantity of ſeed is two buſhels to an acre, but three buſhels is much better; though in ſome lands, where the clover is likely to ſucceed very well, they ſow eight pounds of clover ſeed and one buſhel of Rey ſeed to an acre, and this makes a crop that will laſt ſeven or eight years.

Some mow it as hay, and thraſh it for the ſeed, which, about London, ſells from half-a-crown a buſhel to three ſhillings. Four or five quarters of this ſeed will be ſometimes produced from an acre of the graſs. If at any time a field of this graſs is found to grow thin, it is only neceſſary to ſtrew on a buſhel of the ſeed, and roll it with a wooden roller, and the plants riſing from this addition will make the whole crop ſufficiently thick. Rey graſs has this great advantage, that it kills weeds without any other ſown plant; even thiſtles cannot grow among it. When the Rey graſs is cut for hay before perfectly ripe, the hay is the better; but the ſeed will not grow ſo well. When the ſeed is newly thraſhed, it muſt not be laid too thick, for it is very apt to heat and ferment, and the whole will be ſpoiled. *Mortimer's Huſbandry.*

RHE'UMATISM (*Dict.*)—The preceding cauſes of this diſorder

der are, a ſanguineous habit, accompanied with an acrimony of the juices, a mature age, luxurious living, a ſudden admiſſion of the cold to the body, when over-heated; the influence of the weather in the autumn, an obſtruction of perſpiration, and a tough inflammatory ſtate of the fluids, to be diſcovered by a pleuritic blood. It begins with a continual fever, and creates a violent dilacerating pain, which is greatly increaſed upon the ſmalleſt motion, is long fixed in one place, ſeizes the joints of any of the limbs, and is particularly incident to the knees, the loins, and the coxendix. It alſo ſometimes affects the brain, lungs, and viſcera, is accompanied with a tumor and redneſs of the part, and comes and goes periodically.

If it remains for a conſiderable time, and is increaſed, it often, after the moſt violent pains, deprives the limb of motion, and produces an anchyloſis, which will hardly yield to any medicine.

The immediate cauſe of a Rheumatiſm ſeems to be ſo mild an inflammation, as not to degenerate into a ſuppuration in the lymphatic arteries of the membranes, contiguous to the ligaments of the joints. It is cured by veneſection; repeated antiphlogiſtic purgatives, every evening after which a proper narcotic is to be exhibited; by mild tepid baths, and antiphlogiſtic fomentations applied to the parts affected; by draſtic veſicatories and cauteries; by highly diluting and emollient medicines; by attenuating food; by reſt, and the warmth of the bed; and towards the end of the cure by frictions with warm dry cloths, together with the uſe of antiſcorbutic medicines.

A lumbago or Rheumatiſm ſeizing the loins, and ſciatic pains, are cured in the ſame manner, though with ſomewhat greater difficulty.

Hence appear the reaſons why this diſorder is ſo frequent, and its appearances ſo various; why it is highly dangerous, when it ſeizes the brain or lungs; why in theſe parts it is not diſcovered without the greateſt difficulty; and why the uſe of hot ſubſtances, or the too ſpeedy exhibition of narcotics, muſt be dangerous in it. *Boerhaave's Aphor.*

This diſeaſe happens at any time, but eſpecially in autumn, and principally affects ſuch as are in the vigour of life. It is generally occaſioned by expoſing the body to the cold air, immediately after having heated it by violent exerciſe, or ſome other way. It begins with a chilneſs and ſhivering, which are ſoon ſucceeded by heat, reſtleſſneſs, thirſt, and the other concomitants of a fever. In a day or two, and ſometimes ſooner, there ariſes an acute pain in ſome one or other of the limbs, eſpecially in the wriſts, ſhoulders, and knees, which, ſhifting between whiles, affects theſe parts alternately, leaving a redneſs and ſwelling in the part laſt affected. In the beginning of the illneſs the fever, and the above-mentioned ſymptoms, ſometimes come together; but the fever goes off gradually, whilſt the pain continues, and ſometimes increaſes, occaſioned by the derivation of the febrile matter to the limbs; which the frequent return of the fever, from the repulſion of the morbific matter by external remedies, ſufficiently ſhews.

This diſeaſe, when unattended with a fever, is frequently taken for the gout, though it differs eſſentially therefrom, as will eaſily appear to thoſe who are thoroughly acquainted with both diſeaſes; and hence it is, perhaps, that phyſical authors have not mentioned it; unleſs we ſhould eſteem it a new diſeaſe. But, however this be, it is at preſent very frequent, and though, when the fever is gone off, it ſeldom proves fatal, yet the violence of the pain, and its long continuance, render it no contemptible diſeaſe. For, in caſe of wrong management, it frequently remains not only ſeveral months, but ſome years, and even during life; though in this caſe it is not equally painful, but has its periodical returns, like the gout; and the pain may poſſibly go off ſpontaneouſly, after it has been of very long ſtanding. But, in the mean time, the patient is deprived of the motion of his limbs during life, the joints of his fingers being contracted inwards, with ſtony concretions as in the gout, which rather appear in the internal parts of the fingers than the external, while the appetite may be very good, and the general health not amiſs.

There is another ſpecies of this diſeaſe, though it is not generally eſteemed of this kind, which may properly be called a rheumatic lumbago. It is a violent fixed pain in the loins, reaching ſometimes to the os ſacrum, and reſembling a nephritic paroxyſm; only the patient does not vomit. For, beſides the intolerable pain near the kidneys, the whole conduit of the ureters, even to the bladder, is ſometimes affected with the ſame, though in a leſs degree. I have been formerly led into an error hereby, as imagining it to ariſe from ſome gravel lodged in theſe parts; whereas, in reality, it proceeds from the peccant and inflamed matter of the Rheumatiſm, which affects only thoſe parts, leaving the reſt of the body free. Unleſs this acute pain be removed in the ſame manner as the former ſpecies, it continues as long, and proves equally violent; ſo that the patient cannot lie in bed, but is forced either to leave it, or ſit upright therein, and be perpetually moving his body backwards and forwards.

Since both the kinds of this diſeaſe ſeem to ariſe from inflammation, as appears from their concomitants juſt mentioned, and eſpecially by the colour of the blood taken away, which exactly reſembles that of perſons in a pleuriſy, which is univerſally allowed to be an inflammatory diſeaſe; ſo I judge that the cure ought to be attempted only by bleeding, the heat of the blood being in the mean time abated by cooling and incraſſating medicines, along with a proper regimen.

Accordingly, as ſoon as I am called, I direct ten ounces of blood to be immediately taken away from the arm or the ſide affected, and preſcribe a cooling and incraſſating julap, nearly after the following manner:

Take of the diſtilled waters of lettice, purſlain, and water lily, each four ounces; ſyrup of lemons, an ounce and half; ſyrup of violets, an ounce; mix them together for a julap, of which let the patient drink at pleaſure; or of the following emulſion:

Take ſeven blanched ſweet almonds; of the ſeeds of melons and pompions, each half an ounce; the ſeeds of white poppies, two drachms: beat them together in a marble mortar, then pour on, by degrees, a pint and half of barley-water; mix them well, and, when ſtrained, add two drachms of roſe-water, and half an ounce of white ſugar.

To eaſe the pain, I order a cataplaſm, prepared of the crumbs of white-bread and milk impregnated with ſaffron; or a cabbage-leaf to be applied to the part affected, and frequently renewed. With reſpect to diet, I enjoin a total abſtinence from fleſh, and even the thinneſt fleſh-broths, ſubſtituting in their place barley-broth, water-gruel, panada, and the like. I allow only ſmall-beer for drink, or, which is more proper, a ptiſan prepared of pearl-barley, liquorice, ſorrel-roots, and the like, boiled in a ſufficient quantity of water. I, alſo, adviſe the patient to ſit up ſome hours every day, becauſe the heat which proceeds from always lying in bed, promotes and augments the diſeaſe.

The next day I repeat the bleeding in the ſame quantity; and in a day or two after, as the ſtrength will permit, I bleed again; then interpoſing three or four days, as the ſtrength, age, conſtitution of the patient and other circumſtances indicate, I bleed a fourth time, which is generally the laſt, unleſs too hot a regimen has preceded, or heating remedies have been exhibited without neceſſity. But the uſe of opiates requires more frequent bleeding; and therefore, though the pain be ever ſo violent, during the whole courſe of the diſeaſe, yet, when I intend to effect the cure ſolely by bleeding, I judge it highly neceſſary to refrain from opiates, becauſe the diſeaſe is fixed thereby, and does not yield ſo readily to bleeding; ſo that, where ſuch medicines are given too frequently, bleeding muſt in conſequence be oftener repeated than is otherwiſe neceſſary. Beſides, in the height of the diſeaſe they do not anſwer the expectations we have conceived of them.

While the abovementioned remedies and regimen are carefully continued, I inject clyſters made of milk and ſugar, between times, on the intermediate days of bleeding; earneſtly recommending the exact obſervance of theſe directions, for at leaſt eight days after the laſt bleeding; and then I preſcribe a gentle purging potion to be taken in the morning, and in the evening a large doſe of ſyrup of white poppies in cowſlip-flower water; whereby a check is put to the tumultuary motion of the blood, which might otherwiſe endanger a relapſe. This being done, I allow the patient to return by degrees to his cuſtomary way of living, with reſpect to diet, exerciſe, and air; but at the ſame time caution him to refrain, for a conſiderable time, from wine, and all ſpirituous liquors, ſalt or high-ſeaſoned fleſh, and in general from all food of difficult digeſtion.

After having repeated bleeding, as above ſpecified, the pain is greatly abated, though it does not go quite off; but, as ſoon as the ſtrength returns, which bleeding had greatly impaired, the ſymptoms will vaniſh, and the patient recover perfectly; eſpecially upon the approach of the following ſeaſon of the year, which will be more conducive to recruit the ſtrength, than that wherein he was firſt attacked with the diſeaſe.

But though this, or a ſimilar method, ſeaſonably uſed in the beginning of the diſeaſe, generally proves ſucceſsful; yet it frequently happens, when the cure is attempted by a contrary procedure, that the patient is ſeverely afflicted, during life, with flying pains, which are ſometimes violent, and at others more gentle; whereby the unſkilful are eaſily deceived, and they are commonly reckoned ſymptoms of the ſcurvy.

But it is here to be obſerved, that, when the Rheumatiſm hath taken deep root by a continuance of ſome years, it is improper to repeat bleeding at ſuch ſhort intervals as in the beginning of the diſeaſe, and better to interpoſe ſome weeks between the operations. By theſe means the morbific matter will either be quite exhauſted, or at leaſt in ſo great a degree, that the remains of it may be carried off entirely, by an iſſue made in one of the legs, and exhibiting a proper quantity of ſome volatile ſpirit, every morning and evenings in canary.

But, though there is a remarkable difference between the true Rheumatiſm and the ſcurvy, it muſt nevertheleſs be owned, that there is another ſpecies of the Rheumatiſm, which is near a kin to the ſcurvy: for it reſembles it in its capital ſymptoms, and requires nearly the ſame method of cure; and therefore I call it a ſcorbutic Rheumatiſm. The pain ſometimes affects one, and ſometimes another part; but it rarely occaſions a ſwelling, as in the other ſpecies, neither is it attended with a fever. It is, alſo, a leſs fixed pain, and accompanied with irregular ſymptoms; ſometimes it affects one limb, and ſometimes another; ſometimes it only attacks the internal parts and cauſes ſickneſs, which goes off again upon the return of the pain in the external parts. In this manner the patient is alternately afflicted, and the diſeaſe proves of long duration, like thoſe diſtempers which are eſteemed moſt chronical. It principally attacks the female ſex, and men of weak conſtitutions; ſo that I ſhould have concluded it ought to be referred to the tribe of hyſteric diſorders, had not repeated experience taught me, that it would not yield at all to hyſteric remedies.

Such, likewiſe, as have gone through a long courſe of the Peruvian bark, are ſubject to this diſeaſe, which, by the way, is the only ill effect I have ever obſerved from the uſe of this medicine. But, however it be, this diſeaſe, whether it proceeds from this or any other cauſe, is eaſily conquered by the uſe of the following remedies, which I ſhould have concealed, had I not preferred the good of mankind to any private intereſt:

Take of the conſerve of garden ſcurvy-graſs, two ounces; conſerve of wood-ſorrel, an ounce; compound powder of arum, ſix drachms; ſyrup of oranges, enough to make the whole into an electuary; two drachms of which is to be taken three times a day, for a month, drinking after it three ounces of the following diſtilled water:

Take of garden ſcurvy-graſs, eight handfuls; of water-creſſes, brook-lime, ſage, and mint, each four handfuls; the peel of ſix oranges; nutmegs bruiſed, half an ounce; infuſe them in ſix quarts of mum, and draw off only three quarts for uſe, in a common ſtill.

RHINO'CEROS, in zoology, the name of a genus of quadrupeds; ſo called from an horn growing on their noſe.

Of this genus there are only two known ſpecies. 1. The Rhinoceros with only one horn on its noſe; and, 2. The Rhinoceros with two horns.

In the year 1739 we had a young Rhinoceros ſhewn in England, of which Dr. Parſons has given a very accurate account in the *Philoſophical Tranſactions*.

The creature fed on rice, ſugar, and hay; his keeper uſed to mix the rice and ſugar in the following manner: ſeven pounds of rice and three pounds of ſugar made the proviſion for one day; he eat this at three meals; and beſides this, he eat about a truſs of hay every week, and a large quantity of greens that were brought to him, at different times, and of which he ſeemed more fond than of dried food. He drank often, and always was obſerved to ſwallow a large quantity of water at a time.

He appeared very peaceable in his temper, and bore to be handled on any part of his body, with great patience, except when he was hungry; but he was then always outrageous, as alſo when he was ſtruck. His moſt violent paſſions, even on the laſt occaſion, were however always immediately appeaſed by giving him victuals.

Notwithſtanding the lumpiſh aſpect, and heavy make of this creature, he would jump about very nimbly in his fits of paſſion, and often leap to a great height; and one common mark of his fury was the ſtriking his head againſt the walls, or any thing elſe that was in the way, and this he would do with terrible violence. He was very apt to fall into theſe paſſions in a morning before his rice and ſugar were given him, and from the whole he appeared quite untractable, and ſeemed able, in his paſſions, to have run ſo faſt, as that a man on foot could not have eſcaped him.

This creature was two years old, and did not exceed a young heifer in height, but was remarkably broad and thick. His head was very large; and the hinder part of it, near the ears, remarkably elevated above the reſt of the face, which was flat and ſunk down, in a remarkable manner in the middle, riſing again towards the origin of the horn, but in a much ſmaller degree. The horn ſtands upon the noſe of the animal as upon a ſort of hill; and when the ſceleton of the head is ſeen, that part of the ſkull on which the horn is fixed, is found to riſe into a blunt cone, to anſwer to a cavity in the baſis of the horn, which is very hard and ſolid; in other reſpects having no manner of hollow or core, like thoſe of other quadrupeds. The horn in this young animal did not riſe above an inch high from its tough baſis, and was black and ſmooth at the top, but ragged downwards; and the determination of its growth is backwards, not ſtraight up; this is very evidently ſeen in the horns of old Rhinoceroſes, which are always curved in a conſiderable degree that way. If we conſider the proportion of this animal's ſize to the length of its horn, and thence carry the proportion to that between the large horns we ſee in the muſeums of the curious, we muſt ſuppoſe the animal of a very ſtupendous ſize, when at its full growth. *Phil. Tranſ.* N°. 470.

The ſides of the under jaw, in this creature, ſtand very wide aſunder, ſlanting outwards to the lower edge, and backwards to the neck; the edges turn outwards from this ſtructure of the bones, and the head neceſſarily looks very large. That part of the head which reaches from the fore-part of the horn to the upper lip may be called the noſe; this is very thick and bulky, and has a kind of circular ſweep down towards the noſtrils; on all this part there are a great number of rugæ or wrinkles.

The noſtrils are ſituated very low, in the ſame direction with the opening of the mouth, and not more than an inch from it; and when viewed in a fore-view, the whole noſe, from the top of the horn to the verge of the lower lip, is ſhaped like a bell. The under lip is like that of an ox, but the upper more like that of a horſe, and he uſes it as that creature does, to gather up hay from the rack, or graſs from the ground; but with this ſuperior advantage, that this creature has a power of extending this lip to ſix or ſeven inches in length from the noſe, and there drawing it to a point; with this lip, thus extended, the creature is able to graſp a ſtick, or any ſmall ſubſtance, and hold it extremely faſt; and this power of prolonging the lips ſerves, in many purpoſes, to the ſame end as the trunk of that other unweildy animal the elephant.

The tongue of the Rhinoceros is ſaid to be ſo rough as to be able to rub a man's fleſh off from the bones; but in this young ſubject it was ſo ſoft, that it reſembled that of a calf. It may poſſibly grow harder with age; but the ſtory of its effects ſeems of a piece with the many other falſe marvels reported of this animal. The eyes are dull and ſleepy, much like thoſe of a hog in ſhape; he ſeldom opens them entirely; and it is to be obſerved, that they are ſituated nearer the noſe than thoſe of any other known quadruped. The ears are broad and thin towards the top, much like thoſe of a hog; but they ariſe each from a narrow round baſe, with ſome wrinkles on it, which iſſues out of a ſinus as it were ſurrounded with a fleſhy fold. The neck is very ſhort, and has two folds or wrinkles, wholly ſurrounding it, only that the anterior one is broken underneath; and has a flap hanging from it ſo deep, that it would contain a man's hand; from the middle of the poſterior plica of the neck, there ariſes another, which paſſing backward, is loſt before it reaches the body. The ſhoulders are thick and heavy, and have each a fold paſſing downwards. The body is very large and thick, and ſtands out at the ſides like that of a cow with calf. The legs are very thick and ſtrong; they are round, and ſomewhat ſmaller downwards than in the upper part; and when the creature ſtands upright, they bend inwards at the knee, ſo that they are nothing like ſtraight. In ſome quadrupeds the fetlock bends to the weight of the animal, but in this creature there is no appearance of any ſuch bending, ſo that he ſeems to ſtand upon four ſtumps, eſpecially when viewed behind. He has three hoofs upon each foot forward, but the back part is a great maſs of fleſh, rough like the reſt of the ſkin; and the ſole of the foot is very plump and callous in the ſurface, but eaſily yielding to the preſſure from the ſoftneſs of the ſubjacent fleſh. Its ſhape is like that of a heart, with a blunt apex before, and a broad baſe behind. The tail is very ſmall in proportion to the ſize of the animal, not exceeding ſeventeen or eighteen inches in length, and but thin or ſlender; it is very rough, and has a kind of twiſt or ſtricture towards the extremities, ending in a flat maſs; this gave occaſion to ſome authors to compare the whole tail to a ſpatula; on the ſides of this flat part, there grew a few ſhort, but very thick and ſtrong black hairs, but theſe grow much longer in the more advanced ſtate of the creature; and are not round, like other hairs, but flat, like ſmall pieces of whalebone. The creature has no other hair about it, except a very ſmall quantity at the edge of the ears. See two views of this creature, *Plate* XL. *fig.* 5, 6.

The penis of the male Rhinoceros is of a very remarkable ſtructure, being incloſed in two caſes. The female differs in nothing from the male except in the pudenda which are ſhaped like thoſe of a cow.

The ſkin of the Rhinoceros is thick, and ſeems almoſt impenetrable; it feels like a piece of board of half an inch thick. It is covered in all parts, more or leſs, with a ſort of incruſtations reſembling ſcales. Theſe are ſmall on the neck, and largeſt of all in the ſhoulders and hips; between the folds of this thick ſkin, the cuticle, which is left bare, is ſoft, and eaſily penetrable. The ſcabby incruſtations of the ſkin have been called ſcales, by ſome writers; but this is a very wrong term, for they have nothing of the nature of ſcales, nor any thing of regularity in them.

The creature is of the retromingent, and therefore probably of the retrogenerative kind; the penis, when erect, is not more than nine, or at the utmoſt ten inches long, and is curved backwards at the end. This was the deſcription of the Rhinoceros ſhewn in England at this time, and of all the others that have been ſeen in this part of the world, as to the general characters; but though theſe creatures which we have ſeen, have but one horn, it is very certain that there is a ſpecies of Rhinoceros which has two. Martial has mentioned a Rhinoceros, as ſhewn in the amphitheatre at Rome, which had two horns; but his commentators, ſuppoſing the copies erroneous, have been at great pains to alter it, ſo as to make it expreſs what they had ſeen or heard of, that is, a Rhinoceros only with one horn; but it appears from almoſt indiſputable teſtimony, that there not only is in nature ſuch a Rhinoceros with two horns, but that ſuch were ſhewn in the public ſports at Rome, and therefore the text ſeems to have been very right, and the commentators in the wrong. The creatures we have ſeen have indeed only had one horn ; and the accounts of travellers, and the great number of horns preſerved in the cabinets of the curious, which are all ſingle, ſeem to prove this ; but, though the Rhinoceroſes of Aſia are all one-horned, yet it is certain, that there is a kind found in Africa which has two horns, and it is known, that the Romans had beaſts from this laſt part of the world as well as the other. Peter Kolbe, in his Voyage to the Cape of Good-Hope, deſcribes Rhinoceroſes which he ſaw, and which had a horn on the noſe, and another cloſe behind it. Sir Hans Sloane's muſeum affords two horns of a Rhinoceros, ſtanding juſt as this author has deſcribed them, which are ſtill fixed to the ſame integument ; and we are convinced of the Romans being acquainted with this ſpecies, from a braſs medal of Domitian, which has on it a Rhinoceros, with two horns on the noſe placed in this manner.

Redi who has been very ſagacious in diſcovering the falſity of many of the pretended medicines taken from animals, yet gives us, on the teſtimony of his own experience, an account of ſome very remarkable virtues in the parts of the Rhinoceros. The blood he aſſures us is excellent in cholics and dyſenteries. The decoction of the ſkin, he aſſures us, is a grand ſtomachic antidote, and the horns are very valuable and alexipharmic.

RHINOCEROS *avis*, *the Rhinoceros bird*, a name given by authors to a ſpecies of Indian raven, called by others corvus Indicus cornutus. The beak of which is frequently brought over into Europe.

It is a very ugly bird, and of a very rank ſmell. It much exceeds the European raven in bigneſs, and its head and neck are very thick. Its eyes are very large, and its beak of a very remarkable figure ; having a large and thick horn-like protuberance on its upper part. The whole beak is bent like a bow, not hooked at the end like the beaks of the hawk, &c. It is of a yellowiſh white below, and on the upper part towards the head is of a fine gay red, and the reſt of a yellowiſh white : the upper chap is ſerrated. The horn grows out from the head with this, and runs along it, and bends up at its extremity ; its upper and under parts are red, its middle yellow. The bird feeds on carrion, and the guts of the dead animals. *Aldrovand de Avibus.*

RI'CKETS, *rachitis* (*Dict.*)—This diſorder is a kind of partial tabes, and conſiſts in an unequal nutrition, by which ſome parts are deprived of their due nouriſhment, and waſte away, whilſt others, receiving more than enough, are preternaturally increaſed with an incurvation of the bones and ſpine of the back.

The Cure.

When viſcid, tough, and pituitous humours, depoſited on the ſpinal marrow, are the cauſe of the Rickets, the firſt intention of cure is to reſolve the viſcidity of the juices, remove obſtructions, and by that means promote a free circulation of the humours through all the body. For this purpoſe, in order to remove the fountain of the diſorder lodged in the primæ viæ, we are, above all things, to uſe gentle laxatives ; not neglecting, if it is neceſſary, and the conſtitution of the child admits, the uſe of mild emetics, conſiſting of a few grains of the root of ipecacuanha, exhibited with ſugar and cinnamon-water, prepared without wine, or reduced to the form of an electuary, with ſome proper ſyrup ; for by theſe means the viſcid ſordes, collected in the ſtomach and inteſtines, are not only excellently eliminated, but, alſo, by the ſtimulus of ſuch medicines, a due reſolution of the humours, and an opening of the obſtructed veſſels, are ſucceſsfully obtained : only ſuch ſtimulating medicines are not to be exhibited to patients whoſe ſtrength is exhauſted, who labour under any diſorder of the meſentery, or a violent obſtruction of the viſcera ; ſince, in ſuch caſes, it is more expedient to exhibit medicines of the deobſtruent kind.

To the medicines already recommended we may alſo, now and then, add thoſe of a gently reſolvent kind, as diaphoretics generally are ; ſuch as the tincture of tartar, the acrid tincture of antimony, and preparations of cinnabar ; which, in the Rickets, are preferable to mercurials, and highly beneficial in eliminating the ſerous impurities, partly by perſpiration, and partly by urine ; eſpecially if they are exhibited in ſuch infuſions as dilute and purify the blood.

But, in particular, for removing the obſtruction of the ſpinal marrow, and reſtoring the influx of the nervous fluid into it, various authors recommend frictions of the ſpine of the back, arms, and legs, with warm linen cloths ; as alſo fumigations of frankincenſe, amber, maſtich, and olibanum. But I can, from experience, recommend, as the moſt effectual remedy, baths of ſweet water, boiled with nervous herbs, ſuch as marjoram, lavender, mother of thyme, roſemary, chamomile, and baum. In ſuch baths, the patient is to be frequently immerſed, and have the ſpine of the back and joints rubbed and anointed with the following nervous ointment.

Take of human fat, and expreſſed oil of nutmegs, each half an ounce ; of Peruvian balſam one drachm, and of the oils of rue, lavender, and cloves, each thirty drops.

By theſe means I have often ſeen many patients afflicted with the Rickets, not only ſurpriſingly relieved, but alſo totally recovered.

When the Rickets are of a long ſtanding, the patient's head is preternaturally large, and its ſutures gaping ; the thorax at the ſides is compreſſed to the ſternum, which riſes in a kind of ſharp arch ; the extremities of the ribs are full of knots ; the abdomen protuberant, and the teeth carious and black ; which ſymptoms gradually increaſing, frequently through the whole of the patient's life, produce the like terrible diſorders, eſpecially a ſpina ventoſa, and a caries of the bones.

During the whole courſe of the Rickets, a ſlow fever preys upon the body, till the patient dies ; and then in the carcaſe all the fibres, membranes, veſſels, and viſcera, are found ſoft and flaccid, while the humours are colliquated and mucous.

Hence, the immediate cauſe of the Rickets is, a languid, mucous cold, and vapid cacochymy, perhaps complicated with a latent venereal taint, and accompanied with a lax and flaccid ſtate of the ſolid parts.

The cure of the Rickets is moſt effectually produced by light, eaſily-digeſted, dry, lean aliments, ſeaſoned with mild aromatics, and frequently exhibited, though in a ſmall quantity ; by drinking a ſmall quantity of generous liquors, eſpecially of ale, though not old, but long boiled and thick ; by a dry and ſomewhat hot air ; by wearing very dry and warm cloaths, eſpecially ſuch as are made of wool ; by lying upon couches prepared of aromatic, corroborating, and drying herbs, laid upon boards, in the upper rooms of the houſe ; by geſtation, concuſſion, oſcillation, riding in a chariot in rough roads ; by much dry and warm friction, eſpecially of the abdomen and ſpine, performed with cloths, impregnated with the ſmoke of aromatic ſubſtances ; ſometimes by the repeated application of cantharides, by gentle emetics, frequently though prudently repeated ; by purgatives, and then by corroborating medicines, exhibited for ſome days ſucceſſively ; and, laſtly, by the long continued uſe of corroborating, drying, antiſcorbutic medicines, and ſuch as rouſe the ſpirits. Hence we underſtand the uſes of immerſion in cold water, for the cure of this diſorder, which, however, is not to be put into practice, till the viſcera of the abdomen are, in ſome meaſure, eaſed of the load of humours which oppreſs them. Hence, alſo, the proper uſe of liniments may be underſtood, which ought to be of the nervous kind, and applied to the abdomen, and ſpine of the back ; but not to the prominent parts of the affected bones.

The beſt aliments for children labouring under the Rickets are :

1. Well fermented bread and biſcuit, mixed with a ſmall quantity of ſaffron, nutmeg, cardamoms, cinnamon, ſeeds of celeri, and other grateful and corroborating aromatics.
2. Lean pigeons, fowls, rabbits, mutton, kid, and veal, gently roaſted, cut ſmall, and mixed with biſcuit, ſalt, and a little parſley, thyme, and nutmeg.
3. Millet and barley, boiled with water and raiſins, and then ſeaſoned with a little wine and mild aromatics.

The moſt proper drinks for perſons labouring under the Rickets are, ripe, red, and aſtringent French wines, an ounce of which is to be exhibited three or four times a day.

Half an ounce of Hippocratic wine, exhibited at the ſame time.

Brunſwick mum, Britiſh ale, and that ſpecies of Dutch ale which is ſold at twelve florins.

With theſe malt liquors, in the ſummer-time, may be mixed an equal quantity of medicated chalybeate water, but rather of the ſpaw-waters.

Take of the following recent leaves dried in a ſhade, viz. of the male fern, three pounds ; of marjoram, baum, and mint, each two handfuls : and of the following recent flowers, alſo, dried in a ſhade, viz. of melilot, ſweet trefoil, elder, and roſes, each two ounces. Reduce to a fine powder. Mix with double the quantity of barley-chaff, and put all into bags for couches, on which the patients are to lie ; theſe are to be carefully preſerved from moiſture, and frequently dried.

Take of benzoin, maſtich, olibanum, amber, and frankincenſe, each one ounce ; reduce to a powder ; of which throw a little upon live coals, and the ſteam ariſing from it is to be received in cloths, for rubbing the parts.

Take of the roots of ipecacuanha, one ſcruple ; of white French wine, one ounce ; and of ſugar, two drachms ; infuſe for a whole night ; and when depurated, exhibit in the morning. Let this be repeated every fourth day, for five times.

Take of the beſt rhubarb, half an ounce ; of citrine myrobalans, without the kernels, three drachms ; and of the troches of agaric, two ſcruples. Infuſe in four points of cold ſtrong beer, for twenty-four hours ; and let the patient uſe this for common drink for a month : but, if it ſhould prove too purgative, it may be diluted with an equal, or if neceſſary, a greater quantity of other ale.

The corroborative, drying, exciting, and antiſcorbutic herbs, proper for curing the Rickets, are, agrimony, betony, the bark of caper roots, ſpleen-wort, ſuccory, dorder, ſanicle, endive, male-fern, liver-wort, hart's tongue, baum, myrobalans, oſmund royal, polypody of the oak, the leaves and acorns of the oak, rhubarb, the leaves and root of the bramble, white maiden-hair, ſcabious, the bark, flowers and leaves of the tamariſk, trichomanes, and male ſpeedwell.

Of theſe medicated ales, wines and infuſions may be prepared and exhibited with great ſucceſs ; as alſo conſerves, and other things of a like nature, thus :

Take of agrimony, ſpleen-wort, fern-root, hart's tongue, the root of polypody, and white maiden hair, each two ounces. Having cut theſe ſmall, mix them, and put them in a linen cloth, infuſe them in twelve pints of cold ale, to be uſed for common drink.

Or, take of the leaves and flowers of betony, three ounces; of the bark of the roots of capers, tamariſks, and wild bramble, and of trichomanes, each two ounces; and of filings of ſteel, half an ounce. Infuſe in eight pints of cold white wine, of which one ounce is to be exhibited thrice a day.

Take of Boyle's ens veneris, two grains; which are to be exhibited every evening in Canary wine, for three weeks.

Take of the filings of ſteel, one ounce; of the ſtrongeſt diſtilled vinegar, ten ounces; and of ſugar, three ounces. Boil all together gently, for twenty-ſix hours, in a tall phial; and let the liquor, when filtrated, be kept in a cloſe veſſel. Six drops of it are to be exhibited every morning and evening, in a little Spaniſh wine. *Boerhaav. Aph. & Mat. Med.*

RI'DGES.—The method of plowing land up into Ridges is a particular ſort of tillage. The chief uſe of it conſiſts in the alteration it makes in the degrees of heat and moiſture; theſe being two of the grand requiſites of vegetation, and very different degrees of them being requiſite to the different ſorts of plants. Thoſe plants commonly ſown in our fields require a moderate degree of both, not being able to live upon the ſides of perpendicular walls in hot countries, nor under the water in cold ones, neither are they amphibious; but they muſt have a ſurface of earth, not covered, nor much ſoaked with water, which deprives them of a proper degree of heat, and cauſes them to languiſh. In this caſe they look weak, and their leaves yellowiſh. They ceaſe growing, and, in fine, die in a very weak and bad ſtate. The only way to cure the land of giving this diſeaſe to plants, is to lay it up in Ridges, that the water may fall off, and run into the furrows below, from whence it may be conveyed by drains and ditches into ſome river, or otherways carried wholly off from the land.

The more any ſoil is filled with water, the leſs heat it will have. The two ſorts of land moſt liable to be overglutted with water are hills, the upper ſtratum of mould in which lies on clay; and, generally, all deep and ſtrong lands. Hills are made wet and ſpewy by the wet that falls in rains, dews, and miſts; and this wet, not being able to ſink through the clay, in theſe ſoils, runs down between it and the mould; but extending itſelf through the mould all the way, and making it continually waſhy. The plowing this ſort of land in Ridges, made from the higher to the lower part of the field, is of no benefit; for the water will preſs from below upwards in theſe Ridges, being forced by the addition of freſh ſupplies above.

There are two methods of draining a hill ground like this. The one is to dig ſeveral deep trenches croſs-wiſe, or horizontally on the ſides of the hill: let theſe be nearly filled up with ſhores, and the ſurface covered in the common method: the wet will be received into theſe in all parts, and diſcharged at the ends; and the plough will go over the ſtones, without ſtriking through the depth of earth that covers them. Thus, the land will be dried for a time; but, as theſe channels fill up with earth, between the ſtones, they become of no uſe, and the expence of making new ones is very great.

The other way is to plow the land in Ridges almoſt horizontally, and then the furrows between them are ſo many drains, carrying off the water at their lower ends; if the plough is made to ſtrike a few inches deep into the clay, and the ends of the furrows are no higher than the other parts: every furrow will be a drain to every Ridge, and the land of the Ridges will be kept dry. If there were no other manner of plowing the Ridges on the ſides of hills, than there is in the plain lands, this method of having open furrows or drains on declivities would be impracticable; becauſe the plough could not turn up the furrows againſt the hill and againſt the Ridge alſo, from the lower ſide of it. But the eaſy remedy againſt this inconvenience is to plow ſuch Ridges in pairs, without throwing any earth into the trenches; and then the Ridges will be plain at top, and the rain-water will run ſpeedily downwards to the next trench, and thence to the head land, and ſo out of the field. Theſe trenches will be made, as well as kept always open, by plowing in pairs; and this is abundantly more eaſy than the way of plowing Ridges ſingly.

Every time of plowing the Ridges muſt be changed as to the pairs; ſo that the furrow, which had two Ridges, or lands, turned towards it one time, muſt have two turned from it the next time; and this method keeps the ſurfaces of all the Ridges or lands pretty nearly even. This, however, cannot be done on a hill, whoſe declivity is ſo great, that the plough is not able to turn a furrow againſt it; but, in this caſe, perhaps, it may be ſufficient to plow the Ridges obliquely enough for the furrows to be turned both ways.

This plowing in an horizontal manner, on hills, is the beſt of all others; but our farmers are not to be eaſily brought into it, though they ſee thin lands of this kind ruined for want of it; their reaſons for not doing it, are, that it would prevent the ſuppoſed benefit of croſs-plowing; and that they loſe more ground by having more furrows between the Ridges, than when they lay their lands flat, where the lands are made much larger than the round Ridges can conveniently be. But theſe are in reality very erroneous, as well as miſchievous opinions; for more miſchief than good is done by croſs-plowing in general; and, inſtead of any real loſs of land by Ridges, the true ſtate of the caſe is, that much ground is gained by it; that is, the ſurface of the earth is increaſed in quantity; for if a flat piece be plowed into Ridges, and if in earth ſixteen feet breadth, there be an empty furrow of two feet; and, yet, by the height and roundneſs of the Ridges, they have eighteen feet of ſurface, capable of producing corn equally with eighteen feet, while the piece was flat; there is, then, inſtead of any loſs, one-eighth part of profitable ground, gained by altering the piece from a level into a Ridge.

RI'DING *caſt*, in huſbandry, a term uſed by the farmers for a particular method of ſowing their grounds, by making two caſts upon a ground at the ſame time. This is not much uſed, but it is a quicker way than the double caſt, which is the method now moſt uſed. *Plot's Oxfordſhire.*

Riding *clerk*, one of the ſix clerks in Chancery, who, in his turn, for one year, keeps the comptrolment books of all grants that paſs the great ſeal. *Blount.*

RING, in angling, an inſtrument intended to free the hook, when accidentally entangled among weeds. It is a circular piece of lead, of about ſix inches round, and is faſtened to a long packthread, when it is to be uſed. It is ſlipped over the end of the angling-rod, and let down into the water where the line conducts it to the hook; the rod and line have then no farther buſineſs, but the hook is endeavoured to be diſengaged by the pulling this Ring backwards and forwards by the ſtring which is faſtened to it; the hook is generally freed from the weed by this means; but if not, and nothing but the breaking the tackle will do, the breach is made in this manner near the hook; whereas, if done without this Ring, it might have happened in ſome other part of the line, or the rod itſelf might have been deſtroyed by it.

Rings *of flies*, in natural hiſtory, the ſeveral rounds, or circular portions, of which the bodies of theſe and other inſects are compoſed.

Ring *dove*, in zoology, the name of a bird of the pigeon kind, called by Aldrovand, and other authors, the palumbus torquatus, and, by the Greeks, phaſſa. Its beak is yellow, its feet naked and red, its legs feathered almoſt down to the feet. The upper part of its neck has a very regular and beautiful white circle, from which the bird has its name; and its whole neck, above and below this, is beautifully variegated with changes of colours, according as it is oppoſed to the light. Its head and back are of a duſky blue-grey, and its throat and breaſt of a grey mixed with purple, its belly of a plain grey. The colours are all deeper and more lively in the male than female. It ſeldom flies ſingle, but in large flocks, and builds on trees; its food is ivy-berries, and other vegetable matter. *Ray's Ornithology.*

Ring *head*, an engine uſed in ſtretching of cloth.

Ring *tail*, in zoology, the Engliſh name for the female of the ſubbuteo; the male and female, in this ſpecies, differing ſo much in colour, as to be called by two names; the male being called the hen harrier.

RIPIE'NO, in the Italian muſic, is uſed in pieces of muſic in parts, to diſtinguiſh thoſe that play to fill up, from thoſe that play throughout the piece. There are, ſays Mr. Broſſard, two kinds of the Ripieno: one plays the part of the little chorus exactly, and does not, therefore, increaſe the harmony or number of parts. What is to be played by all the muſicians is marked with the words tutti or omnes. This ſort of Ripieno is found in almoſt all compoſitions. The other ſort is much better, a different part being played, whereby the number of parts is increaſed, and the harmony made fuller. Thus in pieces where in ſtrictneſs two trebles, and baſs, and thorough baſs are ſufficient, becauſe theſe parts are diſpoſed in ſuch a manner, as that their harmony is complete, when played all together; yet, in order to render the piece more perfect, and to give it more grandeur, a counter tenor, tenor, and often two violins are added, whoſe parts are entirely different from the other; and the harmony then has ſeven parts inſtead of three, and is conſequently more complete and full. The parts thus added are properly called Ripieni. *Broſſard.*

RI'PPERS, in the wire-works, are the people who attend in the mills, take the prepared ſmall rods of iron, and work at the barrels where they are drawn into wire. *Ray's Engliſh Words.*

RI'SING-*timbers*, in a ſhip, are the hooks placed on her keel; and are ſo called, becauſe, as they riſe in proportion, ſo her rake and her run riſe on her flat floor by degrees.

RI'VER (*Dict.*)—Some Rivers, at certain ſeaſons of the year, ſwell, ſo as to overflow their banks, and drown the neighbouring lands.—Of theſe the moſt eminent is the Nile, which riſes ſo as to cover all Egypt, except the hills. The inundation begins about the 17th day of June, and increaſes for the ſpace of forty days, and decreaſes for as many: during which period the cities of Egypt, which are all built on hills, appear as ſo many iſlands.

To theſe inundations Egypt owes all its fertility; the heavens there affording no rain, or at leaſt none in any reſpect conſiderable.—Hence, as the inundation is great or ſmall, Egypt for that year is fruitful or barren.

The ancient Greeks, &c. were miſtaken as to the cauſe of this inundation; no body in thoſe days having travelled up to the ſource of the River: but the modern Engliſh and Portugueſe traders into Congo, Angola, Monomotapa, &c. have let us into the ſecret.—From them we learn that the ſpring or ſource of the Nile is in a large lake called Zaire, round which are a great number of huge mountains, called the mountains of the moon. Now, as theſe lie in the ſouthern hemiſphere, their winter will be at the time of our ſummer: but by reaſon of their nearneſs to the equator, being only 10° diſtant from it, they never feel any notable cold: hence it is, that, inſtead of ſnow in the winter, they have rain every day, at leaſt two hours before, and two after noon. In effect, the tops of theſe mountains are always covered with clouds, and the rains almoſt continual. Hence torrents are conſtantly guſhing down from the mountains; all ending in the lake of Zaire: whence they flow into the channel of the Nile, and other Rivers ariſing from the ſame lake, as the Cuamar, the Zaire, &c. Hence the inundation of the Nile.

The other Rivers, which have any notable ſtated inundations, are, the Niger, or Gambia, which overflows at the ſame time with the Nile. Leo Africanus ſays, it begins on the 15th day of June, increaſes for 40 days, and decreaſes as long.—The Zaire, a River of Congo, proceeding from the ſame lake with the Nile, and therefore affected in the ſame manner: the Rio de la Plata in Braſil, which Maffeus obſerves, overflows at the ſame time with the Nile: the Ganges: the Indus; both which laſt overflow in June, July, and Auguſt; at which times the natives ſave great quantities of the water in ponds, to ſerve them the reſt of the year: ſeveral Rivers flowing out of the lake Chiama, into the bay of Bengal, which overflow in September, October, and November. Theſe all bring a very great fertility with them to the ground; the River Macoa in Camboia: the River Parana or Paranaguaſa, which ſome will have to be the ſame with the ſilver River: ſeveral Rivers in Coromandelia, a part of India, which overflow in the rainy months from the great quantity of water iſſuing from the mountain Gatis: the Euphrates, which overflows Meſopotamia certain days in the year. Laſtly, the River Sus in Numidia.

The Rivers moſt celebrated for their length, breadth, ſwiftneſs of current, &c. are — The Nile, which runs almoſt in a ſtraight courſe 2520 geographical miles. The Niger, which runs 2400 miles. The Ganges, 1200 miles. The Ob, 1600 miles. The Jeniſcea in Aſia about the ſame length with the Ob. The River Orellana in America, 60 miles broad at its mouth, and 5000 miles long. The Rio de la Plata, 80 miles broad at the mouth. The Omarannan, another River of Braſil: and the great River of St. Laurence near 2500 miles long.

River *horſe*, in zoology. See HIPPOPOTAMUS.

RIVOLGIME'NTO, in the Italian muſic, is the placing a treble or upper part in the place of the baſs or any low part, or vice verſa. This often happens in double counterpoint, where the treble ſerves for the baſs, or the baſs for the treble; and that in ſuch a manner, that the harmony, though different, remains as correct after this change, as it was in the natural order of the parts.

ROACH, in ichthyology, the Engliſh name of a fiſh, called by the generality of authors the rutilus and rubiculus, by ſome the rubellio. It is a ſpecies of the cyprinus, according to the new ſyſtem of Artedi.

ROA'STING, in metallurgy, is the ſeparation of volatile bodies from thoſe which are more fixed by the combined action of air and fire; and is generally the firſt proceſs in the ſeparation of metals from their ores: it differs from ſublimation only in this, that in this operation the volatile parts are diſſipated, when reſolved into vapours; whereas in that they are preſerved.

ROB (*Dict.*)—It is poſſible, that great improvements might be made, by introducing the uſe of this form among the malt-diſtillers. The great inconveniences attending that, are, that, the malt being of a large bulk, in proportion to its ſaccharine part, and requiring a large proportion of water to extract that ſaccharine part, many large veſſels, ſuch as maſh tubs, coolers, fermenting backs, &c. are neceſſary; and the neceſſary labour on the ſubject is increaſed, and the commodity rendered dearer. The remedy of this ſhould ſeem the introducing a new art ſubſervient to that of the malt-diſtiller, and confining itſelf to the boiling down of malt wort to a Rob, ſo as to ſupply the malt-diſtiller with his ſubject, in the ſame manner as the fine diſtillers are ſupplied with treacle from the ſugar-bakers. By this means the buſineſs of the malt-diſtiller would be reduced to a great degree of ſimplicity, and the ſpirit produced would be alſo much finer than that at preſent; becauſe the ſubject would come tolerably refined to his hands, and purged of his groſs, mealy, and huſky matter, which yields a diſagreeable oil in diſtillation, and is alſo apt to burn the ſtill, and ſpoil the ſpirit. It is poſſible that a ſpirit, purer and finer than that from treacle, might be procured from malt prudently managed.

ROCKS.—Theſe are generally ſuppoſed great enemies to vegetation, and the people of Scotland have been deterred from cultivating many of their beſt lands, from an obſervation that they had a rocky bottom. This is however but a vulgar error among them, for Rocks of a proper kind, and properly diſpoſed, as very many of theirs are, fertiliſe and are beneficial to the land, not hurtful.

In many parts of England we ſee gardens the moſt beautiful that can be imagined, both in regard to flowers and excellent plants, on a ſoil where the bottom is a hard Rock, and the earthy covering not more than a foot, or thereabout, in depth. In ſome of theſe, all the diſadvantages the Scotch complain of, take place, and yet the gardens are fruitful, many of them having lofty hills on the ſouth ſide, the declivity due north, and the Rock perfectly bare next the walls on the north ſide. The north ſides of theſe hills in this very aſpect, only with the Rock covered with two or three feet of earth, make very good hop gardens, producing a vaſt quantity of a very valuable commodity at a ſmall expence; and it is remarkable, that thoſe gardens which ſtand in this expoſure, inſtead of being ſubject to particular evils, often eſcape thoſe blaſts and other miſchiefs which affect the plantations of the ſame kind on the ſouth ſide of the hills. It might be a very valuable article of trade, if the bleak hills of Scotland, or thoſe of ſome of our northern plantations in America, could be made thus fruitful in ſo uſeful a commodity, and there ſeems only the want of a proper trial.

Another extremely valuable plant that might be raiſed on thoſe barren rocky places, as they are generally ſuppoſed to be, is flax, in places where the deſcent is too ſteep for plowing in the common way. It has been proved that a hand plough with a ſtem of aſh of about ſeven feet long, and a plate on each ſide near the end to turn the turf, a coulter to be let out ſhorter or longer to four or five inches deep, to cut the earth up as deep as it lies upon the Rock, and an iron wheel, may be managed with eaſe and conveniency by two people, and will prepare ground for producing large crops of the fineſt flax. The beſt ſort of flax ſeed of Flanders, ſown on this ſort of ground, ſucceeds ſo well, that, if brought into general uſe, it might give the only advantage that is at preſent wanting to the Scotch Holland manufactory, and make it excel that of all the world beſides. The northern American colonies might alſo furniſh us with the ſame ſort of flax raiſed at a ſmaller expence than almoſt any other vegetable commodity, and coming to a ſure market and at a very conſiderable price.

Agriculture in Scotland is too much neglected, to the great impoveriſhing of the country, and the diſtreſs of a numerous poor, for whom it would find conſtant employment. It is not yet known whether many of the moſt valuable plants for medicinal and mechanic uſes will not proſper as well there, as where there are immenſe ſums made by the raiſing them; and the owners of lands would do well in this ſcheme to try the effect of liquorice, madder, woad, and the like plants on their grounds. Wherever the ground is deep enough, it is pretty certain that madder and liquorice would flouriſh, and the laſt of theſe needs ſo little culture, that, if once planted, it may almoſt be left to itſelf. The rocky bottoms of lands, not too bleak, may alſo ſucceed very well with ſaffron, which is one of the moſt profitable plants that can be cultivated. *Philoſ. Tranſact.* N°. 109.

Rock-*cryſtal* (*Dict.*)—This kind of cryſtal is the moſt common of all others, and is what the generality of authors deſcribe under the name of cryſtal of the ſhops, being that kept for medicinal purpoſes.

The cleareſt, pureſt, and moſt tranſparent that can be had, ought to be choſen; and, to prove its genuineneſs, it may be tried with aqua-fortis, true cryſtal making no efferveſcence with that menſtruum. *Hill's Hiſt. Mat. Med.*

ROLL, in the manufactories, ſomething wound and folded up in a cylindrical form.

Few ſtuffs are made up in Rolls, except ſattins, gawſes, and crapes, which are apt to break, and take plaits not eaſy to be got out, if folded otherwiſe.—Ribbonds, however, and laces, galloons, and paduas of all kinds, are thus rolled.

To Roll hot.—By an arret of council in 1698, fullers, ſhearmen, &c. in Poictou, are prohibited to Roll any ſtuff hot, either by having fire over or under it, or by heating the rollers, or otherwiſe, on forfeiture of 100 livres for the firſt offence, or of being degraded from the privileges of maſterſhip in caſe of a relapſe.

The ancients made all their books up in form of Rolls, or little columns; and, in Cicero's time, the libraries conſiſted wholly of ſuch Rolls.—The dearneſs of parchment, and the cheapneſs of papyrus, whereof the Rolls were made, was the reaſon that ſcarce any but paper Rolls were uſed.

Voſſius ſays, they paſted ſeveral ſheets end to end, when filled on one ſide, and rolled them up together; beginning with the laſt, which they called umbilicus, and to which they faſtened an ivory or boxen ſtick, to ſuſtain the Roll.—To the other extremity they paſted a piece of parchment, to cover and preſerve it.

Theſe Rolls were placed in the libraries, perpendicularly to the horizon.—The Jews ſtill preſerve the ancient uſage of Rolls for the law, and the other books they read in their ſynagogues.

Roll *of tobacco*, is tobacco in the leaf, twiſted on the mill, and wound, twiſt over twiſt, about a ſtick or roller.

The generality of tobacco in America is there ſold in Rolls, of various weights: and it is not till after its arrival in England, Spain, France, and Holland, that it is cut.—Roll tobacco is what is chiefly uſed both for chewing and raſping.

RO'LLER, in zoology, the common name of a bird of the mag-pye kind, called garrulus Argentoratenſis by authors, and ſuſpected to be the ſame with the bird deſcribed by Geſner under the name of the blue crow, cornix cærulea, and by Aldrovand under the name of pica marina. Its beak is black and long, ſomewhat crooked at the end, otherwiſe like that of the common mag-pye; its eyes are of a greyiſh hazel colour, and near them are two tubercles bare of feathers. Its rump and part of its wing feathers are of a fine blue, like the ultramarine colours uſed in painting: the middle of its back is of a reddiſh brown, and the head is of a bluiſh green, and its breaſt and belly are of a whitiſh blue or dove colour. It is brought to market in Italy, and ſome other places. *Ray's Ornithology.*

ROLLER, in gunnery, a round piece of wood of about nine inches diameter, and four feet long, which ſerves in moving mortars from one place to another when near. This is done by raiſing the fore-part of the bed ſo high that a Roller may be laid under it; then puſhing the bed forwards, and laying another in its way, and another before that, and ſo on, the mortar is eaſily moved.

ROMAI'N, in huſbandry, the name of a plant cultivated in the fields in many parts of the world, particularly in France, and called by our farmers French vetches, or French tares; it is an annual plant but a very quick grower, and is extremely good food for cattle, particularly for horſes: they let theſe creatures feed on it all the forepart of the ſummer, and then cut it for hay in Auguſt or September. Its ſhort continuance in the ground makes it leſs valuable than ſaintfoin and clover, but it has this advantage over them, that it will grow on poor ground.

RO'MPION.— This kind of bell flower was formerly much eſteemed in England for the ſweet taſte of the roots, and univerſally cultivated in kitchen gardens; but we at preſent diſregard it, though the French continue to be very fond of it. The ſeeds are to be ſown in a bed of light dry earth in March, and in May the young plants will be of a ſize to remove, or they may be left when ſound, only houghing them up to four inches diſtance; being kept clean from weeds for the remaining part of the ſummer, they will be fit for eating in the ſucceeding winter.

ROOK, in zoology, a well known bird of the crow kind.

Rooks are very deſtructive of corn, eſpecially of wheat; they ſearch out the lands when it is ſown, and watching them more carefully than the owners, they perceive when the ſeed firſt begins to ſhoot up its little blade; this is the time of their feeding on it, and they will not be at the pains of ſearching for it at random in the ſown land; for that is more trouble than ſo ſmall a grain will requite them for; but, as ſoon as the blades appear, they are directed without loſs of time or pains by them to the places where the grains lie, and in three or four days time they will root up ſuch vaſt quantities of them that a good crop is often thus deſtroyed in embryo. After a few days the wheat continuing to grow, its blades appear green above ground, and then the time of danger from theſe birds is over; for then the ſeeds are ſo far robbed of their mealy matter that they are of no value to that bird, and it will no longer give itſelf the trouble to deſtroy them.

Wheat that is ſown ſo early as to ſhoot up its green blades before the harveſt is all carried in, is in no danger from theſe birds, becauſe, while it is in a ſtate worth their ſearching for, the ſcattered corn in the harveſt fields is eaſier come at, and they feed wholly on this, neglecting the ſown grain; but as this cannot always be done, the farmers, to drive away theſe ravenous and miſchievous birds, dig holes in the ground, and ſtick up the feathers of Rooks in them, and hang up dead Rooks on ſticks in ſeveral parts of the fields; but all this is of very little uſe, for the living Rooks will tear up the ground about the feathers, and under the dead ones, to ſteal the ſeeds. A much better way than either is to tear ſeveral Rooks to pieces, and ſcatter the pieces over the fields; but this laſts but a little while, for the kites and other birds of prey ſoon carry off the pieces, and feed upon them. A gun is a good remedy, while the perſon who has it is preſent; but as ſoon as he is gone, they will return with redoubled vigour to the field, and tear up every thing before them.

The beſt remedy the farmer has is to watch well the time of the corn's being in the condition in which they feed upon it, and, as this laſts only a few days, he ſhould have a boy in conſtant pay to watch the field from day-break till the duſk of the evening. Every time they ſettle upon the ground or fly over it, the boy is to halloo and throw up a dead Rook into the air; this will always make them riſe, and by degrees they will be ſo tired of this conſtant diſturbance, that they will ſeek out other places of preying, and will leave the ground even before the time of the corn's being unfit for them. The reaſon of their riſing at the toſſing up of their dead fellow-creature is, that they are a bird extremely apprehenſive of danger, and they are always alarmed when one of their comerades riſes. They take this for the riſing of an out-bird, and all fly off at the ſignal. *Tull's Horſehoeing Huſbandry.*

ROPE, an aſſemblage of ſeveral twiſts or ſtrings of hemp, twiſted together by means of a wheel: of various uſes, as in binding, ſtaying, drawing, ſuſpending, &c.

When the Rope is made very thick, it is called a cable, and, when very ſmall, a cord.

The greateſt conſumption of Ropes is in navigation, for the tackling of ſhips; where, though Ropes include the whole cordage:

Yet there are ſeveral Ropes particularly ſo denominated: as, the entering Rope, hung at the ladder to help people up.—The top Rope.—A bolt Rope, wherein the ſail is ſowed.—Buoy Rope, to which the buoy of the anchor hangs.—Gueſt Rope, to tow the long-boat.—The keel Rope.—The bucket Rope.—Rudder Rope, to ſave the rudder, if it ſhould chance to be beat off.—Preventer Rope, to ſave the yard in caſe any part of tyes ſhould be broke.—Breaſt Rope, to laſh the pannels to the maſts.—Guy Rope, to keep the foremaſt forwards, directly over the hatch-way.—Boat Rope, by which the boat hangs, or is faſtened a-ſtern of the ſhip.—And port Ropes.

ROPE-MAKER.— This trade is of great account in England, we being noted for making the beſt cordage for ſhipping in the world.

The work taken throughout is laborious, as well as dirty; but then it is good pay, a good hand being able to get 4 or 5 ſhillings a day, eſpecially in war-time.

To a maſter, who has 200 l. in caſh to turn about, and leſs will not make any great way, it is very profitable; for moſt of them get to be rich in a few years, ſome of whom have had 5000 l, nay, 10,000 l. in trade.

They will take with an apprentice 5 or 10 l, and ſometimes they take them without money. They are at work very early in the morning, but then they leave off ſoon in the evening, nay, commonly in the afternoon.

RO'PE-MAKING, the art of making all kinds of Ropes and cordage, for the uſe of ſhipping, &c.

Every Rope is compoſed of a certain number of threads, called by the workmen yarns; theſe are ſpun in the following manner:

The workman takes a quantity of coarſe hemp, properly prepared, and faſtens one part of it to a ſmall iron hook called a jack, ſeveral of which are placed in a ſemicircular board, having ſmall ſhivers on their axes, by which means they are turned round very ſwiftly, by the help of a line going round the circumference of a large wheel. When he has faſtened the end of his thread to the jack, he walks backwards, ſpinning it with his thumbs and fore-fingers. When he is come to the end of the ſpinning yard, another perſon unties it from the jack, and faſtens it to a reel, about which it is wound.

But, in order to give a better idea of the manner of ſpinning theſe yarns or threads, we have given a perſpective view (*Plate* XXXIX. *fig.* 4.) of a covered ſpinning yard; but it was thought proper to ſhorten it, becauſe, if the whole length of the yard had been exhibited, in a view of this bigneſs, the objects would have been rendered too minute, and the operations very confuſed.

A, B, are two great wheels with the jacks inſerted in ſemicircular pieces over them, and two men in their proper attitudes turning the wheels. Near the wheel B, a ſpinner is mounted on a kind of ſtep ladder, in the form of an inclined plane, in order to reach the crooks of the jacks, to one of which he faſtens the hemp, in order to ſpin his thread. The wheel A, being lower, has no ſtep ladder. At this wheel a man is untying the end of a thread belonging to a ſpinner, who, being arrived at H, the end of the yard, is telling the other that his thread is finiſhed. When the thread is looſed from the jack, it is ſpliced to the end of another thread ſpun by the workman C, who is repreſented holding the end of his own thread in his hand, and moving towards A as faſt as his thread is wound up on the reel D. It muſt be obſerved that all threads are overtwiſted when firſt taken from the jack; the workman therefore as the thread runs through his hand, lets it untwiſt a little; and, in order that the thread may be wound tight round the reel, the thread paſſes through a pulley as at *a*, fixed to the floor of the ſpinning yard; and is alſo turned two or three times round a piece of ſpun-yarn, kept down by a large ſtone, repreſented at *b*. The Reel D is turned by a man, and the thread laid regularly on it by a boy, who holds, with a piece of liſt, the thread, in one hand, guiding it in cloſe ſpirals round the reel; and, that they may lie ſmooth upon it, he is continually ſtriking on them with a flat piece of wood. At E, the other extremity of the ſpinning yard, is repreſented another reel to receive the threads ſpun at the wheel B. Near the middle of the yard, at F, is repreſented a workman ſpinning a thread from a quantity of hemp fixed on a diſtaff; and another ſpinning from hemp wrapped round his waiſt; alſo a groupe of children picking up the flakes of hemp fallen on the floor. The utenſil G, is called a ſtake head, and that at I, a rail and hooks; their uſes are to ſupport the threads.

The Rope-yarns or threads being thus ſpun, the next operation is to form them into ſtrands, called ſkaining, which is done thus: they fix as many reels covered with yarn, either in a perpendicular or horizontal poſition, as they intend threads in each ſtrand.

Then taking the end of a thread from each reel, they put them through an iron ring, and draw them out to the intended length of the Rope, faſtening the ſtrands, at one end of the Rope walk, each to a different hook placed in the croſs-piece of the fixed poſt; and at the other end of the walk, they are all faſtened to one hook in a machine called a cart, or ſledge. This account will be much eaſier apprehended from the perſpective view of it on *Plate* XXXV. *fig.* 13, where the reels placed in a horizontal poſition are repreſented at B, B, and in a perpendicular one at C, C. The threads deſigned to compoſe each ſtrand being put through the rings *a*, *a*, the workmen draw them out in the manner repreſented in the figure. Near one end of the yard is placed the fixed poſt D E, ſupported with ſpruts, that it may be able to reſiſt the power applied to it in twiſting the ſtrands, &c. The croſs-piece has ſeveral holes bored, through which the hooks are put, in order to twiſt the ſtrands. N, is the machine called a ſledge, laſhed faſt to the pile *b*, and loaded with ſtones *c*. The cart, as well as the fixed poſt, is ſupported by ſpruts, and its croſs-piece in the ſame manner bored with holes, in order to receive hooks for twiſting the ſtrands; ſo that it is the ſame, but placed on a ſledge, and therefore at liberty to approach the fixed poſt D E. F, repreſents one of the hooks which is paſſed through the holes of the fixed poſt and ſledge to which the ſtrands are faſtened, and by which they are twiſted.

The ſtrands being formed and faſtened to the hooks, as before mentioned, they are twiſted, and the Rope finiſhed in the manner repreſented *Plate* XXXIX. *fig.* 3. The men at K are twiſting the ſtrands of the Rope, and thoſe at P are twiſting them together, or what the workmen call laying the Rope. Each ſtrand at the fixed poſt is faſtened to a ſeparate hook, but at the cart they are all faſtened to one. In order to lay the ſtrands evenly over each other, and prevent their being more twiſted in one part than another, a piece of wood or metal, in the form of the fruſtum of a cone, having grooves at equal diſtances on its ſurface, is put between the ſtrands, and either held by a man, or faſtened to a cart, according as the Rope is large or ſmall. This inſtrument is called by workmen a top, and is repreſented at T, faſtened to the cart S, by lines round a pin going through it; one end of which is ſeen at R. A larger figure of it is delineated on a drawing (*fig.* 2.) ſuppoſed to be faſtened to the wall of the yard; R, R, are the two ends of the pin going through it; in this figure the manner of the ſtrands in the grooves on its ſuperficies is plainly expreſſed: and alſo a ſmall Rope which is faſtened to the pin and turned ſeveral times round the Rope, in order to give it a proper reſiſtance to the ſtrands, which would otherwiſe twiſt together in a very confuſed and irregular manner: and it muſt be obſerved the more the top reſiſts the ſtrands, the cloſer they will be laid together, and the harder the Rope will be twiſted; and, on the contrary, the leſs reſiſtance the ſtrands meet with from the top, the Rope will be twiſted the ſlacker. A larger figure of the ſingle hook by which the Rope is laid is alſo repreſented in the drawing againſt the wall; where G is the handle by which it is turned; the Rope is faſtened to it in the manner repreſented at M, and the ſpace H I, between the the button L and the crank H, is the part which moves in the hole of the croſs-piece of the cart. The button L, when the hook is in the hole of the cart, is placed againſt the crank H, in order to hinder that part of it from touching the croſs-piece.

Another operation, often performed in making Ropes, is worming them, that is, laying a ſmall line between the ſtrands of the Rope, by which means its circumference is rendered more even, and the Rope itſelf becomes nearly a cylinder. This operation they perform in the following manner: when they are laying the Rope, a perſon takes the end of the line appointed for this purpoſe, and, having put it through the eye of a tool called a wooller, faſtens it to the end of the Rope, and having turned the other four or five times round the Rope, holds the wooller very tight, directing the line between the ſtrands, as it is twiſting up by the men on the cart. If the Rope be large, two men are neceſſary for this operation, who perform the ſame by means of a double wooller. The man at Y, *Plate* XXXIX. *fig.* 3, is worming the Rope, or laying the line between the ſtrands; and the two men at Z are performing the ſame operation by means of a double wooller. And on the drawing, ſuppoſed to be hung up againſt the ſide of the Rope-walk, a ſingle wooller is repreſented at X, and a double one at *a*.

Thus have we deſcribed the whole operation of making a Rope which conſiſts of three ſtrands; but, as ſome are compoſed of four, five, and ſix ſtrands, a few obſervations will be neceſſary with regard to thoſe. The operation is indeed the ſame, except that there muſt be as many hooks at the fixed poſt as there are ſtrands, and the top, inſtead of having three grooves on its ſuperficies, muſt have as many as there are ſtrands; and alſo an hole bored in its axis, in order to receive the heart, or number of Rope-yarns twiſted together, in order to fill up the ſpace which would otherwiſe remain empty in the axis of all Ropes conſiſting of above three ſtrands. This ſpace, if not filled up, renders theſe Ropes not only very difficult to be laid, but alſo weaker. And the reaſon is eaſily conceived; for, as there is a vacancy, or empty ſpace, in the axis of the Rope, the ſtrands have nothing to ſupport them; and cannot, therefore, take any uniform arrangement round this empty axis, but by the means of a lateral preſſure againſt one another: now, the better to preſerve the regularity of this arrangement, there muſt be a perfect equilibrium between the ſtrands, which muſt be of an equal bigneſs and poſition, and equally twiſted; without which, there will infallibly be ſome ſtrand nearer to the axis of the Rope than the others; and ſometimes, eſpecially in the Ropes of five or ſix ſtrands, one of them will lodge at the center of the Rope, and the others conſequently roll themſelves on it; in which caſe this ſtrand would do nothing but wreath and twiſt itſelf about, whilſt the others would wrap round it in ſpiral directions.

A Rope of this kind of five or ſix ſtrands would be very bad; for, when it came to be uſed, the ſtrand of the axis muſt carry all the ſtreſs, which would break it; and then the Rope, being now compoſed but of the four or five remaining ſtrands, would loſe the fifth or ſixth of its ſtrength; beſides, the remaining ſtrands would be ill-diſpoſed towards one another, and moſt commonly unfit to unite in ſtrength together.

To avoid theſe accidents, the moſt part of the Rope-makers fill up the ſpace remaining between the ſtrands with a number of Rope-yarns, on which the ſtrands are coiled; theſe cords are called the heart of the Rope. *Plate* XXXIX, *fig.* 1, repreſents the whole operation of laying a Rope of four ſtrands; in which we may obſerve, 1. Two workmen turning the winch of the ſledge. 2. The maſter Rope-maker, who examines if the ſtrands are well laid near the top. 3. A lad who holds the heart which goes through the axis of the top, and fills the ſpace, which would otherwiſe be empty between the four ſtrands. 4. Four Rope-makers, who, together, turn the winches of the fixed poſt. 5. The cart which carries the block is to be drawn along as a ſledge, having no wheels to it, as that before deſcribed: we find both theſe ſorts of carts in the Rope-yards; but, in making uſe of the ſledge-cart, it is neceſſary that the floor be very even.

As to the ſtrength of Ropes or cordage, M. Reaumur takes occaſion, in the Memoirs of the Royal Academy, to conſider the queſtion, whether a Rope of ſeveral twiſts or ſtrands interwoven, for inſtance, ten, have more ſtrength to ſuſtain a weight, than the ten twiſts would have ſeparately, placed parallel over one another: or, which is the ſame thing, whether if each twiſt be capable of ſuſtaining the weight of a pound, the whole cord be able to ſuſtain more than ten?

There indeed appears no great difficulty in the queſtion; the evidence ſeems ſtrong on the ſide of the affirmative: for, 1. By virtue of the twiſting, the diameter of the Rope is made larger than are thoſe of the ten twiſts together; but it is apparently by its thickneſs that a Rope ſuſtains a weight, or reſiſts a fracture.

2. Twiſted ſtrands have not at all, as when parallel, a vertical direction with regard to the weight; ſeveral of them, and even the greateſt part, have oblique directions, and of conſequence do not bear all the ſhare of the burthen they would otherwiſe bear. In effect, they are inclined planes that are only preſſed with a part of the load.

Hence it would follow, that the ſurplus of the ſtrength of the twiſts might be employed in raiſing a larger weight.

On the other hand it is true, that in twiſting the ſtrands ſome are ſtretched, and others left more looſe, and the new tenſion, given the former, ſerves to weaken them, and has of itſelf the effect of a weight: thus they become leſs able to ſuſtain one ſo large. Thoſe more lax, on the contrary, wave in ſome meaſure the action of the weight, for the action is diſtributed equally on the ten ſuppoſedly equal twiſts; and, if ſome, by reaſon of their particular diſpoſition, receive leſs than their quota, the weight will act more forcibly on the reſt, and will break them firſt, as being more tenſe; after which it will eaſily diſpatch the reſt, as not being in ſufficient number to oppoſe it.

This is the ſum of what can be urged for and againſt the twiſting; to decide between them M. Reaumur had recourſe to experiment. The reſult was, that, contrary to expectation, he ſtill found the twiſting diminiſhed the ſtrength of the Rope; whence it is eaſily inferred, that it diminiſhes it the more, as the Rope is the thicker; for, inaſmuch as the twiſting diminiſhes, the more twiſting, the more diminution.

The reſiſtance or friction of Ropes is very conſiderable, and by all means to be conſidered in calculating the power of machines. M. Amontons obſerves, in the Memoirs of the Royal Academy, that a Rope is ſo much the more difficult to bend; 1. As it is ſtiffer and more ſtretched by the weight it draws. 2. As it is thicker; and 3, as it is to be more bent; i. e. as it is to be coiled, for inſtance, into a ſmaller ring.

The ſame author has thought of ways to prove in what proportion theſe different reſiſtances increaſe; that, ariſing from the ſtiffneſs or rigidity occaſioned by the weight which draws the Rope, increaſes in proportion to the weight; and that ariſing from its thickneſs in proportion to the diameter. Laſtly, that ariſing from the ſmallneſs of the gyres, or pullies about which it is to be wound, is indeed greater for ſmaller circumferences than large ones, but does not increaſe ſo much as in the proportion of thoſe circumferences.

On this footing the loſs a machine ſuſtains, by the cordage being eſtimated in pounds, becomes, as it were, a new weight, to be added to that which the machine is to raiſe. This augmentation of weight will render the cords ſtill more ſtiff, which exceſs is to be computed as before.

Thus we ſhall have ſeveral ſums ſtill decreaſing, which are to be added together, and it will be ſurpriſing to ſee what a ſum they will amount to.

Where Ropes are uſed in a machine, all the reſiſtance reſulting from their ſtiffneſs is to be put together, and all that occaſioned by the friction, which will make ſo conſiderable an augmentation to the difficulty of the motion, that a power, which to raiſe a weight of 3000 pounds, by means of a fixed and a moveable pulley, needed only 1500 pounds; muſt, according to M. Amontons, have 3942 pounds, on account of the frictions, and the reſiſtance of the cordage.

ROSA'CEOUS *Flower*, *roſaceus flos*, in botany, a term uſed to expreſs ſuch flowers as are compoſed of ſeveral petals or leaves, diſpoſed in a ſort of circular form, like thoſe of the roſe; ſuch are the flowers of the piony, crowfoot, cinquefoil, &c. In this ſort of flowers the diſpoſition only of the leaves is regarded, their number being of no conſequence. It is very ſeldom that the number is two or four, except in the circæa and onagra. The moſt frequent number of leaves in theſe flowers is five, as ſuch as have four differ from the cruciform flowers, not only in their diſpoſition, but in this, that the number is in the ſame ſpecies indeterminately four, five, or ſix, as is the caſe in the clematitis, the capers, and the ſpecies of rue, whereas in the cruciform ones it is ever conſtant. See *plate* XL. *fig.* 3.

ROSA'RIA, among the Romans, a kind of perfumes, ſo called, either from their being chiefly made of roſes, or becauſe they had a moſt exquiſite odour.

RO'SARY, is a word frequently met with in the ancient hiſtories of Ireland, and uſed to expreſs a peculiar ſort of baſe money coined abroad, in the form of the penny, current in that kingdom; but of ſo much baſer an alloy, that it was not worth quite half the real value of a penny. This and many other ſuch coins were decried, and it was made death to import any of them by Edward the Firſt, in 1300.

ROSE *Fly*, in natural hiſtory, the name given by authors to a peculiar ſpecies of fly found very frequently on Roſe buſhes, and produced out of a baſtard caterpillar, which feeds on the leaves of that tree.

The male of this fly has a long body, the female a ſhort and thick one; ſhe depoſits her eggs in ſmall holes, which ſhe makes in the bark of the young branches, and, for this purpoſe, is furniſhed with a very remarkable inſtrument placed at the hinder part of the body, which is a kind of ſaw. This is a four-winged fly, and is ſo common on Roſe buſhes, that it is ſcarce poſſible to miſs it in any of the ſummer months; and the parts of the branches where it has depoſited its eggs, are ſo vitiated by it, that they alſo are eaſily known. They are uſually ſwelled to a greater bigneſs, than either the part above or below them, and are uſually ſomewhat bent; they are often black on the underſide, and among this blackneſs the holes made for the eggs, and often the eggs in them, may be ſeen. The head and breaſt of this fly are black. Its wings alſo are edged with black, its body is yellow, and its legs yellow, with a few black ſpots.

If theſe flies be obſerved in a ſummer morning, as they are crawling upon the branches of the Roſe-tree, they will ſoon be found at work for the depoſiting of their eggs. Theſe creatures give us a very good opportunity of obſerving the manner in which they perform this, as they are of a very ſluggiſh diſpoſition, and will ſtand ſtill even to be taken between the fingers; ſo that, when one of them is in a proper ſituation, it may be examined, by bringing the eye near it, and by uſing the common magnifying glaſſes, without quitting its place or its work; and, if there be leaves of the tree, or ſmall branches of it in the way, they may be removed without diſturbing the creature. *Reaumur's Hiſt. Inſ.*

ROSE *Galls*, in natural hiſtory, a name given by authors to certain unnatural productions of the roſa ſylveſtris, or dog Roſe, occaſioned by the bites of inſects: there are two kinds of theſe, the one very common, the other more rare.

The ſcarcer kind is uſually found on the young ſhoots, and on the heps or fruit, and is of a woody ſubſtance; the other is hairy and ſpungy, and is found on the old branches. The woody kind uſually appears in the months of June and July, and is always found in cluſters. Theſe are compoſed often, of twelve or more galls of different ſizes and figures, ſome round, others oblong, ſome of the ſize of an olive, and others not larger than a pea. They are of the common ſubſtance of the white wood or blea of trees, and, when ſituated on the fruit, they prevent its ripening and make a very ſingular figure. They are of a reddiſh colour, and are uſually ſmooth and gloſſy, but ſometimes they are beſet with ſhort and fine prickles.

Eſſence of ROSES. There is ſcarce a more valuable perfume in the world than the eſſence of damaſk Roſes, and ſcarce any thing is obtained from its ſubject with more difficulty and in leſs quantity. All eſſences or eſſential oils are, while in the plant, contained in certain veſicles, lodged in different parts, and of different ſtructure; theſe veſicles are in the Roſe particularly ſmall and tender, and are placed very ſuperficially; the conſequence of this is, that there is originally but a very little of this eſſence in the flower, and this is the very ſubject that will be diſſipated and loſt, when the flowers are gathered and thrown in a heap together, as they are ſucculent, and very quickly heat in lying together. To avoid all diſſipation and waſte of this choice eſſence, the Roſes ſhould be thrown into the ſtill as ſoon as gathered, and diſtilled with very little water, and that in a balneum mariæ; the fire is to be continued ſo long as the flowers float ſeparate about in the water; but as ſoon as ever they form themſelves into a cake, and ſtick to the bottom, the diſtillation ſhould be finiſhed, as they then yield no more eſſence. With all theſe precautions, however, it is with great difficulty we can procure any eſſence of Roſes; what we obtain by this diſtillation being chiefly a very odoriferous and fragrant water. In the warmer countries the ſame caution affords a larger quantity of oil, which may be ſeparated and preſerved under the name of the eſſence. In Italy, they make ſome quantity of it, but there it is very dear; a vaſt quantity of the flowers yielding only a very little eſſence, and that being thick and troubleſome in the procuring, as it everywhere ſticks to the veſſels.

It is to be obſerved, that the ſeaſon of the year, as to wet or dry, makes a very great difference in the eſſential oils of all plants; they are always much finer in dry and hot ſeaſons than in cold and moiſt: we find our Roſe-water in England much finer and more fragrant, though diſtilled in the ſame proportion, in hot and dry ſummers than in colder and rainy ones; and Mr. Geoffroy gives an account that he ſucceeded, one very hot and dry year, in the making the eſſence of Roſes in France, in the following manner:

As the Roſes were brought to him freſh gathered, he turned them immediately into the ſtill; and drawing over the water into a glaſs matraſs, when it had ſtood by ſome time, and was perfectly cold, he diſcovered ſome of the eſſence fixed to the ſides of the matraſs, and the ſurface of the water covered with a thin reticular pellicle. All the contents of the matraſs were put to filtre through a paper, ſupported by a fine linen cloth; and the filtrated water was added to new Roſes for many ſucceeding diſtillations, the produce of which was all filtred thro' the ſame paper. After a long courſe of diſtillations, with freſh flowers every time, but ſtill with the ſame veſſels and the ſame water, there was found in the paper of the philtre a quantity of the thick eſſence; this, being carefully waſhed out of the paper with a ſmall quantity of the moſt fragrant of the water, and afterwards ſeparated pure from its ſurface, was very white, and extremely fragrant, and as thick as fine butter. This is not the only eſſential oil which naturally concretes into this firm ſtate; oil of aniſeed, though fluid, when diſtilled, always concretes in the ſame manner on the firſt approach of cold; and another oil of this kind is that of the laurel, which is uſed in ſome places, though very improperly, to give the ſcent and taſte of bitter almonds, or apricot kernels, to foods of different kinds.

Monſieur Homberg has taught us how to gain a larger quantity of the eſſential oil of Roſes than is uſual in diſtillation, by the previous addition of mineral acids, as the ſpirit of ſalt, vitriol, &c. thereto, which increaſe the fermentation, and, joining with the oil, render it more liquid, and eaſier to be raiſed by heat. He adviſed a perfumer, who before ſcarce obtained an ounce of oil from an hundred weight of Roſes, to ſteep his flowers for fifteen days in water made ſharp with ſpirit of vitriol, by which means the perfumer, upon diſtillation, found his quantity of oil increaſed almoſt a third.

The perfumers keep the ſtructure of the veſſel they employ in this diſtillation a great ſecret. Mr. Homberg tells us, it is a large convenient ſtill, that opens in a tube at the top to receive the water which muſt often be poured upon the Roſes to bring over the oil with it; this it does but very ſlowly, and ſo requires that its quantity be large; the ſtill alſo opens below, that the flowers, when they will yield no more oil, may be eaſily taken out; but the principal contrivance is the figure of the veſſel which receives the oil; this is made like an ordinary matraſs, from the lower part of the belly whereof comes a tube, as from an old-faſhioned cruet, and, riſing to the bottom of the neck of the receiver, it bends outwards; ſo that, though the veſſel uſually contains but two or three French pints, it conveniently receives and lets paſs many hundred pints of the Roſe water, without any neceſſity of being changed; for a change would loſe the ſmall quantity of the oil obtained. The water diſtilled runs through a pipe into a ſecond receiver: the oil, being lighter than the water floats upon its ſurface, and adheres to the neck of the veſſels as high as the aperture of the little pipe, while the water runs from the bottom of the firſt receiver into the ſecond. See *Mem. de l'Acad. des Sciences*, 1700.

ROT, *in ſheep.*— This is the greateſt of all the inconveniencies that attend the keeping theſe uſeful animals.

It is a very hard thing to prevent the Rot, if the year prove very wet, eſpecially in May or June. Salt marſhes and lands, where broom grows, are the beſt places of preſervation for them. Sheep are ſometimes all cleared of the Rot, when not too far gone with it, only by removing them into broom fields. Scurvy-graſs, muſtard, and thyme are alſo good for the prevention of it.

Some propoſe the giving ſheep half a handful of bay ſalt every month or oftener; and there is great probability that this may be of ſervice; but the rational way of attacking all diſorders in cattle, is by conſidering what are the cauſes of them. It will appear upon enquiry, that wet ſeaſons are the general occaſions of the Rot in ſheep, and therefore it would be adviſeable for the owners, when ſuch ſeaſons come on, to remove the animals into the drieſt paſtures they can, and then to feed them principally with dry ſweet hay, oats, bran, and the like; this would prevent the occaſion; and, if they were already a little infected, ſome ſalt, given with their dry food, would be a happy means of curing them. *Mortimer's Huſbandry.*

RO'TCHET, an Engliſh name for the fiſh called by authors cuculus, and more frequently by us the red gurnard. *Willoughby's Hiſt. Piſ.*

RO'TOLO, an Egyptian weight of twelve ounces, each ounce conſiſting of twelve drachms, and each drachm of ſixteen carrats. *Pocock's Egypt.*

RO'TULA, in natural hiſtory, the name of a genus of the echini marini, of the general claſs of the placentæ. The characters of the Rotula are, that they are flat ſhells in form of a cake, compoſed of various flat pieces, and formed into a round, ſomething like that of a wheel; but wanting one or more parts of its outer ring, and radiated or dentated. Their mouth is ſituated in the middle of the baſe, and the aperture of the anus in the third region of the axis, and marked with a cinquefoil flower at the ſummit. The great and obvious character is, however, the dentaged edge.

ROUP, in poultry, is a filthy boil or ſwelling upon their rumps, known by the ſtaring or turning back of the feathers.

The Roup, if not ſoon remedied, will corrupt the whole body; to prevent which, the feathers are to be pulled away, the ſwelling laid open, and the matter preſſed out; after which, the part is to be waſhed with ſalt and water, or brine. *Ruſt. Dict. in voc.*

RO'WEL (*Dict.*) — The Rowelling of horſes is a method of cure frequently had recourſe to in inward ſtrains, eſpecially about the ſhoulders or hips; as alſo for hard ſwellings not eaſy to be reſolved.

The operation is thus.—A little ſlit being made through the ſkin, about a handful below the part aggrieved, big enough to put a ſwan's quill in; the ſkin is raiſed from the fleſh, the end of the quill put in, and the ſkin blowed from the fleſh upwards, and all over the ſhoulder. — Then the hole being ſtopped with the finger, the place blown is beaten with a hazel-ſtick, and the wind ſpread with the hand all over; then let go. This done, horſe-hair, or red ſarſenet, half the thickneſs of the little finger, is put in a Rowelling needle ſeven or eight inches long; the needle is put into the hole, and drawn through again ſix or ſeven inches higher; then the needle is drawn out, and the two ends of the Rowel tied together: anointing it every day, as well as before the putting it in, with ſweet butter and hog's greaſe, and drawing it backwards and forwards in the ſkin, to make the putrid matter diſcharge itſelf more plentifully.

Others, diſliking theſe Rowels, as making too great a ſore and ſcar, uſe the French Rowel, which is a round piece of ſtiff leather, with a hole in the midſt; laying it flat between the fleſh and ſkin, the hole of the Rowel juſt againſt that in the ſkin; ſewing it with a needle and thread drawn through the hole and the ſkin; cleaning it once in two or three days, and anointing it a-freſh.

RUBI'GO, in huſbandry, is the name by which the ancients expreſſed what we call the blight in corn, &c. they give it this name from the reſemblance of the colour of the blighted ſtalks to ruſty iron.

They generally thought that it came from heaven, being ignorant of its true cauſe, which is want of nouriſhment in the earth. Virgil gives this up as an incurable diſtemper, and, tells the farmer, that, if his corn is blighted, he muſt live upon acorns, not ſuppoſing that any remedy could be deviſed for ſuch a diſtemper.

Palladius gives many receipts to cure the blight, and other diſtemperatures of corn that come from above, as they imagined at that time. The chief efficacy of theſe ſeems to conſiſt in certain ſecret ſympathies and antipathies to fright the clouds away with. The world will eaſily judge how likely ſuch means as theſe were to have ſucceſs.

The ancient farmers generally uſed prayers, ſupplications, and ſacrifices to their gods on this occaſion; and, if theſe did not ſucceed, they proceeded to blaſphemy and threatenings, and brandiſhed bloody axes againſt the ſky, as a token to their gods to deſiſt from plaguing them, or elſe to expect no quarter. They uſed to hang up in their fields and gardens, on theſe occaſions, pieces of red cloth, and the feathers and heart of an owl, as a way to fright the clouds from coming over thoſe places. Theſe people in general, having no true knowledge of the theory of huſbandry, had recourſe to magic, and uſed what they thought ſpells and enchantments on all occaſions. Cato, Varro, and even Columella, are full of theſe ridiculous devices. A better knowledge in the real nature of huſbandry has taught us to underſtand this matter, in a very different manner, and to apply more efficacious remedies to it. *Tull's Horſe-hoeing Huſbandry.* See BLIGHT.

RUBRI'CA, in natural hiſtory, a red earth uſed for marking, and in painting. There are two kinds of it, a harder and a ſofter.

The firſt, or harder kind, is but little in uſe, except among the turners in wood, as it does not mark ſo eaſily, requiring to be firſt wetted, and then preſſed hard upon the ſubſtance to be marked. This is dug in Lincolnſhire, Hampſhire, and Suſſex, and is a hard and dry earth, of a ſomewhat pale red, like the common pale red bricks; and is of a very regular and cloſe texture, and always compoſed of a number of thin laminæ, lying cloſely and evenly on one another. It is of a rough uneven ſurface, adheres firmly to the tongue, is not eaſily broken between the fingers, and ſtains the hands a little; it is of a very aſtringent taſte, and melts pretty readily in the mouth. It is very readily diffuſible in water, mouldering to powder, ſoon after being thrown into it, and makes no effervеſcence with acids.

The ſecond, or ſofter kind, is very common, and put to a number of different uſes. It makes ſimply a very good pale red for the painters, and is very ſerviceable to them in their mixed colours. It is in conſtant uſe in many parts of the kingdom for the marking of ſheep; and, when waſhed and ſeparated from its ſandy particles, is, by ſome of our modern druggiſts, ſold under the name of bole-armenic.

It is found in many parts of the world; the beſt in England is that from ſeveral parts of Derbyſhire, from whence the colour-ſhops and druggiſts of London are ſupplied; many of the latter thinking this a ſhorter method than the common one of our bole-armenic makers, of preparing it from a mixture of tobacco pipe clay, and that ſort of the red ochre called Spaniſh brown. See Bole and Bolus.

This ſoft, or common ruddle, is a looſe ponderous earth, of a lax texture, and very friable: and of a pale, but tolerably bright red, of a ſomewhat ſmooth and gloſſy ſurface, ſoft to the touch, adhering firmly to the tongue, eaſily broken between the fingers, and ſtaining the hands. It is of a rough auſtere taſte, very readily breaks, and falls to powder in water, and makes no effervеſcence with aquafortis. *Hill's Hiſt. of Foſſ.*

Arſenical RU'BY, *rubinus arſenicalis*, in chemiſtry, a name given to a ſublimation of a mixture of arſenic and common ſulphur. Theſe two bodies mixed together in different proportions afford very different appearances. If arſenic, mixed with one tenth part of its weight of ſulphur, be thrown into a crucible red-hot upon the fire, and covered immediately with a tile, and finally poured out after two minutes fuſion, it becomes a ſolid brittle maſs of a very pale yellow. If arſenic be melted, in the ſame manner, with a fifth part of ſulphur, the maſs, when cold, will be of a red colour; and finally, if arſenic and ſulphur be melted or ſublimed together, in equal quantities, the product is a beautiful red tranſparent maſs, called rubinus arſenicalis.

Counterfeit Ruby. — The way to give the true fine red of the Ruby, with a fair tranſparence, to glaſſes, is as follows: calcine, in earthen veſſels, gold diſſolved in aqua regia till it become a red powder. The operation will require many days in a hot furnace; when the powder is of a proper colour, take it out; and, when it is to be uſed, melt the fineſt cryſtal-glaſs, and purify it by often caſting it into water; finally add, by ſmall quantities, enough of this red powder, to give it the true colour of a Ruby, with an elegant and perfect tranſparence. *Neri's Art of Glaſs.*

RUFFE, in zoology, the Engliſh name of the cernua or ſmall gilded pearch, a fiſh common in our rivers, and much reſembling the pearch in figure.

The Ruffe is called by the generality of authors cernua fluviatilis; and by ſome chærus acerina and aſpredo. It is called by Johnſon and Charleton alſo ſcrollus.

Willughby, as well as theſe authors, has mentioned the ſcrollus as another ſpecies of fiſh; but it is proved, by obſervation, that they are evidently the ſame ſpecies. Artedi makes this fiſh a pearch, or perca; and accurately diſtinguiſhes it from the other fiſh of that genus by the name of the pearch, with only one fin on the back, and with a cavernous head.

This fiſh may be preſerved alive in glaſs jars with freſh water, and be made very tame. It muſt be fed, for it cannot ſubſiſt on the animalcula of river-water as ſmall dace can.

Ruffe, is alſo the name of a particular ſpecies of pigeon called the jacobine, but is larger, and has a longer beak. The iris of the eye is ſometimes red, ſometimes pearl-coloured. The feathers of the hood and chain are much longer than the jacobine's, though they do not come down ſo low to the ſhoulders of the wings, nor are they ſo compact and cloſe, but are apt to blow about with every little blaſt of wind, and fall more backward off the head, and lie in a rough confuſed manner.

It is a common thing to match the jacobine pigeon with this ſpecies, with intent to improve its chain by the length of the Ruffe's feathers; but the event is, that the pigeon is always worſe inſtead of better, being longer-beaked, and looſer in its head and chain, without any real advantage. *Moore's Columb.*

RUGGI'OLA, a ſort of Spaniſh ſlate, ſerving in many places in the room of tiles and bricks. It is a flaky ſtone, of the nature of ſome of our grey ſlates, and is cut out of a mountain near Cordova; a plate of this, being well heated on both ſides, will retain its warmth for twenty-four hours.

The people of Cornwal, and ſome parts of Yorkſhire, uſe a ſtone, which is of a talcky nature, to warm themſelves when in bed, applying it at the feet of the bed. This they call the warming ſtone from its uſe, and it will retain a ſenſible heat ſix or eight hours, after once moderately warming. *Plot's Oxfordſhire.*

RUM.—Rum differs from what we ſimply call ſugar ſpirit, in that it contains more of the natural flavour or eſſential oil of the ſugar cane; a great deal of raw juice, and parts of the cane itſelf, being often fermented in the liquor or ſolution of which the Rum is prepared.

The unctuous or oily flavour of Rum is often ſuppoſed to proceed from the large quantity of fat uſed in boiling the ſugar; which fat, indeed, if coarſe, will uſually give a ſtinking flavour to the ſpirit, in our diſtillations of the ſugar liquor or waſh, from our refining ſugar-houſes; but this is nothing of kin to the flavour of the Rum, which is really the effect of the natural flavour of the cane. The method of making Rum is this:

When a ſufficient ſtock of the materials is got together, they add water to them, and ferment them in the common method, though the fermentation is always carried on very ſlowly at firſt; becauſe, at the beginning of the ſeaſon for making Rum in the iſland, they want yeaſt, or ſome other ferment to make it work; but by degrees, after this, they procure a ſufficient quantity of the ferment which riſes up as a head to the liquor in the operation, and thus they are able afterwards to ferment and make their Rum with a great deal of expedition, and in large quantities.

When the waſh is fully fermented, or to a due degree of acidity, the diſtillation is carried on in the common way, and the ſpirit is made up proof: though ſometimes it is reduced to a much greater ſtrength, nearly approaching to that of alcohol or ſpirit of wine, and it is then called double diſtilled Rum. It might be eaſy to rectify the ſpirit, and bring it to much greater purity than we uſually find it to be; for it brings over in the diſtillation a very large quantity of the oil; and this is often ſo diſagreeable, that the Rum muſt be ſuffered to lie by a long time to mellow before it can be uſed; whereas, if well rectified, it would grow mellow much ſooner, and would have a much leſs potent flavour.

The beſt ſtate to keep Rum in, both for exportation, and other uſes, is doubtleſs that of alcohol, or rectified ſpirit. In this manner it would be tranſported in one half the bulk it uſually is, and might be let down to the common proof ſtrength with water, when neceſſary; for the common uſe of making punch, it would likewiſe ſerve much better in the ſtate of alcohol; as the taſte would be cleaner, and the ſtrength might always be regulated to a much greater exactneſs.

The only uſe to which it would not ſo well ſerve in this ſtate, would be the common practice of adulteration among our diſtillers; for, when they want to mix a large portion of cheaper ſpirit with the Rum, their buſineſs is to have it of the proof ſtrength, and as full of the flavouring oil as they can, that it may drown the flavour of the ſpirits they mix with it, and extend its own. If the buſineſs of rectifying Rum was more nicely managed, it ſeems a very practicable ſcheme to throw out ſo much of the oil, as to have it in the fine light ſtate of a clear ſpirit, but lightly impregnated with it; in this caſe it would very nearly reſemble arrac, as is proved by the mixing a very ſmall quantity of it with a taſteleſs ſpirit, in which caſe the whole bears a very near reſemblance to arrac in flavour.

Rum is uſually very much adulterated in England; ſome are ſo barefaced as to do it with malt ſpirit; but, when it is done with molaſſes ſpirit, the taſte of both are ſo nearly allied that it is not eaſily diſcovered. The beſt method of judging of it is, by ſetting fire to a little of it; and, when it has burnt away all the inflammable part, examining the phlegm both by the taſte and ſmell. *Shaw's Eſſay on Diſtillery.*

RUN *of a ſhip*, ſo much of her hull as is always under water; growing thinner and lanker by degrees, from the floor timber to the ſtern-poſts.

This is alſo called the ſhip's way aftward.

A ſhip is ſaid to have a good Run, when it is long, and the water paſſes cleverly to her rudder, her tuck not lying too low, which is of great importance to her ſailing—If the water do not come ſtrongly to her rudder, by reaſon of her being built too broad below, ſhe cannot ſteer well; and a ſhip that cannot ſteer well, cannot keep a good wind, nor will have any freſh way through the ſea, but will ſtill be falling to leeward.

RUNCA'TION, a term uſed in the antient huſbandry, to expreſs the clearing away the weeds from among the corn and other ſown plants.

They uſed, when the corn or other plants were an inch or two high, to draw a ſort of rake or harrow over the ground indiſcriminately over the corn and weeds, and, when this was done, a perſon followed over all the field, and picked up all the weeds with the hand; the treading the young corn, however, by this perſon's feet, and the injury done to it by the rake, were ſo great, that the crop always ſuffered greatly by it; many of the Romans choſe to omit the uſe of the rake or harrow, as a thing that did as much injury to the corn as to the weeds, and contented themſelves with the ſending a perſon to pick up the weeds without it.

This was a ſort of firſt hint to the horſe-hoeing huſbandry of the moderns, though ſo injudiciouſly managed, that it was of very little, if any, uſe in its infancy. But had theſe farmers been inſtructed to ſow their corn in rows, and then to uſe the rake or harrow as we do the hoe, only between thoſe rows, they would then have had all the advantage of deſtroying weeds by it, and of ſtirring the earth, and no injury would be done to the crop *Tull's Huſbandry.*

RU'NIC, in ſeveral parts of Sweden, ſtones may be met with which were formerly ſet up as obeliſks in memory of the dead; and theſe monuments are marked with the antient northern letters, called runor, or the Runic characters. In ſome places, the characters vary from the Runic, particularly in free ſtones found in Helſingland, of which Mr. Celſius has given us a deſcription, with an explanation.

From theſe Helſingland inſcriptions an alphabet of ſixteen letters may be derived, which is very ſingular. In other alphabets different ſounds are generally denoted by different figures; but here the ſame character, according to the diverſity of its place and altitude between two parallels, denotes different ſounds.

But theſe characters, however different they may appear at the firſt ſight from the Runic, may eaſily be derived from them; or, vice verſa, the Runic may be derived from the Helſingic, if theſe be ſuppoſed the moſt antient. The ſubtraction of a perpendicular line in the firſt caſe, or its addition in the latter, brings the two characters to a near reſemblance.

The inſcription, which Mr. Celſius conſiders, was publiſhed in Monſ. de la Motraye's Travels, but erroneouſly.

RUNT, the name uſed with the diſtinction of places for ſeveral ſpecies of pigeons. Theſe are the Leghorn, the Spaniſh, and the Frieſland Runt, &c. The columba domeſtica Piſarum, Hiſpaniæ, et Friſiæ of Moore.

The Leghorn Runt is a ſtately large pigeon, ſeven inches or better in the legs, cloſe-feathered and faſt-fleſhed, extremely broad-breaſted, and very ſhort in the back. He carries his tail, when he walks, ſomewhat turned up like a duck's; his neck is longer than any other pigeon's, and he carries it bending like a gooſe or ſwan. He is gooſe-headed, and his eye lies hollow in his head, with a thin ſkin round it, like that of the Dutch tumbler. His beak is very ſhort for ſo large a bird, and has a ſmall wattle on it, and the upper chap falls a little over. It is a very valuable pigeon, but is tender, and requires care.

The Spaniſh Runt is the longeſt-bodied of all the pigeons; it is ſhort-legged and looſe-feathered, and does not walk ſo upright as the Leghorn Runt. Theſe are of a great variety of colours, but are apt to have accidents in ſitting, from their ſitting too heavy, and often breaking their eggs.

The Frieſland Runt is a large pigeon, and has all its feathers reverted, or looking as if placed the wrong way.

The Roman Runt is a pigeon of the ſame general make with the common kind, but ſo large and heavy that it can hardly fly.

The Smyrna Runt is middle-ſized, and is feather-footed, and and that to ſuch a degree ſometimes, as to look as if there were wings upon the foot; the feathers of theſe are ſometimes four or five inches long, and often pull the eggs and young out of the neſts. The common Runt is the common blue pigeon kept for the table, and known to every body. *Moore's Columb.*

RUPELLE'NSIS *Sal*, in chemiſtry, a name given to a peculiar kind of ſalt, invented by Mr. Seignette at Paris, and extolled as a very valuable medicine.

The preparation of it was kept a great ſecret, till diſcovered by ſome members of the Paris Academy. It was found to be a ſpecies of ſal polychreſtum, and was properly a ſoluble tartar compoſed of cream of tartar and the fixed ſalt of common potaſhes well deſpumated. This ſalt is of a very ſingular nature; for, though it be a true alcaline ſalt, it yet is capable of cryſtalliſation, and it does not eaſily diſſolve in the open air as other fixed ſalts do; but, on the contrary, it calcines therein like vitriol and the Glauber's ſalts. *Philoſ. Tranſ.* N°. 436.

Another peculiar property of it is, that, if it be ſatiated with vitriolic acids, and the liquor be evaporated, there is obtained a ſalt which has the figure of Glauber's ſalt, and all the properties requiſite to make Mr. Seignette's ſalt. In order to which, take ſalt of kali or pot-aſhes of Alicant well purified one pound; diſſolve it in water, and add to it cream of tartar half a pound: this is about the quantity uſually neceſſary; but the true proportion, in this caſe, can no more be determined than in the making the common ſoluble tartar, otherwiſe than by trial every time, either from the ſalt of kali's having retained more or leſs humidity, or from the tartar's having more or leſs foulneſs. Boil the whole together, in order to diſſolve the tartar; and, if the quantity of tartar have been too great after the fermentation is over, filtre the liquor, and, as it cools, the ſuperfluous tartar will fall to the bottom; after the ſeparation of the tartar, evaporate the lixivium over a gentle fire to a proper ſtandard, and then ſet it in a cool place, and there will ſhoot fine cryſtals. If the liquor be a little too far evaporated, there will be no cryſtals formed, but the whole liquor will congeal into a hard ſubſtance tranſparent like ice; but, upon diſſolving this in more water, it will ſhoot as fair as it would have done if properly evaporated at firſt.

The virtues of this ſalt conſiſt in its being an excellent purge;

its doſe is from one to two ounces; and it is to be diſſolved in a large quantity of water.

RUPERT'S *Drops*, a ſort of glaſs drops with long and ſlender tails, which burſt to pieces on the breaking off thoſe tails in any parts, ſaid to have been invented by prince Rupert, and therefore called after his name.

This ſurpriſing phænomenon is ſuppoſed to ariſe from hence; that while the glaſs is in fuſion, or in a melted ſtate, the particles of it are in a ſtate of repulſion; but, being dropped into cold water, it ſo condenſes the particles in the external parts of their ſuperficies, that they are thereby reduced within the power of each other's attraction, and by that means they form a ſort of hard caſe, which keeps confined the before-mentioned particles in their repulſive ſtate; but, when this outer caſe is broke, by the breaking off the tail of the drop, the ſaid confined particles have then liberty to exert their force, which they do by burſting the body of the drop, and reducing it to a very peculiar form of powder.

This theory ſeems to be corroborated by making the drops red-hot, and letting them cool again by gentle degrees in the open air, for then there is no ſuch effect. Yet, it muſt be allowed, that there is another experiment which ſeems to impugn this hypotheſis; and that is by grinding away any part of the drop upon a grindſtone, when the remaining part continues entire; though there appears no reaſon why it ſhould not break and burſt into duſt, if the internal parts be the cauſe of it; ſince by this means they muſt needs be ſet at liberty, in the moſt ample manner poſſible, unleſs it be that, in grinding, the vacuities between the internal particles are filled up with the matter worn off from the ſtone; and, by this means fixing the parts of the glaſs next the ſtone, they deſtroy their repulſive force; conſtituting as it were another ſort of hard external caſe, which confines the internal particles no leſs than the other did.

The hiſtory of theſe drops is this: they were firſt brought into England by prince Rupert, out of Germany, and ſhewn to king Charles the Second, who communicated them to the Royal Society at Greſham College; and a committee, appointed on this occaſion by the ſociety, gave the following account of them: They muſt be made of green glaſs well refined, for, till the metal, as the glaſs-men call it, is perfectly refined, they never ſucceed if made of it; but always crack and break ſoon after they are dropped into the water. The beſt way of making them, is to take up ſome of the metal out of the pot upon the end of an iron rod, and immediately let it drop into cold water, and there lie till it is cold. If the metal be too hot when it is dropped into the water, the buſineſs does not ſucceed, but the drop froſts and cracks all over, and falls to pieces in the water, and every one that does not crack in the water, but lies in it whole till it is quite cool, is ſure to be good: there is great nicety in the hitting a due degree of heat in the metal, and the workmen who beſt know their buſineſs cannot promiſe before-hand which ſhall ſucceed, but often two fail for one that hits right. Some of them froſt over the ſurface without falling to pieces, and others break into pieces before the red-heat is quite over, and that with a ſmall noiſe; others break ſoon after the red-heat is quite over, and that with a ſmall noiſe; others break ſoon after the red-heat is over, and make a great noiſe, and ſome neither break nor crack till they ſeem to be quite cold; and others hold together while they are in the water, but fly to pieces with a ſmart noiſe when they are taken out of it; ſome do this on the inſtant, others an hour or two after, and others will keep ſeveral days, nay weeks, and at laſt fall to pieces without being touched. *Neri's Art of Glaſs, by Merrett.*

If one of them be taken out of the water while it is hot, the ſmall part of the neck, and ſo much of the thread or ſtring it hangs by, as has been in the water, will upon breaking fall into ſmall parts, but not the body, though it have as large cavities in it, as thoſe which burſt in pieces.

If one of theſe drops be cooled in the open air hanging on a thread, or on the ground, it becomes like common glaſs in hardneſs, ſolidity, and all other its qualities, and has nothing of the nature of the drops cooled in water.

When a glaſs drop falls into the water, it makes a hiſſing noiſe, the body of it continues red a pretty while, and there proceed from it many eruptions like ſparkles that crack, and make it leap up and move, and ſeveral bubbles ariſe from it till it cools; but, if the water be ten or twelve inches deep, theſe bubbles diminiſh ſo in the aſcending, that they vaniſh before they attain the ſuperficies of the water, where nothing is to be obſerved but a little thin ſteam.

The outſide of the glaſs drop is cloſe and ſmooth like other glaſs, but, within, it is full of ſpungy cavities and blebs. The figure is a ſort of oval or pear-like ſhape, ſuch as pearls are pointed in, the bottom of which is rounded, and the top terminates in a long neck which is uſually variouſly bent and crooked. Almoſt all thoſe that are made in water, have a little protuberance or knob, a little above the largeſt part of the body, and moſt commonly placed on the ſide towards which the neck ends, but ſometimes it is upon that ſide that lies uppermoſt in the veſſel where it is made.

If the water be hot into which the glaſs drop is thrown, it always cracks and breaks in the water, either before the red-heat is over, or very ſoon after. If dropped into oil, they do not miſcarry ſo often as when dropped into water: they produce alſo a great number of large bubbles, and continue longer bubbling than when dropped into water: thoſe made in oil have alſo fewer blebs, and ſmaller than thoſe which are made in water; and frequently they are ſmooth all over, not having thoſe knobs which the others have. Some part of the neck of theſe alſo, and part of the ſmall thread that is quenched in it, breaks like common glaſs; but, if the neck be broken off near the body, and the body held all the while cloſe in one's hand, it will crack and break all over; but even then it flies not into ſo ſmall parts, nor with ſo ſmart a force and noiſe as thoſe do which are made in water, and the pieces will hold together till they are parted, and there then appear long ſtreaks or rays upon them, pointing towards the center of the body, and thwarting the little blebs in it.

If the drops are dropped into vinegar, they froſt and crack, ſo that they are ſure to fall to pieces before they are cold, and the noiſe of their falling in is more loud and hiſſing than in water, but the bubbles are not ſo remarkable.

In milk they make no noiſe nor any bubbles that can be perceived, and never miſs to froſt and crack all over, and fall to pieces before they are cold. In ſpirit of wine they bubble more than in any other of the liquors, and while they remain entire, they tumble to and fro, and are more agitated than in other liquors, and they never fail to crack and fall to pieces; and by that time five or ſix of them have been dropped into this ſpirit, it will be ſet on a flame, but it receives no particular taſte from them.

In water wherein nitre or ſal armoniac have been diſſolved, they ſucceed no better than in vinegar. In oil of turpentine, they firſt broke as in the ſpirit of wine, and the ſecond ſet it on fire, ſo that it could not be uſed again. In quickſilver, being forced to be ſunk by a ſtick, it grew flat and rough on the upper ſide; but the experiment could not be perfected, becauſe it could not be kept under till it cooled. In an experiment made in a cylindric glaſs like a beaker, filled with cold water, out of ſeven that were tried, one only ſucceeded, the reſt all cracking and breaking to pieces; and it was obſerved, in this experiment, that at the firſt falling of the drop into the water, and, for ſome time after, while the red-heat laſted, red ſparks were ſhot forth from the drops into the water; and that, at the inſtant of the eruption of thoſe particles, and of the bubbles which manifeſtly break out of it into the water, it not only cracks, and that ſometimes with a conſiderable noiſe, but the body moves and leaps about, and that as well in thoſe which ſucceed as thoſe that break in the water.

A blow with a ſmall hammer, or other hard body, will not break one of theſe glaſs drops, if ſtruck upon the body; but, if the tip only of the neck be broke off, it flies to ſmall particles, which eaſily crumble into duſt; and, if it be broken, when the particles have liberty to diſperſe themſelves, they will fly every way in an orb, in the manner of a granado.

If they are ground down ever ſo low into the body with water and emery, they do not fly; but rubbed on a dry tile, they uſually fly to pieces as ſoon as the bottom is a little flatted, though ſometimes they bear rubbing away deeper; and ſome, when rubbed half down, have been laid by without burſting, and have flown to pieces a little while after without being touched. If one of them be broken in the hand under water, it ſtrikes it more ſmartly than if in the open air; and, if it be broken near the ſurface of the water, the particles it flies into do not diſperſe themſelves into an orb, as in the air, but all fall regularly and evenly to the bottom; and they burſt in the ſame manner in the exhauſted receiver of the air pump as in open air. One of theſe drops being faſtened into a cement, all but a part of the neck, and then the tip of it broken off, it made a pretty ſmart noiſe, but not ſo great as if broken in the hand; and though, on examining, it appeared to pieces within, and its colour turned greyiſh; yet, the outſide remained ſmooth, tho' cracked, and being taken in pieces, the parts of it roſe like thoſe of the flaky bodies, talc, or the like; the flakes were many of them conical in ſhape, and were alſo ſo cracked, that they eaſily fell into duſt.

Another drop faſtened into a ball of cement of half an inch in thickneſs, upon the breaking off the tip of it, burſt the ball in pieces like a granado. And, when attempted to be bored by a lapidary, as they bore pearls, they fly to pieces as ſoon as the tool enters them, in the ſame manner as they do when the tip is broken off.

Theſe were the ſeveral experiments tried on them by the gentlemen of the Royal Society, and theſe all tend to prove the before-mentioned account of their burſting to be true; and, indeed, none more than the dry and wet grinding of them; the wet emery, in the latter caſe, making a coat in the place of that it wore away; and the dry powder of tile in the former ſcarce anſwering the ſame purpoſe, and at beſt but very imperfectly, and preſerving the body together only for a ſmall time.

RUSH, *juncus*, in botany, the name of a genus of plants, whoſe characters are:

The flower is of the roſaceous kind, conſiſting of ſeveral petals, diſpoſed in a circular form. From the center of the flower ariſes a piſtil, which finally becomes a trigonal fruit or capſule, which opens three ways, and uſually contains a number of roundiſh ſeeds.

Petrified RUSHE. — What is uſually called by this name is a kind of foſſil coral. But we have in England alſo another not uncommon ſubſtance, frequently called by the ſame name; this is an incruſtation of ſparry matter, in form of a ſtony cruſt on the outſides of real Ruſhes; though, in this caſe, it is no real petrifaction, but only a covering of this ſtone-like matter. Incruſtations and petrifactions are uſually confounded together, and the generality of people do not attend to the diſtinction, which is, that, in a real petrifaction, the ſtony matter penetrates the very ſubſtance of the body, as is the caſe in the petrified wood of Ireland and other places; whereas, in theſe incruſtations, the ſubſtance itſelf remains unaltered within, and its outer part alone is covered with the ſtony ſubſtance: this is the caſe with what is called petrified moſs at Scarborough and in other parts of England; and this is the caſe in regard to what we call ſometimes petrified Ruſhes. Theſe being water plants, and growing by the ſides of ſprings, loaded with ſpar, often fall in, and become covered over with it. We have near Kettering, in Northamptonſhire, a ſpring which does this very quickly: a gentleman who tried the experiment, but putting in ſome Ruſhes, at about thirty yards from the ſource, found them in one day covered with a thin ſkin of ſpar; but, after lying ſome months there, it formed itſelf into a cruſt of half an inch thick, round them; and was ſo hard that it would not break by being thrown violently on the ground; but all this while the Ruſhes were not petrified, but only incruſted. *Woodw. Cat. Foſſ.*

RUST *of corn*, in huſbandry, the name given by our farmers to a diſeaſe in corn or other vegetables, in which their ſtalks and leaves ſeem burnt up, and appear of a ſort of Ruſt colour.

Wheat is blighted at two ſeaſons, firſt in the bloſſom, and then its generation is prevented, many of the huſks being empty in the ear, and the rudiments of the grains not impregnated: ſecondly, wheat is blighted when the grains are brought to maturity; and in this caſe they become light, and are of little value for making of bread, having ſcarce any flower in them.

The firſt of theſe cannot happen in England from froſts, becauſe our wheat is not in flower till the month of June; but it is long and continual rains that chill the bloſſoms, and in this manner prevent their fertility: this, however, does not often happen to us; theſe rains are not common at this ſeaſon of the year; and, if they were, this country lying much of it open, the winds diſlodge theſe drops of water from the ears, and prevent the miſchief they would do there.

Lammas wheat does not retain theſe drops ſo long as the bearded or cone wheat; and, in conſequence of this, in the terrible blight in England, in the year 1725, the bearded wheat received infinitely greater miſchief than the Lammas wheat.

The ſecond kind of blight from light ears, is, that which is more frequent, and more general with us; this brings the greateſt ſcarcity of wheat, and the cauſe of this is plainly want of nouriſhment of the grain, by whatever means that want is occaſioned. Several accidents kill the plants, or injure their health, and in that caſe the grains are not filled; lightning does great miſchief to the farmer in this kind, as is plain by the ſeveral black ſpots and patches in fields of corn, in years when there has been more lightning than uſual. This is a diſaſter that muſt be quietly ſuffered, ſince it can neither be prevented nor remedied; but the other cauſes of blights, which are moſt general, and do the moſt damage, may be prevented in ſome meaſure at leaſt.

One great and common cauſe of the blight is the lodging or falling of corn; in this caſe the ſtalks are broken near the ear, and the veſſels are hurt which ſhould carry up the nouriſhment to the ear. In this caſe, there can juſt juices enough paſs for the keeping the plant alive, and bringing it to its full height, but it is languid all the time, and the grains can never be filled with flour. The earlier in the ſeaſon this lodging of the ſtalks happens, the thinner and poorer the ears will be: hence it happens, that when dung and tillage have brought a wheat land into ſo good a ſtate, that in April and May it ſeems to promiſe the farmer five or ſix quarters of wheat, it ſhall all be deſtroyed by falling in June, and ſcarce yield him five buſhels, and this is ſo thin and lank, that the expences of reaping and thraſhing are more than its value. The wind is generally accuſed of the throwing down theſe ſtalks, but this does not ſeem to be truly the caſe; the wind may preſs upon the plants; but the cauſe of their giving way to it is a weakneſs in their ſtalks, and this ſeems either owing to the want of nouriſhment, or the want of air, or of the ſun's rays, and perhaps the want of all three together. A rich acre will maintain a crop of five quarters ſtanding, while a poor acre will not be able to ſupport ſuch a crop, as would have yielded only about three quarters, had it ſtood. This is a proof of want of due nouriſhment being one great cauſe of the falling. Air is neceſſary to the nouriſhment of all plants, wheat in particular requires a very free air. It ſucceeds beſt in open hilly places where the wind comes freely to it, and ſhakes off the drops of water from the leaves, as well as their own recrements; and it is plain, that a great quantity of the ſun's rays is neceſſary to keep the wheat ſtrong; becauſe in the hotter countries it is not ſo ſubject to fall, as it is with us, and in other northern countries.

There is another cauſe of the blight, which is the wheat's coming too late into bloſſom. It ſhould bloſſom in the beginning of June, becauſe there is not otherwiſe time during the hot weather for it to paſs through the different ſtages to the perfection of the grain.

The cauſes of the blight being thus known, the cure or prevention may be attempted by the farmer on much more rational grounds than it was among the antients. It is advantageous to haſten as much as poſſible the time of bloſſoming of the corn, and to protract as long as we can the ripening of the grain, that it may have ſufficient time to fill and ſwell.

The earlieſt ſown wheat is generally obſerved to eſcape the beſt, and this is owing to its coming ſooneſt into bloſſom. The antients uſed to let their ſheep feed upon the corn while young in the blade, by way of preventing it from lodging or falling afterwards: ſome of our own farmers uſe this method alſo; and it is true, that the corn is prevented from falling by this; but the remedy is as bad as the diſeaſe, for the ſtalks are not made very ſtrong by this practice, but the ears lighter. They therefore do not weigh down and lodge the ſtalks indeed, but they are in ſome ſort blighted by this means, and the diſeaſe is cauſed by the means uſed to prevent it. This feeding down the wheat with ſheep retards the time of its bloſſoming, and the only advantage of early ſowing is thus taken away by it: what grows after the eating of the ſheep is a ſort of latter crop, and is always weaker and later than the firſt. The longer the corn remains on the ground, the more nouriſhment it requires from it; and, in this unnatural remaining on the land, there is no proper ſupply provided.

The general remedy for all the caſes of the blight is the modern method of horſe-hoeing huſbandry. In this the hoe ſtirs up the ground as often as the farmer pleaſes, and every ſuch ſtirring gives new life and nouriſhment to the plant: this was a ſupply of food for the ear, may be given, whenever it is neceſſary, and the wide intervals left for the hoe in the drilling the wheat; for this ſort of huſbandry gives a free paſſage for the ſun and air to all the plants.

The moſt general blight of all that happen in theſe cold countries is cauſed by inſects, which ſome think are brought in the air by an eaſt-wind, accompanied by moiſture, a little before the grain is filling with that milky juice which hardens into flour. Theſe inſects depoſit their eggs within the outer ſkin or rind of the ſtalks; and, when the young ones are hatched, they feed on the parenchyma, and eat off many of the veſſels which ſhould convey this juice; then the ear is deprived of it, and muſt in conſequence be thin and poor, in proportion to the number of the veſſels eaten, and as the inſects happen to come earlier or later; for ſometimes they come ſo late, that the grains are ſufficiently filled with this milky juice before they have any power to hurt the veſſels.

In this caſe, though the ſtraw, when examined by the microſcope, appears to have its veſſels eaten and torn, and to be full of black ſpecks, which are cauſed by the ſame inſects, yet the grain is plump and full. This is one of the many caſes in which the early ſown wheat eſcapes the blight. It has been ſeen, that, of the crop of wheat in the ſame field, ſome of which has been ſown earlier and ſome later, though there has been no difference in the whole, yet the early ſown wheat has been full-eared, and the late ſown has been light-eared; and both have had their ſtalks equally eaten and ſpotted by the inſects.

A proof that theſe miſchievous inſects are brought by the eaſt-wind, is, that the corn on the eaſtſide of hedges is often found blighted, and deſtroyed by them, while that on the weſtſide of the ſame hedge is unhurt. Some ſuppoſe they are bred in the earth, and crawl up the ſtalks, becauſe ſome whole fields are ſubject to them, and others eſcape them wholly; but this is more probably owing to the difference of the ſituation of theſe fields, as they are more or leſs expoſed to the eaſt.

Some wheat is more liable to be hurt by this inſect blight than another, and the beſt remedy in this evil is to plant fields, which are moſt expoſed to theſe blights, with ſuch wheat as is leaſt ſubject to be injured by them. The white cone, or bearded white, which has its ſtalk or ſtraw like a ruſh, not hollow, but full of pith, except near the lower part, where it is very thick and ſtrong, is very proper on this occaſion; it is probable that this plant has ſap veſſels, that lie deeper, and ſo are not to be deſtroyed like thoſe of common wheat: the ſtalks of this are often found ſpotted with black, which ſhews that the inſects have been there, and yet the ears are are found full, and the grains plump in them.

There is another kind of blight, called by the farmers moor loor; this is occaſioned by the earth's falling away from the roots of the wheat, and is cured by throwing up ſmall furrows againſt the rows in the drilling method. The horſe-hoeing huſbandry is beſt of all others calculated to prevent blights, and to cure them when they happen; but, as there are ſome years when all wheat is blighted, even at theſe times, the horſe-hoeing huſbandry has an advantage; for, when the ſtalks fall, they never lie abſolutely on the ground in this caſe, but the air has room to play between them; but the common ſown wheat has not this advantage. The ears in the blighted wheat of the drilled kind are not ſo light nor poor as in others,

thers, but make the farmer ſome amends in the corn, though greatly leſs than in the common produce. *Tull's Horſe-hoeing Huſbandry.*

Corn is always more ſubject to blights after a wet ſummer than at any other ſeaſon; the reaſon ſeems, that, the roots being continually drenched with water, the plant runs up to ſtalk, and has very little ear, and the corn is never large or full.

It is obſerved, that when the mildews riſe, or blights fall, they generally infeſt only one kind of grain, ſometimes wheat, ſometimes oats, and ſometimes barley only; and the ſame ſort of obſervation holds good in regard to fruit; ſometimes only apples are blighted, ſometimes only pears, ſometimes cherries, and ſo on. *Mortimer's Huſbandry.*

RYE, *ſecale*, in botany.—This ſort of grain ſucceeds very well on any ſort of dry land, even on the moſt barren gravel or ſand. The farmers ſow it about the beginning of September, after a ſummer's fallow, in the drieſt time they can. Two buſhels of ſeed is the quantity generally allowed to an acre of land; but if it be ground newly broken up, or if it be ſubject to worms, they then allow a peck more to the acre. A little ſprinkling of dung, or mud, upon Rye-land, will greatly advance the crop, though it is laid but half the thickneſs that it is for other corn; its produce is commonly about twenty buſhels upon an acre.

The farmer knows it is ripe when the ſtraw is yellow, the ear bends, and the grain feels hard. It is not apt to ſhed the ſeeds; and therefore, if there are many weeds among the crop, it may be left lying upon the ground, or gravel, as they call it, eight or nine days after it is cut, before it is bound up, if the weeds are not dry ſooner: for, otherwiſe, they will grow moiſt in the barn, and cauſe the whole to give, and not to thraſh well, and ſometimes they will make it muſty.

As it is a grain that will grow in the ear ſooner than any other if it be wet, care muſt be taken, if rain falls after it is cut, to turn it as it lies upon the ground every other day, and at the ſame time to keep the ears as far from the earth, and as much above the ſtubble, as may be; this will prevent the miſchief. If it be pretty clear of weeds, it may be houſed as ſoon as it is cut. If either this grain or wheat lodge upon the ground, it is beſt to cut them, even though they are not ripe; for the ſtalk being broken will yield no more nouriſhment to the ear.

There is another very eſſential uſe to the farmer made of Rye. April is the ſeaſon of the year when food is of all others the ſcarceſt for cattle, eſpecially for ſheep and lambs: on this occaſion ſome ſplit the ridges of the wheat ſtubble, and ſow them with Rye; they harrow this in, allowing about a buſhel to an acre; they feed the ſheep with this in April, and in May they plow it up for fallow. *Mortimer's Huſbandry.*

In many parts of France there have been certain years, in which this grain, from no apparent cauſe, has proved noxious, and ſometimes even poiſonous. Mr. Perrault, travelling through Sologne, was informed that the Rye of that province was ſometimes ſo corrupted, that thoſe who eat of the bread that had much of the corrupted grain in it, were ſeized with gangrenes in different parts of the body, which was not preceded by any fever, inflammation, or any conſiderable pain; and that the gangrened parts uſually fell off after a time of themſelves, without the aſſiſtance of chirurgical inſtruments.

The grains of Rye thus degenerated are black on the outſide, and tolerably white within; and, when they are dry, they are harder and cloſer than the natural good grain: they have no ill taſte, but ſometimes they have a viſcous metallic like honey hanging to one end of them. They grow longer than the other grains in the ſame ear, and are found, from one or two, to ſeven or eight in the ſame ear. Some have ſuppoſed that theſe were not the proper ſeeds of the plant, but ſome other extraneous bodies that got in among them; but it is evident, from a cloſe inſpection, that they are really the genuine ſeeds only altered by ſome accident; the coats, and the furrow, and even the germen for the young plant, being entirely the ſame as in the natural ſeeds.

The places where the Rye is found to degenerate in this manner, are all a dry and ſandy ſoil. In theſe places there is ſcarce any ſoil in which more or leſs of theſe large ſeeds are not found among the others, but, when there are but few of them, the ill effects are not perceived. The ſeaſon when the degeneracy is greateſt, and the effects the worſt of all, is, when there have been exceſſive rains in the ſpring, and there come on exceſſive heats in the ſucceeding ſummer.

The bread which is made of the Rye that holds ever ſo much of this bad corn, is not diſtinguiſhable from other Rye bread by the taſte, and ſeldom produces its ill effect, till ſome conſiderable time after it is taken. Beſides the gangrenes already mentioned, it not unfrequently brings on other bad conſequences, ſuch as drying up the milk of women who give ſuck, and occaſioning ſometimes malignant fevers, accompanied with drowſineſs, ravings, and other dangerous ſymptoms. The part uſually ſeized by the gangrene is the legs, and this often in a very frightful manner. The arms are the parts moſt ſubject next, but all the other parts of the body are ſubject to it.

The firſt ſymptom of this approaching gangrene is a ſtupefaction and deadneſs in the part; after this there comes on ſome pain, though not violent, and the ſkin becomes livid; ſometimes the ſkin ſhews no mark of it, but the pain and ſwelling increaſe; and it is neceſſary to make an inciſion into the fleſh to find the gangrened part. In the more deſperate caſes, the only remedy is the taking off the part; and, if this is neglected, the fleſh is all waſted, and the ſkin becomes black, and clings round the bones, and the grangrene appears again in the ſhoulders.

The poorer people are only ſubject to this diſeaſe; and, as they principally eat the Rye bread, and as thoſe years when there is moſt of this bad grain among the ears of Rye produce moſt of theſe diſorders, it has been judged certain that the Rye is the occaſion of it. It may deſerve enquiry, however, whether that grain may not be innocent of the miſchief, and its degeneracy and the diſtemperature attributed to it may not both be the effect of the ſame bad conſtitution of the air. If it proves, on enquiry, that only thoſe who eat of the Rye are ſubject to the diſeaſe, it will ſeem a proof of its really being owing to it; and in this caſe the miſchief may be prevented by the ſifting the grain before it is ground, the degenerated grains being ſo long that they will all remain in the ſieve that lets the other through. The experiment has been made on the ſpot, by giving the flower of the corrupted grains alone to animals; but it is ſaid, they have been killed by it. *Phil. Tranſ.* N°. 130.

S.

SABÆ'ANS *, Sabæi, the adherents to Sabaiſm; a ſect of idolaters much ancienter than Moſes and the Jewiſh law.

* The word is ſometimes alſo written Sabians, Sabaites, Zabæans, Zabians, Zabaites, Tſabæans, Tſabians, and Tſabaiſts.

The Sabæans were very numerous throughout the eaſt: in later times they have mixed ſomething of Chriſtianity with their ſuperſtition. They ſet a great value on the baptiſm of St. John; whence they have been alſo denominated Chriſtians of St. John.

Some, indeed, doubt whether the Sabæans be the ſame with the Chriſtians of St. John; but Father Angelo de St. Joſeph, a Carmelite miſſionary, and Maracci, in his notes on the Alcoran, aſſert it expreſly. Be this as it will, Mahomet, in his Alcoran, and the Arabian authors ſince him, make frequent mention of them. Beidavius, in his comment on the Alcoran, repreſents them as a kind of mean between the Chriſtians and the Maguſians, who are the followers of the Magi, among the Perſians: he adds, that they pretend to be of the religion of Noah.—Keſſæus notes, that they pretend to be in poſſeſſion of the books of Seth and Enoch, though they own none of the books of ſcripture.

Some charge them with worſhipping the ſtars; and others, the angels, or dæmons. Maimonides attributes both to them, as is obſerved under the article Sabaism.

Abu Joſeph Aſchæus and Keſſæus place the Sabæans about Charan, or Charres, and Ghezira in Meſopotamia; which opinion is confirmed by this, that their books are in the Chaldee tongue, though in a character very different from the Chaldee.

Hottinger ſets aſide the common derivation of Sabæan from צבא militia, hoſt; and will not have it the name of a ſect of religion, but of a people in Arabia Felix, the deſcendants of Saba, grandſon of Cham.—But the critics, to a man, conſpire againſt this opinion.

SA'BAISM, an ancient kind of idolatry; the firſt that ever entered into the world.

Sabaiſm conſiſted in the worſhip and adoration of the ſtars; or, as the ſcriptures call them, צבא שמים tſeba ſchamaim, ſeba ſchamaim, i. e. hoſt, or militia of heaven; whence ſome moderns formed the word Sabaiſm, to denote the worſhip of the heavenly bodies, and that of Sabæans for the worſhippers. See SABÆANS. But as the Hebrew word, whence theſe are formed, is wrote with a צ tzade, which ſome expreſs in the modern tongues by an s, ſome by a z, others by ts, and others by tz; hence ariſe a great many different manners of writing the word among different authors. Some, for inſtance, writing Sabæans, others Zabians, or Zabæans, or Zabæiſts, as Buxtorf; others Tſabians, others Tſabæans, &c.

Maimonides makes frequent mention of this idolatry in his More Nevochim: it was very general, he obſerves, in the time of Moſes. The retainers hereto taught, that God was the ſpirit of the ſphere, that is, the ſoul of the world. Abraham, he adds, was brought up in the doctrine of the Sabæans, who admitted no other gods but the ſtars, and who, in their books, many of which have been tranſlated into Arabic, maintain expreſly, that the fixed ſtars and planets are inferior gods, and the ſun and moon the ſuperior ones. Abraham at length, he tells us, oppoſing theſe errors, firſt aſſerted the exiſtence of a Creator diſtinct from the ſun. The king of the Cuthæans clapped him up in priſon; but, he ſtill perſiſting, that prince, from an apprehenſion of his diſturbing the ſtate by teaching a new religion, confiſcated his goods, and baniſhed him to the extremities of the eaſt. —This relation, he tells us, is found in a book intitled, הצבורה הנבטיה the religion of the Nabathæans.

He adds, that the Sabæans, to the adoration of the ſtars, joined a great reſpect for agriculture; ſet a high value on cattle and ſheep; and taught that it was unlawful to kill them. He even adds, that they worſhipped dæmons, under the form of goats, and eat the blood of animals, though they judged it unclean, merely becauſe they imagined it was the food of dæmons.

This is a ſummary of what that Rabbin gives us concerning Sabaiſm; from whence, it is eaſy judging of what ſome people tell us, that Sabaiſm is a mixture of Judaiſm, Chriſtianity, Mahometaniſm, and Paganiſm. The truth is, the worſhip of the ſtars was eſtabliſhed long before not only Chriſtianity, but even before the law of Moſes. Not but ſome of the later Sabæans have given into divers articles of almoſt all religions.

SA'BBATH (*Dict.*)—The Chriſtians alſo apply the word Sabbath, by extenſion, to the firſt day of the week, popularly called Sunday, or the Lord's-day; as inſtituted by the apoſtles to take place of the Jewiſh Sabbath, and by us obſerved in remembrance, not of the creation, but of the work of redemption's being compleated by our Saviour's reſurrection on that day.

Thoſe who diſpute the divine appointment of a Chriſtian Sabbath, yet allow the moral neceſſity thereof as a wiſe deſignation of time for the recruiting of our bodies, and, at the ſame time, keeping up a ſenſe of the great benefits we have received from God, and a ſpiritual temper of mind. By allowing ſix days to labour, the poor has time to earn his bread, and the man of buſineſs time to diſpatch his affairs. Had more time been allotted to labour and buſineſs, and none to reſt; our bodies would have been too much fatigued and waſted, and our minds too long engaged about worldly matters, ſo as to have forgotten divine things. Greedy people, without ſuch an injunction, would ſcarce have ſpared their own bodies, much leſs their ſervants, ſlaves, cattle, &c.—The creation, therefore, would have ſuffered, had it not been provided for by the inſtitution of a Sabbath.

SABI'NA, *ſavine*, in botany, a genus of plants, whoſe characters are:

The leaves reſemble thoſe of the cypreſs, but are more compact; the berries are verrucoſe; it has a very ſtrong and ſingular ſmell.

Savine is an ever-green ſhrubby tree, that ſeldom grows very tall, having the branches ſet cloſe together, cloathed with narrow, ſhort, ſomewhat prickly leaves, pretty much reſembling cypreſs, of a very ſtrong ſmell; among theſe, after the tree is old, and has ſtood long in a place, grow ſmall, moſſy, greeniſh flowers, which are ſucceeded by ſmall flattiſh berries, leſs than thoſe of juniper, of the ſame blackiſh blue colour. It is planted in gardens, where it ſeldom produces fruit, and has therefore generally been reputed barren.

Savine is hot and dry, opening and attenuating, and a powerful provoker of the catamenia, cauſing abortion, and expelling the birth. It is very good to deſtroy worms in children. Mr. Ray recommends the juice of it, mixed with milk, and ſweetened with ſugar, as an excellent medicine for that purpoſe; beaten into a cataplaſm, with hog's lard, it cures children's ſcabby heads.

Boerhaave, in his Chymiſtry, aſſerts, that a water, prepared from ſavine by repeated cohobations, is a moſt excellent ecbolic, emmenagogue, and promoter of the hæmorrhoids; that it is heating, and a moſt excellent medicine, if uſed diſcreetly. He farther informs us, that the chymical oil of ſavine is a moſt powerful promoter of the menſes, when their retention proceeds from a languor and debility only.

A cataplaſm, made of the ſeeds of ſavine, bruiſed with ſalgem and oil, is ſaid to be good for an anchyloſis; and a cataplaſm of the ſame leaves, mixed with honey, is frequently applied to the umbilical region, in order to deſtroy worms in the belly.

Theſe plants may be propagated by laying down their young branches in the ſpring; which, if duly watered in dry weather, will take root in a year's time, and may then be tranſplanted out, either into a nurſery, or the places where they are to remain: they may alſo be propagated by cuttings, which ſhould be planted on a moiſt ſoil about the beginning of October; which, if duly watered in dry weather, will take root, and the autumn following may be removed, as was directed for the layers.

The time for tranſplanting theſe plants is the ſame with laurels, lauruſtinus, &c. obſerving to do it in moiſt weather, laying a little mulch upon the ſurface of the ground, about their roots, to prevent their drying: after they are rooted, they will require no farther care but to keep them clear from weeds, and to dig the ground about their roots every ſpring, which will greatly promote their growth.

SA'BLE, in zoology, the name of the animal whoſe fur is ſo much valued, and ſold under the ſame name. It is a creature of the weazel kind, and called by authors muſtella zibellina. See the article Zibellina.

Sable *mouſe*, in natural hiſtory, the name of an animal found in Lapland, and in other cold countries; many extraordinary things are related of the manner of living of theſe creatures.

They are of the bigneſs of a ſquirrel, and their ſkin is ſtreaked with brown and black; there are alſo ſome ſpots beſides the ſtreaks; the black is a very fine deep colour, the brown is pale; they have two very ſharp teeth above, and two below of the ſame kind; their feet are like a ſquirrel's, and they have no tail; they are uſually very fat and fleſhy, and are ſo quarrelſome and fierce an animal, that if a ſtick be held out to them they will bite at it, and will hold it ſo faſt, that they may be toſſed and ſwung about in the air by it without letting it go. In their march they uſually keep a direct line from north-eaſt to ſouth-weſt, and always travel in thouſands in the ſame troop. The whole number forms a ſquare body, and they march only from the time of the twilight to the morning, lying ſtill all the day.

They march in lines, which are ſome ells diſtant, but always exactly parallel to each other, ſo that the places they have gone over look like the furrows of a plowed field. If they meet with any thing in their way that might deter another animal, it never ſtops them; but, though it be fire, a deep well, a pond, a torrent, or a bog, they, without heſitation, venture through, and by that means many thouſands of them are deſtroyed, and are found dead in the morning, in the waters, or otherwiſe.

If they be met ſwimming over lakes, and attacked by men in boats, with the oars, boat hooks, or other inſtruments; they neither retreat nor offer to run up the oars, but hold on their courſe; and if they be put out of it they preſently return into it again. When they are met in the woods or fields, they ſet themſelves upon their hinder feet, and make a ſort of ſqueaking noiſe, ſomewhat like the barking of a dog; they will leap up at a man, and riſe as high as his head, and in this manner they will defend their line a long time; but, if they find themſelves overpowered, they will diſperſe and run into holes, or any other places of ſecrecy, making a noiſe, which ſounds ſomething like the word biob, biob.

They never come into a houſe, nor meddle with any thing that we eat; if they chance to come to a houſe in their way, there they ſtop till they die; but, if they come to a ſtack of hay or corn, they eat their way through.

When they march over a meadow, they do it great damage, by eating the roots of the graſs; but, if they encamp there, they wholly deſtroy the produce; the land looks like a place where there had been a fire, and the whole ſurface looks as if ſtrewed with aſhes.

They are ſaid to be very fruitful, bringing forth eight or nine at a time; but it is certain, at leaſt, that they bring forth more than one, for, in their marches, it is not unuſual to ſee a female with a young one in her mouth and another on her back. They ſeem no great delicacy to creatures of prey. If dogs or cats kill them they eat only the head, and when a bird of prey ſeizes them it only feeds on the entrails; it is ſaid only on the heart: the poor Laplanders, however, in want of other food, eat the whole body, and ſay it is as well taſted as a ſquirrel. In the ſeverity of winter theſe creatures lie under the ſnow, and have their breathing-holes as the hares, and other inhabitants of theſe places uſe to have. The Laplanders are always glad to ſee theſe creatures on their march, for it always foretels plenty of more valuable creatures among them: the ſame cold, that ſends theſe out, ſending alſo a number of fowls, ſquirrels, foxes, and other animals the ſame way. Wormius has written a complete treatiſe on this animal, calling it mus Norwegius; this is reprinted at large in his Muſeum. *Phil. Tranſ.* N°. 251.

SA'CCHARUM *ſaturni*, ſugar of lead, in medicine, is recommended by ſome internally for dyſenteries, and hæmorrhages of all kinds; but the generality of the world condemn it, as containing all the poiſonous qualities of the metal it is made from in their higheſt degree.

Externally, it has been long famous for its virtues in the eryſipelas, in inflammations of all kinds, and in embrocations. It is uſed alſo in ſmall quantities in collyriums for the eyes; it deterges, dries, and cicatriſes ulcers; and in gonorrhœas is mixed in injections with great ſucceſs.

It is well known that this ſalt made with the common vegetable or mineral acid, when diſtilled, will not give back the acid again, but only yields a water without any ſharp taſte and an inflammable oil; but if it is made into the animal acid of piſmires, whether procured by diſtilling thoſe inſects freſh, or by throwing large quantities of them into water till it is ſufficiently impregnated, it will, on diſtillation, yield back the ſame proportion of acid of the ſame ſtrength. *Philoſ. Tranſact.* N°. 68.

SA'CRIFICE (*Dict.*)—The manner of ſacrificing among the ancient Hebrews, is amply deſcribed in the books of Moſes. That in uſe among the Romans is as follows:—In the choice of the victim, care was taken it were without blemiſh or imperfection, its tail not too ſmall at the end; the tongue not black, nor ears cleft; and the bulls ſuch as had never been yoked. The victim being pitched upon, they gilt his forehead and horns, eſpecially if a bull, heifer, or cow. The head they alſo adorned with a woollen infula, whence hung two rows of chaplets, with twiſted ribbons; and on the middle of the body a kind of ſtole, pretty large, hung down on both ſides: the leſſer victims were only adorned with bundles of flowers and garlands, together with white tufts or garlands.

The victims, thus made ready, were brought before the altar; the leſſer were not led in a ſtring, but driven to the place: the greater were conducted in an halter; if they made any ſtruggle, or refuſed to go, the reſiſtance was taken for an ill augury, and the Sacrifice ſet aſide.—The victim, thus brought before the altar, was examined very circumſpectly, to ſee if there were no defect in it: then the prieſt, being clad in his ſacerdotal habit, and accompanied with the ſacrificers and other attendants, and being waſhed and purified according to the ceremonies preſcribed, began the Sacrifice, with making a loud confeſſion of his unworthineſs, acknowledging himſelf guilty of divers ſins; for which he begged pardon of the gods, hoping they would be pleaſed to grant his requeſts.—Theſe confeſſions were like thoſe of the Hebrews; with this difference, that the Pagans confeſſed the frailty of mankind, and owned their faults; the Jews confeſſed chiefly the greatneſs of God, accompanying it with hymns and muſical inſtruments.

The confeſſion over, the prieſt cried aloud, Hoc age, i. e. Compoſe yourſelves, and mind your buſineſs; and preſently an uſher, holding a rod in his hand, called commentaculum, went through the temple, and made all thoſe withdraw, who were not initiated in the myſteries of religion, or ſuch as were excommunicated.

The cuſtom of the Greeks, from whom the Romans borrowed theirs, was, that the prieſt, coming to the altar, ſhould aſk aloud, Τίς τί δε? Who is here? The people anſwered, Πολλοὶ καὶ ἀγαθοὶ, many good perſons: then the uſher went through the temple, crying, Ἑκὰς, ἑκὰς, ἔστε βέβηλοι, that is, out with the wicked. The Romans commonly uſed the words, nocentes, profani, abſcedite.—All thoſe who were driven out of the temples among the Greeks, were comprehended under theſe general words βέβηλοι, ἀμύητοι, ἀκαθάροι. The profane being withdrawn, they cried, favete linguis, or animis, and paſcite linguam, to require ſilence, and attention during the Sacrifice.

Theſe ceremonies ended, the chief ſacrificer being ſat down, and the reſt of them ſtanding, the magiſtrates or perſons, who offered Sacrifice, came before him, and preſented him with the firſt-fruits and victim, and ſometimes made a ſhort diſcourſe, by way of compliment; as we find Homer makes Ulyſſes do, when he preſented the high-prieſt with Iphigenia to be ſacrificed.—As any perſon came to preſent his offering, he waſhed his hands in a place appointed in the temple for that purpoſe.

Laſtly, when the offering was made, the prieſt that officiated, perfumed the victim with incenſe, and ſprinkled it with luſtral water; and having waſhed his hands, and got up again to the altar, he prayed to the god to whom he preſented the Sacrifice, with a loud voice, that he would accept of thoſe offerings, and be pleaſed with the victim he ſacrificed to him for the public good, and for ſuch and ſuch things in particular.—In the cloſe of the offertory and prayer, made by the prieſt to the gods, he came down the ſteps of the altar, and, from the hand of one of his aſſiſtants, received the ſacred paſte, called mola ſalſa, made of barley or wheat flour, mixed with ſalt and water, which he threw upon the head of the victim, ſprinkling a little wine upon it, which was called immolatio.—Servius ſays, the prieſt ſcattered little bits of this paſte upon the head of the victim, the altar where the ſacred fire burned, and the knives, by way of conſecration. He then took wine in a veſſel called ſimpulum, and having taſted it himſelf firſt, and made his aſſiſtants do the ſame, to ſhew that they partook of the Sacrifice, he poured it between the horns of the victim, pronouncing theſe words of the conſecration, Mactus hoc vino inferis eſto; Let this victim be improved and honoured by this wine. This done, he pulled off the hairs from between the horns, and threw them into the fire; and commanded the victimarius, who aſked him, Agon', Shall I ſtrike? to knock down the victim with a blow on the head with an hammer or ax; upon which, another aſſiſtant, named popa, preſently thruſt a knife into his throat; whilſt a third received the blood, wherewith the prieſt ſprinkled the altar.

When the victim was ſlain, they flead him, if it was not a burnt offering, for then they burned ſkin and all; took the fleſh off the head, and adorned it with garlands and flowers, faſtened it to the pillars of the temples, as well as the ſkins, as enſigns of religion; carrying them about in proceſſion in public calamities.—Not but that the prieſts often wore the ſkins, and others went to ſleep upon them in the temples of Æſculapius and Faunus, that they might receive favourable reſponſes in their dreams, or be cured of their maladies. They then opened the victim's entrails, and after circumſpectly viewing them, to draw preſages therefrom, according to the art of the aruſpices, they floured them with meal, and ſprinkled them with wine, and made a preſent of them to the gods, reddebant exta diis, by throwing them into the fire in ſmall bits, boiled or parboiled; and hence the entrails were called porriciæ.

The entrails being burned, and the other ceremonies finiſhed, they believed the gods to be ſatisfied; and that they could not fail to find their vows accompliſhed, which they expreſſed by the word litare, q. d. all is finiſhed, and well done; whereas non litare, on the contrary, intimated there was ſomething wanting to the perfection of the Sacrifice, and that the gods were not appeaſed.— The prieſt afterwards diſmiſſed the people with theſe words, Ilicet.

Hence it may be obſerved, that the Sacrifices conſiſted of four principal parts; the firſt called libatio, or the pouring a little wine upon the victim; the ſecond immolatio, when, after they had ſcattered the crumbs of ſalted paſte thereon, they killed it; the third, redditio, when they offered the entrails to the gods; and the fourth, litatio, when the Sacrifice was perfected, and accompliſhed without any fault.

SA'CRILEGE (*Dict.*)— The ancient Chriſtian church diſtinguiſhed ſeveral ſorts of Sacrilege, which were puniſhed with different kinds of cenſures.

The firſt kind of Sacrilege was, the diverting things, appropriated to ſacred uſes, to other purpoſes. 'If any one, ſay the apoſtolical canons, either of the clergy or laity, take wax or oil out of the church, let him be caſt out of the communion, and make reſtitution, with the addition of a fifth part'. The ſame cenſure is denounced againſt ſuch as apply to their own uſe the ſacred utenſils of gold, ſilver, or linen. The fourth council of Carthage excommunicates thoſe perſons, as guilty of Sacrilege, who withhold from the church ſuch donations as are left to it by the deceaſed. And whether a man retracted what he himſelf had given to the church, or detained what was given by others, or robbed her of what ſhe was actually poſſeſſed of, it was all the ſame ſpecies of Sacrilege, and equally puniſhed with excommunication.

Another crime, puniſhed under the name of Sacrilege, was, robbing the graves, or defacing and ſpoiling the monuments of the dead. The imperial laws made this offence capital.

Another ſort of men, who were accuſed and condemned as ſacrilegious perſons, were thoſe, whom they commonly called traitors, becauſe they delivered up their bibles, and the ſacred utenſils of the church, to the Pagans, in the time of the Diocleſian perſecution. The firſt council of Arles makes it depoſition for any clergyman to be guilty of this baſe piece of treachery.

A fourth ſpecies of Sacrilege was, the profaning the ſacraments, the churches, altars, holy ſcriptures, &c. There are ſome inſtances of turning churches into ſtables. We may reckon alſo all ſorts of idolatry and divination, magic, and the abuſe of the ſcriptures for lots, charms, and amulets, among this ſpecies of Sacrilege.

Fifthly, the moleſting or hindering a clergyman in the performance of his proper office, is, in the civil law, called Sacrilege; and, by a law of Honorius, all ſuch criminals were to be notified by public officers to the governor of the province, who was to proceed againſt them, and puniſh them as capital offenders.

Laſtly, the ancients reckoned it Sacrilege to deprive men of the uſe of the ſcriptures, or the ſacraments, particularly of the cup in the Euchariſt.

The Romiſh caſuiſts acknowledge theſe ſeveral ſpecies of Sacrilege, excepting only the laſt, which, for a very obvious reaſon, they never mention. But they call many things Sacrilege, which the ancients reckoned no crimes at all; as the laying taxes or tribute upon eccleſiaſtics, by the civil power, without conſent of the Pope; for which ſecular princes are excommunicated by the famous bull in Cœna Domini: as alſo the bringing eccleſiaſtical perſons, for any crime, before the ſecular tribunals. Some other things, very laudable in themſelves, they brand with the odious name of Sacrilege; as, the removing images out of places of divine worſhip.

SA'DDLE, in the manage, a kind of ſtuffed ſeat, laid on the back of a horſe, for the convenience of the rider.

The origin of the Saddle is not well known: Gorop. Becanus attributes its invention to the Salii, a people among the ancient Franks; and hence, ſays he, came the Latin ſella, a Saddle.

It is certain that the ancient Romans were unacquainted with the uſe either of Saddle or ſtirrups; whence Galen obſerves in ſeveral places, that the Roman cavalry, in his time, were ſubject to ſeveral diſeaſes of the hips and legs, for want of having their feet ſuſtained on horſe-back. And, long before him, Hippocrates had noted, that the Scythians, who were much on horſe-back, were troubled with defluxions in their legs, becauſe of their hanging down.

The firſt time we hear of Saddles among the Romans, was anno 340; when Conſtantius, endeavouring to deprive his brother Conſtantine of the empire, made head againſt his army, and, entering the ſquadron where he himſelf was, threw him off his Saddle, as we are informed by the hiſtorian Zonaras.— Before, they made uſe of ſquare pannels; ſuch as we ſee in the ſtatue of Antoninus in the capitol.

The uſe of Saddles was firſt eſtabliſhed in England, by a law of Henry VII, whereby the nobility were obliged to ride on Saddles.— It is but very lately that the Iriſh have taken to it.

There are various kinds of Saddles; as the

Running SADDLE, a very ſmall one, with round ſkirts.

Burford SADDLE, which has the ſeat and ſkirts plain.

Pad SADDLE, of which there are two kinds; the one made with burs before the ſeat, the other with bolſters under the thighs.

French pad SADDLE, the burs whereof come all round the ſeat.

Portmantua SADDLE, furniſhed with a cantle behind the ſeat, to keep a carriage off the rider's back.

War SADDLE, furniſhed with a cantle, and a bolſter both behind and before.

SADDLE-GALLED, is when a horſe's back is hurt, or fretted with the Saddle.

It is cured by bathing the part with urine, or warm wine: when the ſore is large, they bathe it with aqua ſecunda, ſtrewing over it the powder of old ropes of flax, and conſuming the proud fleſh with vitriol or colcothar.

SAGE *Apples*, a name given by naturaliſts to a ſort of ſoft gall or protuberance, found frequently on the leaves and ſtalks of Sage in the eaſtern part of the world, and much reſembling the ſoft gall of the oak leaf, called the oak apple.

Theſe are both owing to the ſame cauſe, the puncture of an inſect of the fly kind, which depoſits its eggs in the wound; and the worms or maggots, hatched from thoſe eggs, feed on the inſide of the gall, and occaſion a preternatural derivation of juices to the part, whence it ſwells and aſſumes this form. The leaves of many other plants are alſo liable to the ſame accident, particularly thoſe of ground-ivy, on which there grows eatable galls of this kind. The Sage apples are ſo frequent in the eaſt, that they are brought to market at Conſtantinople, and eaten as delicacies.

SA'GENE, a Ruſſian meaſure equivalent to ſeven Engliſh feet. Five hundred Sagenes make a werſt. *Phil. Tranſ.* N°. 445.

SAGITTA'RIA *alexipharmica*, *arrow-root*, *dart-wort.*— This plant has a root two or three inches in length, geniculated, of the thickneſs of a man's thumb, white, and of a conic figure, every interval or ſpace between the joints being half an inch in length, and every joint ſending forth ſeveral fibres two or three inches long, for attracting nouriſhment. From the root ariſe various leaves on pedicles three inches in length, and of a good breadth, embracing one another, or the outer ones wrapping themſelves about the inner, and ſurrounded with a white ring at the place of appoſition. The leaves are four inches long, and two inches broad, near the round baſe, where they are broadeſt, and are thin, fibrous, and graſſy, and of a greeniſh-yellow colour. In other reſpects it is like the canna Indica.

Sir Hans Sloane obſerved this plant in the gardens of Jamaica and the Caribbee Iſlands. It was tranſplanted to Jamaica from the iſland of Dominica, and is highly valued, on account of its alexipharmic virtue, and its efficacy againſt wounds inflicted by poiſoned darts and arrows; for which purpoſe it is frequently uſed by the Indians, who bruiſe the herb, and apply it to the injured place. *Raii Hiſt. Plant.*

SAIL, in navigation, an aſſemblage of ſeveral breadths of canvas, or ſtrong hempen cloth, ſewed together by the liſts, and edged around with a cord; faſtened to the yards and ſtays of a veſſel, to make it drive before the wind, which bears thereupon.

There are two kinds of Sails; the one ſquare, generally uſed in large ſhips or veſſels.— This has various names, according to the various maſts it is faſtened to; as the main Sail, fore Sail, the mizzen Sail, the ſprit Sail, &c.

The others are triangular, called ſmack Sails, and by ſome Latin Sails, becauſe chiefly uſed in Italy, and in flat-bottomed veſſels; though they are alſo uſed on the mizzen-maſts and ſtays of other veſſels.— They need but few ropes, and little wind; but are dangerous, and not to be uſed in foul weather.

There are ordinarily ten Sails in large veſſels; which number is increaſed at bottom by the addition of bonnets, and at the ſides by caſe Sails.

A veſſel is ſaid to ſet Sail, to go with full Sail, to make all her Sail, that is, to open all her Sails. To be under Sail, is to have ſet Sail, &c.

SAILS, alſo denote the vanes of windmills; or the arms or flights, whereby the wind has its effect on windmills.— Theſe are either horizontal or perpendicular.

SA'ILING (*Dict.*)— Sailing, in a more confined ſenſe, is the art of conducting a veſſel from place to place, by the working or handling of her ſails and rudder: though what is done, by means of this latter, is more properly called ſteering or guiding.

To bring Sailing to certain rules, M. Renau computes the force of the water, againſt the ſhip's rudder, ſtem, and ſide; and that of the wind againſt her ſails.— In order to this, he 1. conſiders all fluid bodies, as the air, water, &c. as compoſed of little particles, which, when they act upon, or move againſt any ſurface, do all move parallel to one another, or ſtrike againſt the ſurface after the ſame manner. 2. That the motion of any body, with regard to a ſurface on which it is to ſtrike, muſt be either perpendicular, parallel, or oblique. In the firſt caſe, the body ſtrikes with all its force, which will be greater or leſs, according as the body moves ſwifter or ſlower. In the ſecond caſe, the line of motion *a b*, *Plate* XLI. *fig.* 1. will not affect the ſurface at all; becauſe it is no way oppoſed to it; nor can the moving body ſtrike upon it, or touch it. In the third, if the line of motion, A D, be oblique to the ſurface D C, ſo that the angle of incidence be A D C, then the motion of the body in the line A D may be reſolved into two directions, viz. into A E or B D, and A B. But the direction or line of motion A E, being parallel to the ſurface D C, cannot affect it at all; ſo that the whole motion of the body A, in that oblique manner of ſtriking on the ſurface, will be expounded by the perpendicular line A B. And if D A be made the radius of a circle, whoſe center is at D, B A will be the ſine of the angle of incidence, A D C.

Hence it is deduced, that the force of a particle of air or water, as A, ſtriking againſt the ſurface D C, which may repreſent either a ſail or the rudder of a ſhip, in the oblique direction A D, will be to the perpendicular force thereof, as B A is to D A: that is, as the ſine of the angle of incidence is to the radius.

And ſince what is thus true of one particle, ſingly conſidered, will be true of all the particles of any fluid body collectively; it will follow, that the force of the air or water, ſtriking perpendicularly upon a ſail or rudder, to the force of the ſame, in any oblique impingency, will be, as the ſquare of the radius to the ſquare of the ſine of the angle of incidence: and, conſequently, that all oblique forces of the wind againſt the ſails, or of the water againſt the rudder, will be to one another, as the ſquares of the ſines of the angles of incidence.

If the different degrees of velocities be conſidered, it will be found, that the forces will then be as the ſquares of the velocities of the moving air or water; that is, a wind that blows thrice as ſtrong, or moves thrice as ſwift as another, will have nine times the force upon the ſail.— And it being alſo indifferent, whether you conſider the motion of a ſolid in a fluid whoſe particles are at reſt; or of thoſe particles moving all parallel againſt a ſolid that is at reſt; the reciprocal impreſſions being always the ſame; if a ſolid be moved with different velocities in the ſame fluid matter, as ſuppoſe water, the different reſiſtances which it will receive from that water will be in the ſame proportion, as the ſquares of the velocities of that body.

Let H M, *fig.* 2, repreſent a ſhip, C D the poſition of the ſail, and A B the courſe of the wind blowing towards B. Draw B G perpendicularly to the ſail, and G K perpendicular to the line of the keel produced H M K. By what is ſaid above, the ſail C D will be driven by the wind A B, according to the direction of the line B G. So that, if ſhe could divide the water every way with the ſame facility, as ſhe doth with her head, the ſhip would go directly to the point G, along the line B G. And, if H K repreſent her direct courſe, ſhe would have got forwards the length B K, and ſideways ſhe would have gone the quantity G K. But, as her length is much greater than her breadth, ſo ſhe will divide the water, or make her way in it with more difficulty with her ſide, than with her head or ſtern; on which account, ſhe will not run ſideways ſo far as K G, but fall ſhort of it in proportion to the ſaid difficulty of dividing the water with her ſide, that is, if the reſiſtance ſhe finds in her paſſing through the water ſideways, be to that of paſſing lengthways, ſuppoſe, as ten to one, then will not the ſhip get ſideways above a tenth part of the line G K.

Wherefore, if K G be found to G L, in the ratio of the reſiſtance of the ſide to that of the head, and the line B L be drawn; the ſhip will go to the point L, along the line B L, in the ſame time as it would have gone to G, if it could have divided the water every way equally. — This part, K L, is called the drift, or lee-way of a ſhip, and the angle K B L is her degrees of lee-way; as the angle A B K expreſſes how near the wind ſhe lies.

After this, the author proceeds to demonſtrate, that the beſt poſition or ſituation of a ſhip, ſo as ſhe may make the leaſt lee-way, but go to wind-ward as much as poſſible, is this: that, let the ſail have what ſituation it will, the ſhip be always in a line biſſecting the complement of the wind's angle of incidence upon the ſail; that is, ſuppoſing the ſail in the poſition B C (*fig.* 3.) the wind blowing from A to B, and conſequently the angle of the wind's incidence on the ſail A B C, and its complement C B E; then muſt the ſhip be put into the poſition B K, or move in the line B K, biſſecting the angle CBE. He ſhews farther, that the angle which the ſail ought to make with the wind, i. e. the angle A B C, ought to be but twenty-four degrees; that being the moſt advantageous ſituation to go to wind-ward, the moſt that is poſſible. And, in order to bring this to bear in practice, he directs to put marks to the ſheets, braces, and bow-lines of the lower ſails, to know when they are in their beſt ſituation; and then, even in the night, when the marks of a brace or of a ſheet ſhall come to the cleat, one may be pretty well aſſured, that the ſail trims well.

To this might be added, many curious things from Borelli de Vi Percuſſionis, concerning the different direction given to a veſſel from the rudder, when ſailing with a wind, or floating without ſails in a current; in the former caſe, the head of the ſhip always coming to the rudder, and in the latter always flying off from it.

SAI'NTFOIN, *ſanum*, or *ſanctum fœnum*, the name given by the French, and continued by us to a ſpecies of plant, frequently uſed for the food of cattle, either freſh or dried; it is called holy-hay, or wholeſome hay, from its excellent nutritive quality. The ſtalks of the plant are commonly about two feet long, but they grow ſometimes to five or ſix feet, and it has tufts of red flowers of three, four, or five inches in length.

This plant will make a forty times greater increaſe in poor ground than the common turf; and this is owing to its having along perpendicular root, of that kind, called tap roots, which ſinks to a great depth to attract its nouriſhment. The length of this root is ſcarce to be credited by any but thoſe who have ſeen it; it is frequently drawn out of the ground to the length of twelve or fourteen feet, but it is ſaid to be often thirty feet or more in length.

The farmers have a general opinion, that this plant never ſucceeds well in any land, where there is not an under ſtratum of ſtone, or chalk, or ſome other hard matter, to ſtop its running; but that otherwiſe it ſpends itſelf in root, and comes to nothing above-ground. This is an error too groſs to need much refutation. It is certain, that, the roots being to plants what the ſtomach and guts are to animals, the more and larger roots any plant has, the more nouriſhment it receives, and the better it thrives.

Saintfoin always ſucceeds where its roots run deep, and the beſt crops of all are produced upon lands where there is no hard under ſoil to obſtruct their paſſage. An under ſoil of clay may kill the plants, by retaining the water, and chilling and rotting their roots.

The long root of Saintfoin has, near the ſurface, many horizontal roots iſſuing from it, which extend themſelves every way; there are of the ſame kind all the way down, as the roots go, but they grow ſhorter and ſhorter all the way. Any dry land may be made to produce this valuable and uſeful plant, though it be ever ſo poor, but the richeſt and beſt land will produce the beſt crops of it. The beſt way of ſowing it is by drilling, but the earth muſt be very well prepared, and the ſeed well ordered, or elſe very little of it will grow. The heads of theſe ſeeds are ſo large, and their necks ſo weak, that, if they be much more than half an inch deep, they are not able to riſe through the incumbent mould; and, if they are not covered, they will be malted, as the farmers expreſs it; that is, it will ſend out its root while it lies above-ground, and be killed by the air; and whether the farmer plants bad ſeed that will not grow, or good ſeed that is buried or malted, the event will be the ſame. The ground will be underſtocked with plants. A buſhel of ſeed to an acre of land is full twenty ſeeds to each ſquare foot of land; but, as there is ſome difference in the largeneſs of the ſeeds, there is no abſolute certainty as to this calculation. The worſt ſeaſons for planting it are the beginning of winter, and the drought of ſummer; the beſt is the beginning of the ſpring; and it is always ſtrongeſt when planted alone, and is not ſown together with corn, as is the practice of ſome farmers. If barley, oats, or any other corn, ſown with the Saintfoin, happen to be lodged afterwards, it kills the young Saintfoin. If it be planted with any other corn, it is beſt done by drilling in the horſe-hoeing way; in this caſe it is not much liable to be killed by the lodging of the corn, as the drilled corn ſeldom falls at all, and, when it does, never falls ſo low as the ſown corn.

The quantity of ſeed to be drilled upon an acre of land will depend wholly upon the goodneſs of it; for there is ſome ſeed of which not one in ten will ſtrike, whereas in good ſeed not one in twenty will fail. The method of knowing the goodneſs, is, by ſowing a certain number of the ſeeds, and ſeeing how many plants are produced by them. The external ſigns of the ſeeds being good are, that the huſk is of a bright colour, and the kernel plump, of a light grey or blue colour, and ſometimes of a ſhining black. The ſeed may be good, though the huſk be black, as that is owing ſometimes to the letting it receive the wet in the field, not to its being half rotted in the heap.

If the kernel be cut a-croſs, and appear greeniſh and freſh, it is a certain ſign that it is good. if it be of a yellowiſh colour, and friable, and look thin and pitted, they are bad ſigns. The quantity of ſeeds allowed to the acre in the drill way is much leſs than that by ſowing, and is to be computed according to the number of plants that are to be allowed in that ſpace, allowing for the common caſualties. It is not neceſſary to be exact in this calculation, or to ſay whether two, three, or four hundred plants are to be allowed to a ſquare perch; neither is it poſſible to know beforehand the preciſe number of plants that may live out of thoſe that come up; for ſometimes the grub takes them when they have only the two firſt leaves, and the crop is greatly diminiſhed by this means. Four gallons of good ſeed to an acre of land will cover it with plants, when judiciouſly managed.

Single plants of Saintfoin make the greateſt crops; but the farmers, in general, plant them ſo cloſe, that they ſtarve one another. The ſingle plants always run the deepeſt, and thoſe which do ſo will always draw moſt nouriſhment. The plants which ſtand crowded ſtarve one another, and often die after a few years; but the ſingle ones grow to a vaſt bigneſs, and are every year better and better.

The beſt way to calculate how many plants are to be allowed to a perch, is to compute how much hay each ſingle large plant will produce; for, if kept ſingle, and well cultivated, they will all be large ones. Without culture, theſe plants never arrive at a fourth part of the ſize that they do with it. The hay of a large ſingle cultivated plant will weigh more than half a pound, and a hundred and twelve plants upon a ſquare perch, weighing but a quarter of a pound a piece, one with another, amount to two tons to an acre. If Saintfoin be planted on ſome ſorts of land early in the ſpring and hoed, it will ſometimes produce a crop the following ſummer; in a garden the ſeeds ſown in February will yield plants of two feet high that will flower in the month of June following; and, though March be froſty, the young plants ſeldom ſuffer by it. This ſhews, that this plant is naturally a quick grower; but the farmers uſually plant it on poor or cold land, and give it too little culture, which make it backward, and ſlow of growth with them. The poor land, uſually allotted to this plant, alſo makes it generally yield but one crop a year, but on a rich land it will yield two very good crops annually, with a moderate ſhare of culture and management.

The farmer who expects to make a profit of this plant muſt not expect a good crop the firſt year. Nothing is ſo injurious to Saintfoin as its ſtanding too thick; if it be ſown ſo thick as to cover the ground the firſt ſummer, the plants will ſtarve one another for ever after; but, if the owner will be content to place them ſo thinly as to have but a ſmall crop the firſt year, they will increaſe prodigiouſly, and every ſucceeding crop will be better and better. When Saintfoin is well hoed, it will grow as much in a fortnight as it would otherwiſe do in ſix weeks; and this quick growing is of advantage to it every way, not only making the plants large, but of better nouriſhment to the cattle, whether they are eaten green or made into hay.

The proper diſtance to drill this plant for the horſe-hoeing huſbandry is at double rows with eight inch partitions between them, and thirty inch intervals between every two and two. Theſe intervals need only be hoed alternately, leaving every other interval for making the hay on. This method of hoeing is of vaſt advantage, and poor land by means of it will always produce two crops a year. The land is always to be perfectly cleared of graſs before the ſowing the Saintfoin, and the lumps of earth carefully broken. But no harrowing is to be allowed after it is drilled, for that would bury it; and it is not proper to roll it at all, unleſs for the ſake of barley, when they are ſown together; and when that is done, it ſhould be with a light roller and in dry weather. This ſhould be done lengthwiſe of the rows, and as ſoon as it is drilled; if it be not done at this time, it is beſt to ſtay three weeks before it is done, that the necks of the young Saintfoin may not be broken. No cattle are to be ſuffered to come in the firſt winter upon the Saintfoin, after the corn is out, among which it was ſown. Their feet would injure it by treading the ground hard, as much as their mouths by cropping it, and it would never come to good. Sheep ſhould not be ſuffered to come at it, even the following ſummer and winter. One acre of drilled Saintfoin, conſidering the difference of the quantity and goodneſs of the crop, is worth two acres of ſown Saintfoin on the ſame land, though the expence of drilling be twenty times leſs than that of ſowing. The firſt winter is the time to lay on manure after the corn is reaped off. Pot-aſhes, or the like, are very proper, and a ſmall quantity of them will do, as there are at this time no other plants to partake of the benefit, but the young crop has it all; and the young plants, being thus made ſtrong at firſt, will continue ſo, and be long the better for it.

It is obſerved, however, that in the drilling and horſe-hoeing way there is no neceſſity for any manure at all. Some farmers ſow eight or ten buſhels of the ſeed of Saintfoin to an acre along with their corn, with intent that it ſhould kill all the other weeds; but the conſequence is, that the plants ſtand cloſe, and ſtarve one another, and are no bigger than where the plant grows wild on the hills in Calabria, where it is ſo ſmall and ſeemingly deſpicable a plant, that it ſeems a wonder that any body ſhould be tempted to think of cultivating it: yet, when rightly managed, it ſeems capable of being as uſeful a plant as any in the world. Where theſe plants ſtand ſo thick, they draw out all the nouriſhment from the ground, in a few firſt years, and ſo die, though manured ever ſo carefully. Six or ſeven years ſeems their greateſt duration; whereas, when the ſeed is drilled in, and the plants are horſe-hoed, they will be as ſtrong and vigorous as ever, at thirty years ſtanding.

Some people who have turned their thoughts to huſbandry, have been of opinion, that the cytiſus would ſucceed better with us than the Saintfoin; it is probable enough that it would grow well; but the labour of ſheering it would, with us, where the pay of ſervants is ſo dear, run away with the greateſt part of the profits of the crop.

Lucerne is another thing which many have thought of introducing among us in the place of Saintfoin, but it requires ſo much care to ſuit it with a proper ſoil, that, whatever are the profits of it, it never can be ſo general as Saintfoin. *Tull's Horſe-hoeing Huſbandry.*

Saintfoin ſucceeds beſt alſo in high grounds, which is a great advantage in the article of making it into hay, as it has greatly more advantage of the ſun, and leſs to fear of miſchief from wet than graſs which grows in low grounds. On the high grounds the wind will dry more in an hour than it will in meadows that lie low in a whole day; and often the crops of Saintfoin make a very good hay in the ſame ſeaſons in which all the graſs hay is utterly ſpoiled. The ſun on the high grounds has alſo a more benign influence, and ſends off the dew there two hours earlier in the morning, and holds it up as much longer in the evening; by theſe advantages, the Saintfoin has more time to dry, and is made with half the expence of common hay.

All kinds of hay differ greatly in their goodneſs, according to the manner in which they are made; but the hay of Saintfoin differs more than all.

There are properly four kinds of the Saintfoin hay, differing according to the times of cutting them. Theſe are, firſt, the virgin hay; ſecondly, the bloſſomed hay; thirdly, the full grown hay; and fourthly, the thraſhed hay. The firſt of theſe, or virgin hay of Saintfoin, is the beſt of all, and excepting lucerne, has not its equal in the world. The Saintfoin for this hay muſt be cut before it begins to bloſſom; for when it ſtands till full blown, the moſt volatile ſpirituous and nutritive parts of its juices are ſpent on the generation; and this being done at once, the ſap is greatly depauperated, and the plant can never afterwards recover the ſtrength, vigour, and nutritive qualities it had at that time. The exact time of cutting this is, when a few of the bloſſoms, which are forwarder than the reſt, are beginning to look red. Saintfoin, cut in this ſtate, even though the weather prove bad, may be made up in ſmall ricks, and a chaff baſket drawn in the middle of each; this eaſy care will prevent it from firing; and, though the colour be a little altered, it will be as good and nouriſhing, as if made at the moſt favourable ſeaſon. Working ſtone-horſes have been kept for the whole winter on this hay alone without corn, and they are ſo fond of it, that they will refuſe beans and oats mixed with chaff in the common way for it.

Sheep will alſo be fatted in pens in winter with only this hay and water, better than with peaſe, oats, and the like; and, if the hay be weighed to them, and the whole expence and profit computed, the clear profit will be found to amount to four pounds a ton. Theſe creatures make no waſte in this way of feeding, but eat up every morſel of the ſtalks, though ever ſo thick, for they are always brittle, and are as well taſted as the reſt.

The bloſſom hay is very beautiful to the eye, and of a very ſweet ſmell; but it does not fatten the ſheep as the virgin hay does, nor can working horſes be kept fat upon this without an admixture of ſome corn.

The land ought to be well tilled for the virgin hay; for, if it ſtands on a poor land, without much culture, it will not be above four or five inches long before it flowers, and will therefore yield but a poor quantity, and will ſpring up again, but very ſlowly, for another crop; but, when on good land and well tilled, it will yield at this time two or three tons to an acre, and will ſpring up immediately very ſtrong for a ſecond crop.

This virgin hay is ſeldom ſold, it being worth a much greater price than the common, and is uſually kept by the farmer for his own uſe.

SAINTS, Sancti, in the Romiſh church, holy perſons deceaſed, and, ſince their deceaſe, canoniſed by the pope, after ſeveral informations and ceremonies.

One of the points wherein the Roman Catholics and Proteſtants differ, is, that the former addreſs, invoke, ſupplicate Saints, &c. to intercede for them; whereas the latter hold it ſufficient to propoſe their good examples for our imitation.

The number of Saints, allowed as ſuch, in the Romiſh church, is prodigious: Father Papebroche reckons ſeventeen or eighteen hundred to have died on the firſt of June, only. Indeed, the crowd of Saints wherewith their martyrologies are ſtocked, is ſcandalous, even to the more ſober of their own communion.

Father Mabillon, in an expreſs diſſertation on the Worſhip of unknown Saints, obſerves, that honours are given to Saints, who, perhaps, were not Chriſtians; and whoſe names were never known. Hence, being under a neceſſity of giving them names, they are therefore called baptiſed Saints. He adds, that they every day beſeech Saints to intercede for them with God, when it is much doubted, whether they themſelves be in heaven.

Father Papebroche and his aſſociates have been a long time employed in writing the lives and acts of the Saints: they range them each on the day of the year wherein they died: for the firſt ſix months they have publiſhed twenty-four volumes in folio; and ſince Papebroche's death, in 1714, his ſucceſſors have publiſhed two more.

SAL *Aquarum*, in natural hiſtory, a name given by many of the ancient writers to the nitre of the ancients or natrum.

They had this ſalt principally from Egypt, and called it, in their works, the produce of the evaporated waters of the Nile; for this reaſon Hippocrates ſometimes calls it Sal Ægypti, and ſometimes Sal in aquis creſcens, a ſalt growing in the waters.

Sal *circulatum*, in chemiſtry, a term uſed by Paracelſus for a preparation of ſea-ſalt, of which he diſtinguiſhes two kinds, under the name of circulatum minus and circulatum majus. Theſe ſeem to have a great affinity with the famous alkaheſt or univerſal ſolvent, ſo much talked of in the works of this author, and his ſucceſſor Van Helmont.

The circulatum minus was a liquor procured by a tedious proceſs from ſea-ſalt; this ſalt, he ſays, is that body in which nature has placed the greateſt perfection; and from this he, by incredible induſtry, procured a liquor which he calls a perpetual oil, and to which he alſo gives the name of the ens primum of ſalts. He calls it the higheſt and moſt ſucceſsful of all ſalts, and declares that all poiſons are ſubdued by it; and that being brought to the utmoſt degree of purity and ſubtility, it pervades all bodies, and readily diſſolves them, itſelf remaining unaltered in the action. Theſe are all properties expreſly attributed by Helmont to the famous alcaheſt.

The circulatum majus, however, we are told, by the ſame author, was much more powerful and much more difficult to be obtained. This he calls the matter of mercurial ſalt, and the living fire. He acknowledges that the higheſt fire and celeſtial fire lie hid in common mercury, and ſays the quinteſſence of mercury is celeſtial fire: by this and a great many other enigmatic expreſſions in this writer, there is room to believe, that the alcaheſt, deſcribed by Helmont, is a preparation of mercury and ſea-ſalts. *Boerh. Chem.*

Sal *diureticus*, a form of medicine of the nature of the terra foliata tartari, introduced into practice by the late College Diſpenſatory. The method of preparing it is this: take of any alcaline fixed ſalt a pound, boil it in four or five pints of diſtilled vinegar in a gentle heat. When the fermentation is over, pour on more diſtilled vinegar; and, when the fermentation ariſing from this addition is over, pour on ſtill more, and proceed thus till the moiſture being nearly all evaporated, freſh vinegar being added will excite no more fermentation: this generally happens when about ten quarts have been uſed; then evaporate to a dryneſs; the ſalt will be impure, and muſt be melted, for a ſmall time, with a gentle heat, afterwards diſſolved in the water, and filtred; if the melting has been rightly performed, the ſtrained liquor will be pellucid as water; then evaporate this in a gentle heat to a dryneſs, and you will have a very white ſalt, ſoluble either in water or ſpirit of wine. *Pemberton's London Diſp.*

Sal *marinum regeneratum*, in chemiſtry, the name given to a ſea-ſalt, produced by adding an alcali to its acid ſpirit of ſalt drawn by diſtillation. The proceſs is thus: dilute four ounces of oil of tartar, with three times its weight of fair water; put this mixture into a tall glaſs body, and heat it, and drop into it any of the kinds of ſpirit of ſea-ſalt, whether Glauber's, or that prepared with bole; ſhake the veſſel now and then, and continue to drop in the acid till the alcaline liquor is ſated, and there riſes no more efferveſcence; filtre the liquor, and evaporate to a pellicle, and ſet it by to cryſtalliſe, and there will be procured cryſtals of perfect ſea-ſalt, in all things agreeing with common ſalt. *Boerh. Chem.*

Sal *martis*, ſalt of iron.—A chemical preparation which is made as follows: mix together a quart of water and eight ounces of oil of vitriol; pour the oil of vitriol in by a little at a time; and, having put this mixture into a glaſs veſſel, add to it filings of iron, four ounces. When the ebullition is over, evaporate the liquor to a pellicle, and ſet it to ſhoot; there will be found a green vitriol or ſalt in fair cryſtals, which dry for uſe.

This ſalt is one of the moſt powerful preparations of iron; it opens obſtructions of all kinds, and ſtrengthens the viſcera; it is an excellent medicine in cachexies, obſtructions of the ſpleen and liver, and in ſuppreſſion of the menſes; it is alſo found good againſt worms.

The beſt manner of giving it is in ſolution, half an ounce in a quart of water, four ounces of which is a doſe; and, if drank in the manner of the natural chalybeate waters, it will be found to excel moſt of them in its good effects.

Sal *mirabile*, Glauber's ſalt. See *Glauber's* SALT.

SA'LEP, in the materia medica, the root of a ſpecies of orchis. Salep ſhould be choſen clean, firm, and hard; it is very little liable either to decay, or ſophiſtication.

The people of the Eaſt are extremely fond of Salep; they look upon it as one of the greateſt reſtoratives and provocatives to venery in the whole vegetable world.

That Salep is the root of an orchis, no way differing from our common orchis's in virtue, but owing its appearance to the manner of preparing it, and, conſequently, that Salep may be prepared from the roots of orchis of our own growth, Mr. Geoffroy has proved in the following manner: He conſidered, that the method of curing one root in the eaſtern parts of the world was probably the ſame with that uſed in all; and obſerving that Kæmpfer had deſcribed the manner in which the Chineſe prepare their ginſeng to make it pellucid, which was by firſt ſteeping, or macerating it in water, and afterwards carefully drying it; he determined to attempt the curing the roots of the common orchis, in a method not unlike that uſed to the ginſeng, in order to make Salep of it. The Salep, which we receive from Turkey, is a root of a white or reddiſh colour, according to its different age; and, as we receive it, is always tranſparent. As to our own orchis, if we attempt to dry the roots in the common way, they never will appear at all like the Salep, but will become ſhrivelled up and brown, and will always retain, or be ready to imbibe, from a humid air, a great quantity of moiſture. To prepare theſe, in imitation of the Salep, Mr. Geoffroy choſe the largeſt, plumpeſt, and faireſt roots he could find; theſe he nicely ſkinned, taking off the whole outer rind; then throwing them into cold water, he ſuffered them to macerate there ſome time; after this he lightly boiled them; and after this taking them out of the water, and draining them, he had them ſtrung upon threads, to be dried in a warm and dry air. When the roots were thoroughly dried, they were very tranſparent, and reſembled pieces of gum tragacanth, and continued dry and hard. The roots thus prepared may be kept ever ſo long in a dry place, and will never attract humidity, or become mouldy and rotten; as they will always do in wet weather, if dried in the common way with their ſkins on.

The orchis roots thus prepared may be reduced to powder: this powder will diſſolve away in boiling water, and a ſcruple of it will make a baſon full of jelly, in the manner of the Turkiſh Salep. This jelly is an admirable medicine in all the caſes, in which Salep is preſcribed, and may be rendered agreeable by the addition of wine, ſugar, ſpice, &c. and the powder may be given with great ſucceſs in aſſes milk, for diſeaſes of the breaſt.

If the water, in which the roots have been boiled, be evaporated over a gentle fire in an earthen veſſel, there will remain an extract of a viſcous texture, and a very agreeable ſmell, reſembling that of a meadow of flowers when the wind blows over it. *Mem. de l'Acad. Scienc. Par.* 1740.

SALICA'RIA, *ſpiked willow-herb*, in botany, a genus of plants, whoſe characters are:

The calyx is tubulous, ſtriated, and multifid; the flowers are roſaceous, hexapetalous, and grow out of the upper inciſures on the inſide of the tubulated calyx, almoſt in a ſeries of whorls, and are furniſhed with a multitude of ſtamina, ſometimes no fewer than eighteen. The ovary, which is adorned with a long tube, that has an apex ſhaped like a baſon, when ripe, becomes an ovated, bicapſular ſhell involved in the calyx, and full of ſmall ſeeds.

It grows in marſhy places, and by the banks of rivers, and flowers in July. The herb, which is uſed in medicine, is an ophthalmic. The diſtilled water is a preſent remedy for wounds, punctures, and ſugillations of the eyes, as well as dimneſs of ſight and all other infirmities incident to thoſe parts. It is a ſpecific in inflammations. *Raii Hiſt.*

The decoction of the herb is an excellent remedy for the epidemic diarrhœa of Ireland. *Threk. Synop. Hib.*

SALICO'RNIA, *jointed glaſswort*, or *ſaltwort*, in botany, a genus of plants whoſe characters are:

It hath an apetalous flower, wanting the empalement; for the ſtamina (or cives) and the embryoes grow on the extreme part of the leaves: theſe embryoes afterwards become pods or bladders, which for the moſt part contain one ſeed.

Theſe plants grow on the ſea-coaſt in many parts of Europe, and upon the ſhores in ſeveral places in England, which are waſhed every tide with the ſalt-water; but rarely planted in gardens, becauſe it is very difficult to make them grow in any other ſituation, than in ſalt-marſhes, and on the ſhores, where the ſalt-water frequently flows. Of theſe plants there ſeem to be two or three varieties, which appear remarkably different; but are not ſuppoſed to be diſtinct ſpecies.

The inhabitants near the ſea-coaſt, where theſe plants grow, cut them up towards the latter end of ſummer, when they are fully grown; and, after having dried them in the ſun, they burn them for their aſhes, which are uſed in making of glaſs and ſoap. Theſe herbs are by the country people called kelp, and are promiſcuouſly gathered for uſe.

From the aſhes of theſe plants is extracted the ſalt called ſal kali or alcali, which is much uſed by the chemiſts.

The manner of gathering and burning of theſe herbs is already mentioned under the article of KALI in the Dictionary; ſo I ſhall not repeat it in this place.

In ſome parts of England theſe herbs are gathered and picked for ſamphire, though it is very different from either of theſe.

SA'LII (*Dict.*)—There were two companies or colleges of Salii: the ancient eſtabliſhed by Numa, called Palatini; the latter by Tullus Hoſtilius, called Collini and Agonales. Though Servius tells us, there were two kinds inſtituted by Numa, the Collini and Quirinales; and two others by Tullus, the Pavorii and Palorii.

In ſinging, they uſed a peculiar ancient ſong, called Saliare carmen; and, after the ceremony, were entertained with a feaſt: whence Saliares epulæ, and Saliares dapes, paſſed into a proverb for good eating.

Their chief, called præſul, and magiſter Saliorum, was one of their number: it was he led the band, and begun the dance; the reſt imitating all his ſteps and motions.—The whole company was called collegium Saliorum.

Sext. Pompeius makes mention of Salian maids, virgines Saliares, hired for the purpoſe, and joined with the Salii, wearing a kind of military garb, called paludamentum, with high round bonnets like the Salii, and, like them, performing ſacrifices with the pontifices in the palaces of kings.

M. Patin takes it, there is a figure of one of the Salii on a medal of the Saquinian family; who, beſides the buckler in one hand, holds the caduceus in the other. — But his look appears too grave and ſedate, and, beſides the buckler he holds, does not ſeem to be an ancyle, as being quite round and not indented any where. And again, why ſhould a prieſt of Mars, the god of war, be repreſented with a caduceus, the emblem of peace? It is probable, therefore, this is no figure of any Salius, as Patin imagines.

SALINE *Principle*, a term uſed by the chemical writers, to expreſs a conſtituent part of ſeveral mixed bodies, on which their exiſtence in that form depends; and which, though always exiſtent in them, and always ſeparable by art, is yet not perceivable in many of them in the complex. See PRINCIPLE.

SALINE *Earths*. The chemiſts under this, as a general head, reckon all thoſe Saline and earthy ſubſtances, which are calcined or burnt in the fire; as all the kinds of lime, pot-aſhes, ſoot, and the like; theſe being ſo many mixtures of ſalt and earth; and all ſalts appearing to them, indeed, on a rigorous examination, to be only earths of different natures, which, when reduced to a certain degree of ſubtility or fineneſs of parts, ſo as permanently to diſſolve in water, are then emphatically denominated ſalts. *Shaw's Lectures*.

SALIVA'TION (*Dict.*) — There are many ways of raiſing a Salivation, and all by mercurial preparations. The preparations which I have uſed myſelf, ſays Turner, as the ſafeſt and moſt commodious, are calomel and mercurius dulcis ſix times ſublimed, given inwardly, in the milder pox; or the ſame being faſter radicated, and got into the bones, the crude mercury externally, in the way of unction.

The mercurius vitæ, arcanum corallinum with the red, yellow, and green precipitates (however in uſe with ſome) I think too churliſh, and ſcarce ſafe for tender conſtitutions; nor indeed can I ſee any reaſon for their uſe, whilſt we have better and leſs hazardous medicines to ſupply their room.

In ſalivating by the internal method, to an adult perſon, of a tolerably good habit, as to his ſtrength, and who has not been much uſed to the medicine, I generally give fifteen grains of calomel with a little conſerve of roſes in the morning, and the like doſe in as much of diaſcordium without honey, at night, which I prefer to the larger given once, or, as cuſtomarily, twice a day; becauſe it is now leſs liable to run ſuddenly thro' them, or too haſtily ſublime, and endanger them that way, by the inflammation. Beſides, in this gradual way of proceeding, it comes on more certainly, eaſily, and alſo more ſecurely to the patient; the effect of each doſe affording opportunity of foreſeeing readily, what more be requiſite, and when you muſt intermit, if not entirely forbear its farther exhibition.

I know a phyſical writer hath lately acquainted us, that we are each time to double the doſe of calomel; as for the firſt, fifteen grains, for the ſecond half a drachm, for the third a drachm, and ſo till the ſpitting comes on; but I would adviſe, that no perſon take this author for his guide in this affair, leſt inadvertently he deſtroy his patient, together with his own reputation.

After three, four, or five days of this management, we uſually obſerve the fauces to inflame, the inſide of the cheeks to become tumid, or high and thick, being ready to fall in betwixt the teeth, upon ſhutting of the mouth; the tongue looks white and foul, the gums alſo ſtand out, the breath ſtinks (which is a favourable omen of its coming on) and in general, the whole inſide of the mouth appears ſhining, ſeems as it were parboiled, lying in furrows, as it appears, after ſtrong ſpirits have been retained in the mouth. They now begin to refuſe their nouriſhment, while the tongue, gums, and cheeks are ſwelled, and ſo ſore that they cannot chew, eſpecially ſolid food, but muſt be now content with liquids and the ſofter aliments. Beſides, they are often ſick at the ſtomach, and frequently puke, or bulk up a thin phlegm, another promiſing forerunner of a good Salivation, when the pukes are moderate and eaſy, and come by intervals. But, if attended with cardialgia, or violent pains and torture at the ſtomach, perpetual and inceſſant reachings, fainting and cold ſweats, nothing is more dangerous.

The inſide of the mouth beginning to appear thus whealed, you may expect ſoon after to find it ulcerated, eſpecially about the ſalival glands; and then it may be proper to deſiſt for a day or two, if not give over, that you may the better obſerve the increaſe of the ulcers, what ſloughs are likely to be raiſed, and of what depth and dimenſion they are like to prove; from which a near conjecture may be made of the duration as well as quantity of the ſpitting, now begun; the conſiſtence of the effluent lymph being at the ſame time conſidered.

When the Salivation is thus raiſed, the patient ought to be encouraged to proceed chearfully; and to be ſometimes refreſhed with a little mulled wine, of what ſort he likes beſt; but red is preferable, if there be any tendency to a diarrhœa, adding a third, and ſometimes one half of water. Let his diet be a ſmall chicken broth, water-gruel, and panada; his drink a ſmall ſack-whey, or poſſet-drink, with a draught of good ſmall-beer and a toaſt between whiles: but, in gripes or a looſeneſs, the white drink, prepared of calcined hartſhorn or rice-water; alſo the decoction of the ſhavings of hartſhorn and ivory, boiled with a cruſt of bread, and ſweetened to the patient's taſte, are to take place of the reſt.

Thus having given him ſome few days reſpite, if after the coming on of the ptialiſm, you find him hearty, and his chops but moderately ſwelled on the outſide, and not very ſore within, the ulcers not increaſing, and few and no ſloughs appearing, the flux alſo inconſiderable in quantity, you may now again give him a ſcruple of calomel in diaſcordium, as he goes to reſt, repeating the ſame for two or three days following, as you find occaſion.

When in this way he has taken about half an ounce of calomel (though there is ſeldom occaſion to go ſo high) with but little alteration as to the ſwelling or ſoreneſs of his mouth, and as little appearance of the ptialiſm; his pulſe and other circumſtances, with reſpect to any ill ſymptom attending, favouring the ſame, he may may be vomited with eight, nine, or ten grains of the turpeth mineral by itſelf, only made into a bolus with conſerve of roſes, or farther mixed up with half a ſcruple, or fifteen grains of the calomel, encouraging the operation with ſmall draughts of common poſſet-drink between whiles, upon each motion to reach; but without loading his ſtomach, as is cuſtomary in other emetics, leſt, happening to run downwards, it invert the order or courſe of its intended operation. The ſame vomit, if found requiſite, may be repeated two or three days after, which at theſe times often anſwers our end, by raiſing the humours towards the jaws, and forwarding the Salivation much more effectually, than more doſes of the calomel, ſimply repeated, would have done; and if, after this, it ſhould ſo happen, as in ſpite of all endeavours to the contrary, it ſometimes will, whether from ſome ſingular idioſyncraſy, the tenacity of the lymph, or ſome defect in the glandular ſecretion, that the ſpitting will not riſe to any quantity, notwithſtanding the tumefaction, inflammation, ſtench, and putrefaction, and ſometimes ulceration alſo in the patient's mouth, you muſt forbear and purge it off. The relief of the patient muſt now be attempted ſome other way, as by giving calomel once or twice a week, and purging it off again next day, or two days after; and on the intervening days, direct ſome other antivenereal ſpecific, ſuch as the alterative pill of gum guaicum, diaphoretic antimony, and the æthiops mineral, with a good ſtrong decoction of the woods, well choſen and energetic, ſuiting alſo with the temperament of the patient; as, if cold and phlegmatic, the ſcobs of guaiacum; if hot and dry, the ſarſaparilla and China roots; which, however ſlighted by ſome as inſignificant, yet obſerved with a ſtrict diſcipline, as to the other non-naturals, have certainly very great advantages attending them, as well perſpiring the noxious particles, and drying up the ſuperfluous ſerum by the one, as contemperating the acrid and ſour juices by the other. By this method, duly proſecuted, though it may be ſomewhat longer, the purpoſe may be at length effected, which by the former was not to be obtained. Some have remarked, that thoſe perſons who are purged with great difficulty, are with great difficulty ſalivated; which may ariſe from the ſame cauſe, the toughneſs of the humours, and ſlower ſecretion. Although, in the evacuation downwards, we often find thin, choleric, and dry bodies are more eaſily moved by lenients, as common oil, manna, lenitive electuary, caſſia, diaprunnum, even a bit of freſh butter, or fat broth, than by ſtronger purgatives of ſcammony, colocynth, and the like.

When the ptialiſm proceeds ſucceſsfully, it may be left to take its courſe, till it declines ſpontaneouſly, which, in proportion to the ulcers or thickneſs of the ſloughs about the parts of the mouth, may happen at the expiration of one and twenty days, or ſometimes a month from the time of its firſt riſing, which is uſually long enough to ſubdue this diſeaſe, after it is confirmed. I ſaid, from the time of its riſing, or ſpitting perhaps a pint and a half a day, till it comes to three, four, or five pints, in twenty-four hours, and ſo gradually goes off again; for often the firſt four or five days, and ſometimes a whole week is ſpent in bringing it to the firſt proportion.

Beſides this way of Salivating by the calomel, in the more ſtubborn and rebellious pox, attended not only with cruel nocturnal pains, gummata, tophs and nodes, but alſo rotten or foul bones; where the patient has been long uſed to the taking of calomel, or a like mercurial preparation internally, and has perhaps been often ſalivated by ſuch preparations to no purpoſe, it is better to attempt the cure by ſalivating with the unction, in which little regard is to be had as to the choice of the ointment with which the quickſilver is to be incorporated, ſince the ſtreſs is entirely laid on the quickſilver. In this method, as well as in the other by calomel, care muſt be taken not to proceed too haſtily.

If you have one ounce of the quickſilver to three ounces of axungia (which is the proportion I have uſually obſerved) about an eighth part may be uſed night and morning; letting the patient rub it gently, with his own hands, into his limbs before the fire, beginning from his ancles up his ſhins to his knees, all round his joints; and ſo to his thighs, which are preſently after to be covered cloſe up with his yarn ſtockings and flannel drawers; then let him uſe the remainder of this eighth part about his elbows, and ſo to his ſhoulders, wiping his fingers and hands clean about the glands of his armpits, or thoſe of his groin: his body being all the while defended from the cold air, by a ſcreen or blanket hung behind him, and after wrapped up warm in his flannels, as he muſt alſo be in the other method of ſalivating; ſuch I mean as a flannel ſhirt or ſhift, waiſtcoat and drawers, a cap and muffler pinning up thereto behind, and covering well his throat, chin, and cheeks before, to keep theſe parts from the cold air, which above all is highly neceſſary.

Some alſo anoint the trunk, eſpecially the ſpine; but I always found the pores of the other parts ſufficient to let the globules of the mercury into the blood; and it is not material by what particular pores it had firſt its admittance.

For thoſe who are very weak, once a day may ſuffice; but the robuſt and ſtrong may be anointed twice, or, which is as well, and will ſave trouble, divide the unction into four parts, and conſume one part about him every night, after which let him enter into a warm bed, with flannel ſheets or blankets, diſpoſing him to a gentle breathing ſweat, with a draught of warm poſſet-drink, mace-ale, or, if very feeble, a cup of his mulled wine; by which the pores being opened, the mercurial particles may have the freer entrance.

It is uſual to increaſe the mercury and ointment to four times the quantity, which we have directed. Thus Harvey preſcribes one pound of axungia to be mixed with three ounces, and ſometimes ſix ounces of quickſilver, adding alſo a little white hellebore and crude antimony in fine powder, pretending thereby to forward the Salivation, and increaſe the force of medicine in maſtering any malignity. Mr. Wiſeman's compoſition was alſo ſix ounces of mercury to one pound of the other materials, of which he uſed one ounce, or two ounces at a time, once or twice a day, for four, ſix, or eight times, according to the patient's ſtrength, and the eaſe or difficulty of raiſing the flux. Hildanus directs ſix ounces of mercury to twenty ounces of axungia, and the other ingredients. But I can ſee no reaſon for uſing ſo much axungia, provided a half, or a fourth part of it, be ſufficient to convey the quickſilver into the blood; nor to what end any other ingredients ſhould be added to the axungia, unleſs the turpentine, being, as I conceive, more like to hinder, eſpecially the ſpecies or powders, by ſtopping up the pores, than to forward the operation. But, leaving every one to follow the proportion he likes beſt, in relation to my own, I muſt farther obſerve, that if after the third unction, ſuppoſing the whole divided into four parts, the patient begins to complain of his mouth, or that the inſide thereof appears ulcerated, you muſt ſtay a day or two to ſee the effect of what is already done, before you proceed farther. The like muſt be obſerved when gripes, or bloody ſtools, approach. But if the ſpitting comes not on, and no ſupervenient ſymptom contra-indicates, you may expend the remaining fourth part in like manner; and perhaps, in ſome bodies, there may be occaſion for a half, or full as much more. However, it will always be found ſafeſt to proceed leiſurely, when you have gone thus far, and ſometimes to wait a day, two or three, before you continue the unctions; ſince, although at firſt it may ſeem as if the medicine had taken no effect, you may ſoon after find it ſufficient. For, though a day or two after the fourth unction, the flux may be longer than uſual in coming forwards, and the excoriations about the chops or inſide of the mouth appear inconſiderable, yet in a day or two more they may be ſeen to ſpread and increaſe to a copious ſpitting, beyond what was expected. But when after rubbing in an ounce, or an ounce and a half of the mercurial ointment, the Salivation appears not, it may alſo be neceſſary here to adminiſter a doſe or two of the turpeth mineral, at a day or two days diſtance; and, where there are gummata, tophs, and nodes, you are in the unction more eſpecially to rub the ointment well into theſe parts, laying over them afterwards the emplaſtrum de ranis, with a double quantity of mercury. This will both help the reſolution of them, and encourage or keep up the ptialiſm, which being arrived to the quantity of four, five, or ſix pints, in a day and night, is accounted a ſufficient diſcharge. Yet this is no abſolute rule to go by, or upon which we can ſafely pronounce the patient whole and ſound, any more than the quantity of the medicine to be uſed can be limited to any one certain, or conſtant proportion. Since we have known ſome who have ſpit more, yet miſs their cure; whilſt others who have come very ſhort of ſuch a quantity, have notwithſtanding obtained theirs. However, during the Salivation this way raiſed, upon its too ſudden declenſion (though it commonly happens that, the ſloughs being deeper, and their mouths ſorer, they uſually ſpit longer than by proceeding internally with the calomel) it is often expedient to give a ſcruple of the ſame, every day, or every other day, for two or three times, as there may be occaſion; and, towards the concluſion, you are to purge your patient with two or three ounces of the common infuſion of ſenna, and one ounce of the ſyrup of buckthorn, or, for thoſe that are very weak, an infuſion of ſliced rhubarb, ſenna leaves and tamarinds, with ſalt of tartar, adding to the ſtrained liquor one ounce of the beſt manna, or ſolutive ſyrup of roſes, which may be repeated once or twice a week for two or three times; and, when he is a little eaſy, his chops growing pretty well, he may be permitted to eat a little meat, as the fleſh of a chicken or rabbit, alſo veal or mutton, but well roaſted, without ſauce or gravy. About this time alſo, it is uſual to ſweat them, at leaſt before they go abroad, in their bed, or ſtove, or under the cradle, with ſpirit of wine burning juſt by, to be continued as their ſtrength will bear, for an hour or two, and to be repeated at two or three days diſtance, if there be occaſion, obſerving that the moſt care be now taken, that your patient be not injured by the cold air, and that he gradually cool himſelf, by leſſening or withdrawing the heat or bed cloths he lies under, leſt, getting cold, he make ſome freſh complaint of pains, which though ariſing from this new occaſion, he may impute to the old one, and think the worſe of his cure for ſome time.

During his ſweat, let him rub his body thoroughly with warm napkins, conveyed to him in the bed; and, when faint, let his ſpirits be kept up with three or four ſpoonfuls of ſome proper cordial julap, or a draught of his burnt wine.

In order to promote this diaphoreſis, he may take a little Venice treacle, with a ſcruple of the cinnabar of antimony, or half a ſcruple of bezoar mineral, upon which let him drink a draught of his diet-drink, made as hot as he can bear it. This drink he ought to be ſtrictly confined to, for three weeks or a month after he comes out of the Salivation, that having by this evacuation ſecured his body from any relics of the diſeaſe, or its remedy, the redundant ſeroſity remaining after the colliquation may be dried up, before the blood is ſupplied with freſh nutritious juices. By the neglect of this circumſtance, and by running over haſtily to their wonted liberty and cuſtom of living, they too ſuddenly fill their blood with a load of improper and unſuitable juice, at this time in a weak infirm ſtate, and, deſpiſing their purging, ſweating, or diet, as needleſs pieces of formality, or an uſeleſs penance, too often incur the misfortune of an unhappy relapſe. *Turner.*

SA'LIX, the willow. See the article WILLOW.

SAL'MON, *ſalmo*, a well known fiſh. It is diſtinguiſhed from other fiſh of the truttaceous kind by theſe characters: it is of an oblong body covered with very ſmall ſcales, a ſmall head, a ſharp noſe, and a forked tail. Its back is bluiſh; the reſt of its body whitiſh, or reddiſh, and uſually ſpotted. Its under jaw is bent upwards, and that ſometimes ſo much as to make itſelf a ſinus in the upper, by conſtant motion, and ſometimes to perforate it.

The Salmon is firſt produced from its parent's ſpawn in freſh rivers, thence it goes into the ſea to acquire its growth and feed, and, at the time of its full growth, and in the ſeaſon for ſpawning, it removes into the freſh waters again.

The Salmon in the different ſtages of its life and growth has different names. The Latins called it, when young, ſalar, when of a middle growth ſario or fario, and only when full grown ſalmo. In England the fiſhermen have names for it in every year of its growth. In the firſt it is called a ſmelt, in the ſecond a ſprod, in the third year a mort, in the fourth a fork-tail, and in the fifth a half fiſh; finally, in the ſixth it is called a Salmon. This is the common agreement of our fiſhermen, though there are ſome who ſay the Salmon comes much ſooner to its full growth. *Willughby's Hiſt. Piſc.*

The Salmon is bred in rivers, but goes every year from thence into the ſea; and at a certain ſeaſon of the year it always returns up into the freſh water again; and what is remarkable, is, that, ſo far as obſervation has been able to trace them at any time, the ſame ſhoals of Salmon always return into the ſame river out of which they ſwam, not into any other; ſo that the people who live on the Salmon fiſhery are not afraid for their rivers being cleared, by all the fiſh in them going down into the ſea, for they know that they will all return up to them again at a proper time. When the Salmon has once entered a freſh river, he always ſwims up againſt the ſtream, and often will go an hundred leagues up a river in the large and long rivers; and the people at this vaſt diſtance from the mouth have the pleaſure of taking a fiſh, that is properly in part of the ſea kind. It is alſo remarkable, that the rivers which moſt abound with Salmon do not make the ſeas, about their mouths, any more abound with them than others, particularly the harbour of Breſt affords no Salmon; though the river Chateaulin, which diſcharges itſelf into it, is the richeſt Salmon river in France.

Another ſingularity, in regard to the Salmon, is their ſwimming up the rivers together in ſuch vaſt numbers. It is to be allowed, indeed, that herrings, mackarel, and many other fiſh, do in the ſame manner appear on the coaſts at certain ſeaſons in prodigious numbers; but the reaſons for their coming together, in theſe quantities, are much more eaſily explained than that of the Salmon's doing ſo. The herrings, when they come in ſuch prodigious ſhoals to the coaſts of Normandy, have been found to be allured thither in theſe numbers by a prodigious quantity of a particular ſort of ſea worms which are their favourite food, and which are found to cover the whole ſurface of the ſea at that time. Rondeletius has deſcribed theſe inſects under the names of ſea caterpillars; they always appear in the months of June, July, and Auguſt, which are the herring ſeaſons at that part of the world; and probably the ſame cauſe will be found to bring them to other places, if ſufficiently enquired into, as theſe and ſome other fiſh come to certain places in ſhoals to get food. The Salmon do it, in order to propagate their ſpecies. The ſpawn of the Salmon is never depoſited but in rivers, and, at the time that theſe fiſh are found up the rivers, it is only with this intent; the females go firſt, and the males follow as far as the others pleaſe to lead them, which is uſually to ſome convenient place in ſhallow water, where the ſpawn, when depoſited, is not buried under too great a quantity of water, but has the advantage of a continual warmth from the ſun's heat.

Salmon do not equally frequent all rivers, though they may ſeem to us equally proper for their reception. There are two rivers which open themſelves into the harbour of Breſt, very near one another; the one of theſe is famous for the quantity of Salmon in it, and the great advantage of the fiſhery; the other never has any of theſe fiſh in it. It moſt probably is owing to their finding plenty of food, and proper places for the depoſiting their ſpawn in the one of theſe rivers, and not in the other, that makes this regular choice. *Des Landes*, *Trait. Phyſ.*

SALMON *trout*, the Engliſh name of the fiſh called trutta lacuſtris by Geſner and other authors. It is caught in lakes in mountainous countries, and grows to a very conſiderable ſize, ſometimes to thirty, forty, or fifty pounds weight. It reſembles the trout in figure, but its belly is very flat, and has, as it were, a long furrow or cavity running the length of the belly. Its back and head are of a very beautiful bluiſh green colour; and the whole fiſh, eſpecially its back and the upper parts of its ſides, are marked with numerous black ſpots. Its back fin is alſo ſpotted with black, and its ſcales are ſmall and ſilver-coloured. *Geſner de Piſc.*

Bay SALT. — This Salt is of two kinds: the firſt drawn from ſea water, as is practiſed in France, Spain, and Portugal, and many other hot countries; the other from the water of ſalt ſprings, or lakes, as in the Cape Verd iſlands, in the iſland of Tortuga, Turks iſland, and many other parts of America.

The firſt kind is, in time of peace, imported into Great Britain in very large quantities, and our colonies and fiſheries in America commonly ſupply themſelves with the latter.

Bay Salt is not extracted from Sea water in the colder parts of Europe, as on the coaſts of Germany, Denmark, and Sweden, but in places ſituated in a more ſouthern climate, as on the coaſts of France, Spain, and Italy. Some marine bay Salt has alſo, of late years, been made in England at Limington, and in ſome other parts of Hampſhire, and in the Iſle of Wight: but in theſe places it is only made in drier ſummers, and then rather by accident than deſign, it being collected from ponds, which were originally made for heightening of ſea-water, or reducing it into a ſtrong brine by the heat of the ſun, in order to leſſen the expence of fuel, in boiling it into white Salts. *Brownrig of Salt.*

The ponds, in which this Salt is made, nearly reſemble a rude kind of Salt marſh, deſcribed by Agricola, in which the ſea-water is received into a pool, and thence by a trench is conveyed into ſeveral pits dug in the earth; and, when it has ſtood ſome time in theſe pits, it is ſuffered to run out into others, and ſo on, till the brine is ſtrong enough to cryſtalliſe.

This is the caſe in our Engliſh Salt works; but the French marſhes, in which a vaſt quantity of bay Salt is annually prepared, are made in a much more artful manner. A full account of which is given in the *Philoſophical Tranſactions*, N°. 51. See SALT *marſh*.

The ſeveral kinds of bay Salt, made in the different parts of the world, are found to differ greatly from one another in ſeveral particulars; as firſt, in the ſize of the cryſtals, which is owing to the heat of the ſun, and the time it lies in the pits. The French cream of Salt, and the blown Salt of the iſle of May, are fine and ſmall-grained. The Portugal Salt is larger grained than that of France; and that of Tortuga is larger than either. Secondly, in purity. As all bay Salt has ſome mud, ſlime, or the like, in the making, and ſome kinds are mixed with the bittern Salt, or what is called Epſom Salt; they are all more white while dry, and more pellucid when moiſt, and they differ in colour, according to the earth which makes the bottoms of the pits. Thus, ſome of the French bay Salt is grey, ſome reddiſh, and ſome white, according as a blue clay has lined the pits, or a red, or white one. Fourthly, ſome kinds of bay Salt are more apt to contract a moiſture from the air than others: it is ſometimes owing to the ſmallneſs of the grain, and ſometimes to a mixture of a calcarious or alcaline Salt with it. And, fifthly, ſome kinds have an agreeable ſmell in large heaps; ſuch are the Portugal and the Hampſhire bay Salts; and this ſeems owing to the ſea-water they were made from, having a bituminous matter in it. Sixthly, It differs greatly in taſte, according to the various foreign mixtures it contains; and it will often alter in taſte, and other qualities, by long keeping. Thus the Salt of Peccais is ſo bitter, when new made, as not to be eatable, but after keeping a while it becomes very pleaſant. This is owing to its containing at firſt a large portion of the bittern Salt, or Epſom Salt, which liquifies in keeping, and, running off in form of a fluid, leaves the reſt of a good taſte. In general bay Salt is much fitter for uſe, after it has been kept ſome time in a dry place, than when it is firſt made.

From the accounts already given of the bay Salt of other countries, and the manner of preparing it, it ſeems evident, that our being obliged to purchaſe it of other nations is the effect of our want of application to the making it ourſelves; ſince it is evident that it may be very well made, both in England, and in many of our American colonies.

In England, a very advantageous ſort of works might be ſet on foot in the following manner: a number of Salt pits ſhould be made in a row in the marſh, and their bottoms lined with plaiſter, or ſome ſtrong cement that will not eaſily break up; and, by this caution, the Salt may be drawn white and pure like the Portugal kind, not grey like the French. Over each pit covers ſhould be made of thin boards, or rather of canvas painted white, and ſtretched on frames of wood; and theſe ſhould be fixed to ſtrong poſts, erected on the north ſide of the pits, and contrived to be eaſily drawn back to them, in the manner of draw-bridges. Theſe covers, thus fixed, may be let down over the pits, in manner of a ſhed or pent-houſe, in rainy weather to keep the brine from being diluted with freſh water; and in dry weather they may be raiſed almoſt to a perpendicular, but inclining a little towards the ſouth, ſo as to form a wall with a ſouth aſpect; and thus they would ſerve for a double uſe, being a covering to the pits in rainy weather, and reflectors of the ſun's heat in fair. The reflexion of ſo large a body of the ſun's rays, in the courſe of a bright day, would greatly promote the evaporation of the brine; and the hinges, on which the reflectors turn, being placed at ten inches from the ground, when the reflectors ſtand upright, there will be a ſpace under them, through which the air will continually flow in a briſk current, and this will greatly promote the evaporation of the water.

The paſſages of communication between the pits muſt be narrow and winding, and muſt be wholly ſtopped up in wet weather, that no freſh water run into the brine. This channel ſhould be covered alſo with boards, and at the entrance of the pits there muſt not be a pond, as is the cuſtom in France, but only a narrow covered trench running parallel with the ſide of the pits which is oppoſite to the reflectors; and the pond, which forms the entrance of the pits in the French Salt marſhes, muſt in theſe be detached from them, and, inſtead of it, there muſt be formed a fourth brine pond, communicating with the third by a long and narrow channel.

If theſe contrivances ſhould be reduced to practice in England, the Salt will probably cryſtalliſe much faſter there than in the French marſhes, and the brine may be kept as deep, and even deeper than in the French pits; and a ſhower of rain will only retard the work for the ſmall time in which it is falling; whereas, in the French works, it throws them back three or four days, as no Salt can be formed till all the water it brought be evaporated.

Four ciſterns may be dug adjoining to the brine pits, to admit the brine in the Salt ponds, when the weather is very rainy; and as to the Salt water in the reſervoir, if it ſhould be found neceſſary to preſerve it from rain in ciſterns, when ſo much rain falls, as to make it freſher than ſea-water, it may be let out and ſea water admitted in its place. And in order to promote the evaporation, and to make the Salt water in the reſervoir fitter to ſupply the firſt brine pond with brine of a due ſtrength, it may be proper, by means of a ſmall fire engine, continually to force up the Salt water in the reſervoir, as often as occaſion requires, and by means of a diverger, fitted to the engine, to make it deſcend again into the reſervoir, like a ſhower of rain; by which means, the evaporation of the watery vapours will be greatly promoted, after much the ſame manner as is practiſed in ſeveral of the Salt works in Germany, where the brine is very weak. *Brownrig of Salt.*

Thus by augmenting the force of the ſun's heat, and of the air, by promoting the evaporation of the watery vapours, and preventing the brine from being diluted with rain, it is very probable that, during the ſummer ſeaſon, double the quantity of Salt might be prepared at an Engliſh work with theſe contrivances, than is now uſually prepared at a French Salt marſh of equal magnitude.

Beſides theſe methods of managing ſea-water, it is certain that very large quantities of bay Salt might be prepared in England, with great eaſe, from the natural brine of Salt ſprings, and from the common foſſil or rock Salt of Cheſhire diſſolved in weak brine, or in ſea-water. Upon the whole, bay Salt might thus be made here at a moderate price, and in ſufficient quantities to ſupply both the nation itſelf, and all our colonies.

Brine SALT, a name given to that ſort of common Salt which is not made from ſea-water, but from the water of Salt wells and ſprings. Great quantities of this Salt are made in moſt of the inland countries, as in Germany, Switzerland, Hungary, and in ſome parts of France and England.

The ancient methods of boiling of brine into Salt, in Cheſhire and Worceſterſhire, are accurately deſcribed in the Tranſactions of the Royal Society; and the method, formerly uſed in Staffordſhire, is delivered in Dr. Plot's Hiſtory of that country; but the method, now generally uſed in England, is this:

The brine, being received from the well into a large ciſtern, is thence received, as occaſion requires, into the Salt pan. Theſe pans are of the ſame form with thoſe uſed in the boiling of ſea Salt, and uſually hold about eight hundred gallons: in ſome places theſe are made of iron, and in others of lead.

When the brine is put into the pan, a little blood is mixed with it, in order to clarify it, and leaden pans are placed at the corners, to receive the ſcratch, or calcarious earth, that ſeparates from it in the boiling. An ounce of blood is ſufficient for eight hundred gallons of brine. As ſoon as it is boiled, it is carefully ſkimmed, and afterwards it is ſuffered to boil very briſkly for ſome time, till the Salt is granulated; after this the ſcratch is ſeparated, and the fire ſlackened, till the whole Salt is formed.

When they have ſeparated the ſcratch, and the Salt is ready to cryſtalliſe, they put into the pan ſeveral ſorts of ſeaſonings, as they call them, ſuch as ale, butter, and the like, which they ſuppoſe correct the bad qualities of the brine, and make the Salt of a ſmaller grain. After this they boil it very gently, and when as much Salt is formed, as will fill two or three of their wicker baſkets, they rake it up to the ſides of the pan, and fill it into the baſkets, placing them over the leach trough, that the brine may drain into it from the ſalt. The Salt taken out they call a draught of Salt, and the operation a clearing of the pan. In this manner they draw the Salt, and clear the pan five or ſix times during each proceſs, leaving at laſt only a few quarts of brine at the bottom of the pan. The baſkets, into which they put the ſalt out of the pan, are called alſo barrows: they uſually contain about a buſhel of ſalt, and are of a conic figure, open at the baſe. The whole proceſs of working a pan of brine uſually laſts about twenty-four hours. After the Salt has drained an hour or two in the baſkets, it is removed into the hot-houſe over the furnace, where it remains four or five hours to be thoroughly dried, and is then taken out of the baſkets, and laid up for ſale. In all the Engliſh Salt works, the leach brine, which is what remains in the pan after the Salt is cryſtalliſed, and what drains from the Salt in the baſkets, is not thrown away, as it is in Germany, but is added to the pan next to be boiled. And, beſides the Salt made in this manner, they have, at moſt of the Engliſh Salt works, a different kind, which they call ſhivery Salt.

They have alſo another kind of Salt, made up in form of ſugar loaves in ſmall wicker baſkets, which is thence called loaf Salt, or baſket Salt. This is the whiteſt, drieſt, and fineſt-grained of any Salt, and is therefore greatly eſteemed at table. In preparing this Salt they uſe ſome reſin, and other additions, to break the grain, and render it very ſmall; others alſo, to this purpoſe, boil it the more briſkly and ſtir it briſkly all the while. But in Cheſhire, where the beſt baſket Salt is made, they uſe no particular proceſs about it, but only take the third draughts of every pan, which always are the pureſt Salt; and they do not ſuffer theſe to lie ſo long in the pan, as when they make Salt of a larger grain, but take it out before it can form large cryſtals: by this means they have it of a fine ſmall grain, and they then preſs it hard down into the wicker baſkets, and, when dried in the ſtove, they let it remain in the baſkets for ſale. *Brownrig of Salt.*

Not long ſince Mr. Lowndes publiſhed a method of greatly improving the Engliſh brine Salt, ſo as to make it at leaſt equal to the French bay Salt.

The method is this: let a brine pan, containing about eight hundred gallons of liquor, be filled with brine to within an inch of the top; then make and light the fire, and, when the brine is juſt lukewarm, put in either an ounce of blood from the butchers, or the whites of two eggs. Let the pan boil with all poſſible violence, and, as the ſcum riſes, take it off. When the freſh or watery part is pretty well decreaſed, throw into the pan the third part of a pint of new ale, or the ſame quantity of the grounds of any malt liquor. When the brine begins to grain, add to it the quantity of a ſmall nut of freſh butter, and, when the liquor has ſtood half an hour longer, draw out the Salt. By this time the fire will be greatly abated, and ſo will the heat of the liquor; let no more fuel be thrown on the fire, but let the brine gently cool, till a perſon can juſt bear to put his hand into it; keep it in that degree of heat as nearly as poſſible, and when it has worked for ſome time, and is beginning to grain, throw in the quantity of a ſmall nutmeg of freſh butter, and about two minutes after that ſcatter throughout the pan, as equal as may be, an ounce and three quarters of common alum, pulveriſed very fine; then inſtantly, with the common iron ſcrape-pan, ſtir the brine very briſkly in every part of the pan for about a minute; then let the pan ſettle, and conſtantly feed the fire, ſo that the brine may never be quite ſcalding hot, yet always a great deal more than lukewarm; let the pan ſtand working thus for about three days and nights, and then draw it, or take out the Salt. The brine remaining will, by this time, be ſo cold, that it will not work at all, therefore freſh coals muſt be thrown upon the fire, and the brine muſt boil for about half an hour, but not near ſo violently as before the firſt drawing; then with the uſual inſtrument take out ſuch Salt as is beginning to fall, and put it apart; then let the pan ſettle and cool. When the brine becomes no hotter than one can juſt put one's hand into it, proceed as before, and let the quantity of alum not exceed an ounce and a quarter, and about eight and forty hours after draw the pan, and take out all the Salt. *Lowndes's Brine Salt improved.*

This is Mr. Lowndes's proceſs; only he afterwards directs cinders to be chiefly uſed in preparing the fires, the better to preſerve an equal heat; and by that means alſo he propoſes ſaving a conſiderable expence, aſſerting, that at preſent cinders are ſo little valued in Cheſhire, as to be thrown out into the highways. Mr. Lowndes adds, that, in a pan of ſize beforementioned, there may be prepared, at each proceſs, ſixteen hundred pounds weight of Salt from the beſt brine in Cheſhire, and one thouſand and ſixty-ſix pounds from the ordinary brine of that county. This, as the proceſs continues five days, is a little more than five buſhels and a half of Salt a day, from the beſt brine, and a little more than four buſhels a day from the ordinary kind.

Sea SALT (*Dict.*)—The moſt convenient works for the making this Salt are conſtructed in the following manner: the ſaltern is erected at ſome convenient place near the ſhore; it is a long and low building, conſiſting of two parts, one called the fore-houſe, and the other the pan-houſe or boiling-houſe. The fore-houſe ſerves to receive the fuel, and cover the workmen; and in the boiling-houſe are placed the furnace, and the pan in which the Salt is made. And in ſome places they have two pans, one at each end of the building, and the fuel and place for the workmen are the middle. The furnace opens into the fore-houſe by two mouths, and from theſe is carried up a wall to prevent the aſhes from flying to the Salt pans, and in this is a door of communication between the two houſes. The body of the furnace conſiſts of two chambers, divided from one another by a brick work called the mid feather, which from a broad baſe terminates in a high edge nigh the top of the furnace, and, by means of ſhort pillars of caſt iron fixed upon it, ſupports the Salt pan. The pans are oblong and ſhallow, the common meaſure being fifteen feet in length, twelve feet in breadth, and ſixteen inches in depth; they are commonly made of plates of iron joined together with nails, and the joints filled with a ſtrong cement; and the bottom of the pan is prevented from bending down, or changing its figure, by hooks faſtened to ſtrong iron bars which are placed acroſs it.

Between the ſides of the pan and the walls of the boiling-houſe there runs a walk five or ſix feet broad, where the workmen ſtand to draw out the Salt. The roofs are wood, and are faſtened with pegs of wood, nails mouldering away into ruſt in a few months.

Not far diſtant from the ſaltern on the ſea ſhore, between full ſea and low water mark, they make a little pond in the rocks, or with ſtones in the ſand; this they call a lump, and from this pond they lay a pipe; through which, when the ſea is in, the water runs into a well adjoining to the ſaltern, and by this well they pump it into troughs, by which it is conveyed into their ſhip or ciſtern, in which it is ſtored up till they have occaſion to uſe it.

The ciſtern is built cloſe to the ſaltern, and may be placed moſt conveniently between the boiling-houſes on the backſide of the fore-houſe. It is made either of wood, brick, or clay, and ſhould be covered with a ſhed, that the Salt-water in it may not be weakened by rains, and ſhould be placed ſo high that the water may conveniently run out of it into the pans. When the ſea-water has ſtood in the ciſtern till the mud and ſand are ſettled from it, it is drawn off into the Salt pan; and, at the four corners of the Salt pan, where it is ſupported by the brick work, and conſequently the flame does not touch its bottom, there are placed four ſmaller leaden pans and ſcratch pans, which, for a Salt pan of fifteen feet, are uſually about a foot and half long and a foot broad, and three inches deep. Theſe have a bow or circular handle of iron, by which they may be drawn out with a hook when the liquor in the pan is boiling.

The Salt pan being filled with ſea-water, a ſtrong fire of pit-coal is lighted in the furnace, and then, for a pan which contains about fourteen hundred gallons, the Salt-boiler takes the whites of three eggs, and incorporates them all with two or three gallons of ſea-water, which he pours into the Salt pan, while the water contained therein is only lukewarm, and mixes this with the reſt by ſtirring it about with a rake. In many places they uſe inſtead of eggs the blood of ſheep or oxen to clarify the ſea-water; and in Scotland they do not give themſelves the trouble of clarifying it at all. As the water heats, there ariſes a black frothy ſcum upon it, which is to be taken off with wooden ſkimmers. After this, the water appears perfectly clear, and, by boiling it briſkly about four hours, a pan loaded in the common way, that is about fifteen inches deep, will begin to form cryſtals upon its ſurface. The pan is then filled up a ſecond time with freſh ſea-water; and, about the time when it is half filled, the ſcratch pans are taken out and emptied of a white powder, ſeeming a kind of calcarious earth, which ſeparates itſelf from the ſea-water, during its boiling before the Salt begins to ſhoot. When theſe have been emptied, they are again put into their places, where they are afterwards filled again. This powder, being violently agitated by the boiling liquor, does not ſubſide till it comes to the corners of the pan where the motion of the maſs is ſmaller, and it there falls into theſe pans placed on purpoſe to receive it.

The ſecond filling of the pan is boiled down after clarifying in the ſame manner as the firſt, and ſo a third and a fourth; but in the evaporation of the fourth, when the cryſtals begin to form themſelves, they ſlacken the fire, and only keep the liquor ſimmering. In this heat they keep it all the while that the Salt is granulating, which is nine or ten hours. The granules or cryſtals all fall to the bottom of the pan; and when the water is almoſt all evaporated, and the Salt lies nearly dry at the bottom, they rake it all together into a long heap on one ſide of the pan, where it lies a while to drain from the brine, and then is put into barrows and carried to the ſtore-houſe, and delivered into the cuſtody of his majeſty's officers. In this manner the whole proceſs is uſually performed in twenty-four hours, the Salt being commonly drawn out every morning. This is the method in moſt of our Salt works, but in ſome they fill the pan ſeven times before they boil up the Salt, and ſo take it out but once in two days, or five times in a fortnight. In the common way of four boilings, a pan of the uſual ſize, containing one thouſand three-hundred gallons, they draw from fifteen to twenty buſhels of Salt every day, each buſhel weighing fifty-ſix pounds.

When the Salt is carried into the ſtore-houſe, it is put into drabs, which are partitions, like ſtalls for horſes, lined at three ſides, and the bottom with boards, and having a ſliding board on the foreſide to draw up on occaſion. The bottoms are made ſhelving, being higheſt at the back, and gradually inclining forwards; by this means the brine, remaining among the Salt, eaſily ſeparates and runs from it, and the Salt in three or four days becomes ſufficiently dry; in ſome places they uſe cribs and barrows, which are long and conic wicker baſkets for this purpoſe, and in ſome places wooden troughs with holes in the bottom. The ſaline liquor which remains after the making of Salt is what is called bittern.

The ſides of the pans in which the Salt is made, are ſoon cruſted over with the ſame ſort of matter formed into cakes or cruſts, that falls in powder into the ſcratch pans; this the workmen call ſtone ſcratch; they are obliged to cleanſe the pans of it once in a week or ten days, otherwiſe they will be burnt: in England they do this with iron picks, but at Hall in Saxony they have a much better method; for they then take out the pans, and, turning them bottom upwards, burn ſtraw under them, by which means the matter of the cruſt looſens itſelf, and after this it falls off on being ſtruck with a mallet or hammer. *Brownrig of Salt.*

In Lancaſhire, and ſome other parts of England, ſea Salt is made in this manner: they pare off, in dry weather, in ſummer, the ſurface of the flats, which are covered at full ſea, and bare when the tide is out. When they have procured heaps of this, they put it into troughs, and pour freſh water on it; this waſhes off the Salt that hung about the ſand, and is received ſo impregnated into veſſels ſet underneath the troughs. So long as this liquor is ſtrong enough to bear an egg, they put on more water; when an egg ſinks in it, they throw the ſand out of the troughs, and put in freſh from the heaps. The water thus impregnated with Salt they boil in leaden pans, and evaporate to a dryneſs, the Salt remaining behind. *Ray's Engliſh Word.*

Salt upon SALT, a name given to a kind of common Salt prepared by the Dutch, of great uſe in preſerving herrings and other fiſh, and to which they principally owe their advantages in their herring trade. The Dutch prepare two kinds of refined Salt, one of a ſmall grain, intended for the uſe of the table, and called butter Salt. They export large quantities of this to the countries upon the Rhine, and into other parts of Germany. The other kind is a very ſtrong and pure Salt, and is of the largeſt grain of any boiled Salt, now made: this laſt they call the St. Ubes or Liſbon Salt, from its reſemblance to the pure bay Salt made in thoſe places.

The Salt, which they refine, is altogether marine bay Salt, and they chiefly have it from France and Spain; but they find, by experience, that any one kind of bay Salt does not anſwer their purpoſes ſo well as two or more kinds; they therefore frequently mix three parts of Cadiz Salt with one part of that of Souſton, which is of great ſtrength, but very dirty, and of a green colour, and does not coſt above half the price of the Spaniſh Salt; for diſſolving the bay Salt, they uſe ſea-water, which they bring in lighters to Dort and Rotterdam from below the Brill or Helvoet; out of theſe lighters it is craned into cellars, and is thus impregnated with bay Salt to a certain degree of ſtrength, which they determine by hydrometers made for that purpoſe. After the heavy droſs of the Salt is ſubſided to the bottom of the cellar, the clear brine is pumpted up into the Salt pan through a mat, which retains the light ſcum, ſtraws, or other impurities, which floated on the ſurface of it. Theſe Salt pans are of iron, of a round figure, and commonly forty feet in diameter, and eighteen inches deep. Theſe pans are placed over a hearth furnace, and the only fuel they uſe in the boiling the Salt is dry turf. The fire is kept up ſo high, that the liquor boils briſkly all the time, and, if any ſcum ariſes, they carefully take it off, but they uſe no clarifying mixtures. A little before the Salt begins to granulate, they add to the pan a lump of butter, of the bigneſs of a walnut, and half a pint of ſour whey, which has ſtood at leaſt half a year. When theſe things are perfectly mixed in by a good ſtirring, they ſhut the doors and windows of the houſe, that no air can blow in cold, and the houſe is kept thus hot all the time that the Salt is forming. This method is not new, or peculiar to the Dutch works, for Agricola deſcribes an apparatus of board, to keep the cold air out of the Salt pan all the time that the Salt is forming; and the Germans uſe it in many places at this time.

It is out of this ſame brine, and by the ſame proceſs, that they make the table Salt and the ſtrong Salt; only towards the end of the proceſs they make this difference, if the pan is to be wrought into table Salt, the brine is kept gently ſimmering during the whole operation, and all is finiſhed in twenty-four hours; but, if it be to be made into the ſtrong Salt, they ſlacken the fire to ſuch a degree, that the operation takes up three days. In both caſes they let the ſalt remain in the pan till the whole is finiſhed; they then rake it out with wooden rakes, and after it has drained a while in wooden drabs, it is fit for uſe. The mother brine, of which there always remains a large quantity in the pan after the ſtrong Salt is made, as alſo the drainings of the drabs where the Salt is put, is reſerved to be boiled up into table Salt; but the mother brine of the table Salt becomes more ſharp and bitter after every proceſs, and is finally thrown away. *Brownrig of Salt.*

Sedative SALT, a name given by the modern chemiſts to a Salt, of the virtues of which they boaſt much. Thoſe who firſt deſcribed it gave the proceſs for making it in a very enigmatical manner; and their ſucceſſors invented many different ways of preparing it. The truth is, that all mixtures of borax with the vitriolic acids furniſh us with a ſedative Salt, as do alſo the mixtures of borax with ſpirit of nitre or of ſea Salt.

Vitreous SALT, in chemiſtry, a term uſed by ſome modern chemiſts for a kind of Salt, which, till of late, has wanted a name, and which is found in and ſeparable from the fixed alcaline Salts of vegetables.

It is bitter, hard, fixed, and not alcaline, and of a cryſtalline or gloſſy appearance.

The method preſcribed by Boerhaave for the procuring it with moſt eaſe, is this: put ſix pounds of the beſt pot-aſhes into a clean glaſs, add thereto twenty pints of cold rain water, ſtir them together with a ſtick, and ſuffer the whole to reſt. When the aſhes are thoroughly diſſolved, gently decant the clear lixivium, and there will be found at the bottom, mixed with the fæces, a number of ſmall greyiſh granules, of a bitter taſte, and of an almoſt glaſſy brittleneſs and hardneſs; theſe are the Salt required, and contain no alcaline quality; but, to obtain it in greater purity, diſſolve ſix pounds of pot-aſhes in fourteen-times their weight of water; filtre the lixivium while hot, and make it perfectly clear; then put it into a glaſs veſſel ready heated, and moiſtened, and ſuffer it to ſtand; a duſky cruſt will ſoon begin to ſhoot to the bottom and ſides of the glaſs, and will gradually become thicker and thicker; at length when no more appears to ſhoot, pour off the liquor, and there will remain behind a Salt like the former, but purer, and in larger quantities: if the remaining lixivium be boiled a little, and ſet to cryſtalliſe again, it will afford a ſmall quantity more of this Salt; but after this it will yield no more; whence there ſeems to be only a certain and determinate quantity of this Salt contained in the alcali. If this Salt be put into a veſſel of rain water and ſhook about, it does not diſſolve, only the alcali waſhes off, and the Salt remains purer than before: after this, it is to be gently dried and kept. *Boerhaave, Chem.*

SALT *marſh*, *ſalina*, a place where Salt is made, of which there are many natural ones in the hotter countries, where the ſea, exhaling the water of Salt lakes, leaves the Salt dry and ready for uſe at the bottom, without any art or labour of man to make it: thus, in Muſcovy and ſome other places, there are whole fields of Salt.

The countries, however, where this is not naturally performed, may effect it by art, and make ſaline or Salt marſhes, where they may uſe the ſun's heat to great advantage. This is annually done to great advantage in France, and there is no reaſon why we may not do the ſame, either at home or in our American colonies, though it has not yet been attempted.

In order to make a ſaline or Salt marſh, a low plat of ground muſt be choſen, adjoining to the ſea, and diſtant from the mouths of large rivers, and this muſt be near ſome convenient harbour for veſſels. The ground muſt be free from freſh water ſprings, and out of the reach of land floods, and if poſſible ſhould have a clayey bottom; and finally, it muſt be well defended from the ſea, either by natural or artificial banks of earth of a proper ſtrength and thickneſs.

The ground thus choſen muſt be hollowed out to three ponds or receptacles. The firſt into which the ſea-water is uſually admitted may be called the reſervoir. The ſecond receptacle, which is to be divided into three diſtinct ponds, communicating with each other by narrow paſſages, and containing brine of different degrees of ſtrength, may be called the brine ponds; and the third receptacle is to be furniſhed with an entrance, between which and the brine ponds there is to run a long, narrow, and winding channel; the reſt of it is to be divided into ſmall and ſhallow pits, containing a very ſtrongly ſaturated brine, which in them is to be converted into Salt, and they may therefore very properly be called the Salt pits.

The firſt receptacle or reſervoir muſt have a communication with the ſea by a ditch, defended on each ſide by walls of brick or ſtone, and made of ſuch a depth, that by it all the water of the reſervoir and other parts of the Salt marſhes may be able to run out at low water, and by it, alſo, the ſea may be admitted into it at high tide. So that at neap tides the marſh may be filled with ſea-water to the depth of ten inches in the reſervoir; and, conſequently, at higher tides, to the depth of two feet, when there is occaſion to overflow the marſh, as is always to be done in the winter ſeaſon, when there is no Salt to be made; for, by this means, the wood work is kept from decay, and the clay bottom from injuries by froſt. The ditch between the reſervoir and the ſea muſt have a flood-gate, by which the ſea water may be admitted, retained or let out as occaſion may require. *Brownrig of Salt. Phil. Tranſ.* N°. 51.

The ſeveral ponds or receptacles muſt not have all their bottoms upon the ſame level, but muſt be made of unequal depths, ſo that the firſt receptacle or reſervoir may be eight inches and a half deeper than the Salt pits in the third receptacle. The three brine ponds alſo ſituated between the reſervoir and the Salt pits muſt be of unequal depths. The next adjoining to the reſervoir muſt be the deepeſt, and that which is nigheſt the Salt pits the ſhalloweſt, but all of them muſt be ſhallower than the reſervoir; and the three receptacles being thus conſtructed, the water ſtanding at the ſame height in them all, and forming with its ſurface one continued plain, will be ten inches deep in the reſervoir, when only an inch and half in the Salt pits.

The length and breadth of the brine ponds and reſervoirs are to be at diſcretion; but it is beſt to err in making them too large, and in general they ought to be ſo large as to furniſh the Salt pits with a conſtant ſupply of brine, fully ſaturated with Salt; and, for this purpoſe, it is neceſſary to have them of different dimenſions, in different countries, according to the degree of heat.

The bottoms of the reſervoir and brine ponds are to be lined with any kind of lean and tough clay, or earth, that will hold water; and the French uſe a red, or blue clay, to be had in in the neighbouring grounds. With them, the blue always ſucceeds better than the red, which colours the Salt much more; but in order to have a perfectly pure Salt from this kind of manufacture, the bottom ſhould be lined with ſome clean cement, which will hold water perfectly, and will not be eaſily broken up. Id. Ibid.

The ſalina or marſh being thus conſtructed, the ſaltmen, at the proper ſeaſon of the year, open the flood-gate when the tide is out, and drain off all the ſtagnating water; when this is done, they repair the bottom of the marſh in ſeveral places, where it is found neceſſary, and cleanſe the ſeveral receptacles from mud and dirt: after this they admit the ſea-water, at the next high tide, till it floats the whole marſh, and ſtands at about ten inches high in the reſervoir. In a day or two moſt of the water in the Salt pits is exhaled, and what remains is a very ſtrong brine; they then let in more ſea-water at the two or three following tides, and ſo take care to admit as much water freſh into the marſh as has been waſted in vapour by the heat, conſtantly raiſing it to the height of ten inches in the reſervoir, and, conſequently, to an inch and a half in the Salt pits; and when the weather is extremely hot, or there are ſharp drying winds, they fill them ſomething higher than this.

All the parts of the marſh are thus ſupplied with water out of the reſervoir, but the ſea-water which is let into the reſervoir, is not confuſedly let into the other water or brine of the ponds and Salt pits; for, as the ſeveral parts of the work communicate only by narrow channels, it is provided, that the Salt water flowing out of the reſervoir never returns to it again, but gently flows along till it arrives at the ſecond brine pond, and from that to the third, being forced forwards by the ſea water received from time to time into the reſervoir: during this flow courſe, the watery fluid always flies off in great quantity by exhalations, and the brine is continually preparing for cryſtalliſation, as it flows along gently, growing all the way ſtronger and ſtronger, as it approaches the Salt pits; ſo that, when it at length enters theſe pits, it is fully ſaturated with Salt; and particular care is taken to guard the entrance of the Salt pits by a long and narrow channel, by which means the ſtrong brine contained in theſe pits is prevented from returning back, and mixing with the weaker brine in the brine ponds; care is alſo taken, that the ſtrong brine in the Salts pits is ſpread out very thin, and expoſed to the ſun and air with a large ſurface, by which means the water more quickly exhales from it, and the Salt is left concreted into cryſtals. Theſe cryſtals, or Salt, the workmen in France draw out every day, and diſpoſe them at length together in a pyramidal heap, which they cover over at the top with thatch or ſtraw, and ſo preſerve them from the injuries of weather. Thus at a ſmall expence and trouble a Salt is prepared, which is found very fit for all domeſtic uſes; and France is furniſhed with a very profitable article for exportation into other countries.

Glauber's purging SALT (*Dict.*)—Though this be a well known preparation, and the reſult of a mixture of a vitriolic acid with marine Salt, and the world has ſuppoſed it could be no other way found than by ſuch an union made by art; yet Mr. Heliot has communicated to the academy of ſciences at Paris, an account of its being found in vitriol alone, without the addition of any foreign matter.

The common green vitriol or copperas is well known to be made in England, by an union of the ſulphureous acid of the common pyrites and iron. Old iron is thrown into large quantities of a ſolution of the pyrites, that it may be diſſolved; and the union produces a concrete in the form of a regular ſalt. This Salt we well know contain a ſulphureous matter; whether that be obtained from the pyrites, or from the iron that enters its compoſition; ſince, in the diſtillation of its oil, there ever eſcapes a very ſtrong and penetrating ſcent of ſulphur through the junctures of the veſſels.

There are alſo ſome vitriols, particularly the common Swediſh kind, which may very probably be aluminous; ſince the yellow ſhining gold-like marcaſite from which it is made, yields in its native ſtate true ſulphur in diſtillation, and afterwards affords vitriol in the lixivium, after the remainder has been long expoſed to the air; and, finally, it yields alſo alum, by the addition of urine and pot-aſhes to what they call the mother water of vitriol.

Mr. Lemery has ſhewn, that after a moderate diſtillation of green vitriol, a ſalt of the nature of alum may be drawn by a lixivium from the colcothar; and, beſides this, Mr. Heliot has found in that colcothar, a vitrifiable earth, and a genuine Glauber's Salt. Thoſe who are at all acquainted with chemiſtry, know that Glauber's Salt is a concrete compoſed of the vitriolic acid and Sea ſalt, and it is generally received as a certainty that any other acid joined to ſea Salt cannot afford this concrete; therefore, if Glauber's Salt is to be produced from ſea Salt alone, and yet is proved to be found in pure vitriol; it muſt follow, that pure vitriol does contain ſea Salt, or at leaſt, that ſubſtance which is the baſis of ſea Salt: and this will prove a leſs ſingular obſervation, if it can be evinced, according to Becher, that all the known Salts owe their origin to marine Salt.

Mr. Lemery, in order to procure his aluminous ſalt from vitriol, does not puſh his diſtillation too far, that the acid may remain engaged and entangled in that earth, by the union with which it is to form this ſalt, which is afterwards to be ſeparated by lixiviation; but Mr. Heliot puſhes the diſtillation to the utmoſt degree with a violent fire of three or four days and nights, ſuch as Kunckel preſcribes, for the diveſting vitriol of all its acid, that the remainder in the retort may contain little or no ſalt at all. He took eighteen pounds of Engliſh vitriol, which he calcined to a redneſs, and by that means reduced it to ſix pounds. This quantity, though put in a covered earthen veſſel, acquired nine ounces in weight from the humidity of the air in two days; and in this ſtate it was put into a German retort, and urged to that degree by the violence of fire, for ſo long a continuance, that the remaining black maſs, though treated with all the care imaginable, and waſhed by repeated lixiviation, yielded only two ounces and a half of Salt, and that of a very earthy kind. About nine ounces of phlegm had been ſeparated at the beginning of the diſtillation, but when the white vapours began to appear, the veſſels were all cloſed, and ſo kept to the end of the operation; the produce of which was an icy oil of vitriol, which was found in a black cryſtalline form.

The ſucceſs of the operation, as to the procuring this icy oil of vitriol, depends on the nice luting the junctures of the veſſels, ſo as to prevent all communication with the external air; for otherwiſe the vapours attract a moiſture from the air, which renders them fluid in the receiver.

The receiver muſt alſo be placed at a conſiderable diſtance from the retort, that it may be cool enough to condenſe the vapours, and large enough to prevent their exploding for want of room; for though the preceding calcination has carried off the more valuable parts, yet there remains matter enough for great exploſion, and for the formation of a ſubſtance not leſs inflammable, than crude ſulphur, were the acid in a leſs proportion.

The beſt method is to fit to the neck of the retort a receiver with two necks; the one of which receives that of the retort, and the other is received into a capacious ſingle receiver, of the common kind.

The icy oil is not eaſily got out of the receiver, for it exhales ſo ſtrong a ſulphureous vapour, that if it be placed lower than the operator's head, it would ſuffocate him in a moment.

This icy oil is black, becauſe it carries over with it a quantity of that oily matter, which no vitriol is ever entirely free from, and which is always found in the mother water, as it is called, of vitriol, after the repeated cryſtalliſations of the ſalt from it; and it is well known, that any inflammable ſubſtance, in ever ſo ſmall a quantity, will turn the pureſt oil of vitriol black; nor is this all, for the acid ſpirits alſo, when urged by a violent fire, carry over with them iron, or at leaſt ſuch particles as are capable of becoming iron. This is eaſily demonſtrated in either the common or the blackeſt cryſtals of the icy oil of vitriol; for, if theſe be diſſolved in a large quantity of pure diſtilled water, and allowed to ſtand ſeven or eight days, there always precipitates to the bottom of the veſſel a ſediment, which, after it has been calcined, has many particles which readily anſwer to the magnet. Beſides this oily matter, and theſe particles of iron, the oil of vitriol carries with it alſo a white, heavy, and cryſtalline ſubſtance, of the nature of earth, which may be ſeparated, by means of ſpirit of wine, from oil of vitriol, ever ſo well rectified. The ſame ſort of earth is alſo found in the Salt, which is extracted from the caput mortuum, left after the diſtillation of the icy oil. The lixivium, made by this author from the remaining maſs, left after the diſtillation of the icy oil of vitriol, was expoſed to the air, in a glaſs cucurbit, for the ſpace of ſix months; and the ſaline liquor, concentrated by evaporation in a ſand-heat, became green, and would by no means cryſtalliſe. The firſt ſaline pellicles had a ſaline but earthy taſte; theſe precipitated by degrees of themſelves, and were finally ſucceeded by others, which taſted acid, but not greatly ſo. This liquor being evaporated to a dryneſs, an ounce of the remainder was put into a retort, and four ounces of oil of vitriol were put on it, with one ounce of water, to forward the diſſolution; this was kept in digeſtion twenty days, at the end of which time the liquor acquired a green colour, which ſhewed that there were yet in the maſs metallic parts for it to diſſolve: this was finally diſtilled with a gentle heat to ſeparate the phlegm, and afterwards the fire was increaſed to drive over the acid; the oil of vitriol came over as ſtrong, as it was when put on, but much more ſulphureous. The diſtilled oil, being returned upon the ſalt, with the freſh addition of a ſmall quantity of water, became ſo hot, that the veſſel could not be held in the hand; which had not been the caſe in the firſt mixture, at leaſt not in any ſenſible degree. Several more cohobations made it yet more and more acid, and at length it became ſo cauſtic, as to leave an eſchar on being juſt touched upon the tongue.

The green colour, which the acid firſt received, became at length changed into a blue one, which gave ſuſpicion that there was copper, as well as iron, in the vitriol. This might appear ſtrange, as it was Engliſh vitriol that was uſed; but Kunckel has proved by experiments, that there is ſome copper in all vitriol, even in the Engliſh; nay, he advances, that in the vitriol of iron, made with oil of vitriol, and filings of that metal, there may always be diſcovered ſome portion of copper; and, in fine, that there is no iron but contains ſome portion of copper, and no copper but contains ſome portion of iron.

After the ſixth cohobation of this blue liquor, there remained a granulated and filamentous ſaline ſediment, on the ſurface of which there was a ſmall quantity of a yellow ſublimation, reſembling flower of ſulphur; warm water, being poured upon this matter, became of a greeniſh colour; and this, being digeſted in a ſand-heat, became afterwards reddiſh, and precipitated to the bottom a white and very heavy powder; which, on a ſeries of examinations, proved to be of the nature of that opake white ſtone, uſually found among the ores of metals, and called by the Germans quartz. The ſaline liquor, from which this was ſeparated, became yet redder, by longer digeſtion, but, when cold, it turned to a fine green.

This liquor, being concentrated, by evaporation, to the quantity of two or three ounces, was put into a glaſs veſſel, with its pellicle, which ſoon precipitated itſelf to the bottom, in form of a thin cruſt, covering the ſurface of the glaſs in the manner of a wet paper. In five or ſix weeks time, there became formed in this veſſel, both at the bottom and ſides, a number of large cryſtals, of a beautiful green colour, and, as the liquor dried away, theſe mouldered into a browniſh red powder. In fine, there appeared, in the remainder of this liquor, another ſort of cryſtals; theſe were white and tranſparent, and were formed in ſquare columns, with their extremities cut in the manner of thoſe the pyramids of the columns of Glauber's Salt; they had alſo a better taſte, and left a remarkable ſenſe of coldneſs on the tongue. Theſe appeared indiſputably, by theſe and all other trials, to be true Glauber's Salt. *Mem. de l'Acad. Scien. Par.* 1738.

It is to be obſerved, that, though Glauber made this Salt known about the middle of the preceding century, yet Kunckel in his Laborat. Chymic. aſſures us it was known in the electoral houſe of Saxony an hundred years before. However this be, we owe the knowledge of it to Glauber, who called it admirable; and it ſoon acquired, and has ever ſince maintained, the reputation of an excellent internal medicine in many caſes.

Glauber's Salt may be obtained from borax, by mixing oil of vitriol with it. Mix four ounces of borax with one ounce and one drachm of oil of vitriol; upon ſublimation, this gives the ſal ſedativum of Homberg, and the reſiduum, expoſed to a ſtrong fire, affords Glauber's Salt. This operation may be ſhortened very much, for, inſtead of ſublimation, the ſalt may be obtained by cryſtalliſation, in light foliated laminæ. This Salt, whether prepared by ſublimation or by cryſtalliſation, has the property of diſſolving in ſpirit of wine; and, if this ſpirit of wine be ſet on fire, the flame is green. Spirit of wine has no effect on borax, and the oil of vitriol, digeſted with it, does not make its flame green. Therefore it is neceſſary, in order to give this greenneſs to the flame, that borax ſhould be united to an acid. *Philoſ. Tranſ.* N°. 436.

SALT-*petre.* See NITRE, *Dict.* and *Sup.*

SAMA'RITANS (*Dict.*)—Salmanazar, king of Aſſyria, having conquered Samaria, led the whole people captive into the remoteſt parts of his empire; and filled their place with colonies of Babylonians, Cutheans, and other idolaters. Theſe, finding themſelves daily deſtroyed by wild beaſts, deſired an Iſraelitiſh prieſt to inſtruct them in the ancient laws and cuſtoms of the land they inhabited. This was granted them; and they thenceforth ceaſed to be incommoded with any beaſts. — However, with the law of Moſes, they ſtill retained ſomewhat of their ancient idolatry. The Rabbins ſay, they adored the figure of a dove on mount Gerizim.

Be this as it will, it is certain, the modern Samaritans are far from idolatry: ſome of the moſt learned among the Jewiſh doctors own, that they obſerve the law of Moſes more rigidly than the Jews themſelves.—They have a Hebrew copy of the Pentateuch, differing in ſome reſpects from that of the Jews; and written in different characters, commonly called Samaritan characters; which Origen, Jerom, and other fathers and critics, ancient and modern, take to be the primitive character of the ancient Hebrews; though others maintain the contrary. The point of preference, as to purity, antiquity, &c. of the two Pentateuchs, is alſo diſputed by the modern critics.

The Samaritans are now few in number; though it is not very long, ſince they pretended to have prieſts deſcended directly from Abraham. They were chiefly found at Gaza, Neapolis (the ancient Sichem) Damaſcus, Cairo, &c. They had a temple, or chapel, on mount Gerizim, where they performed their ſacrifices.

Joſeph Scaliger, being curious to know their uſages, wrote to the Samaritans of Egypt, and to the high-prieſt of the whole ſect, who reſided at Neapolis. They returned two anſwers to Scaliger, dated in the year 998 of the Hegira of Mahomet. Theſe anſwers never came to the hands of Scaliger. They are now in the French king's library, and have been tranſlated into Latin by father Morin, prieſt of the oratory; and printed in the collection of letters of that father in England, 1682, under the title of Antiquitates Eccleſiæ Orientalis. M. Simon has inſerted a French tranſlation, in the firſt edition of Ceremonies & Coutumes des Juifs, by way of ſupplement to Leo de Modena.

In the firſt of theſe anſwers, wrote in the name of the aſſembly of Iſrael in Egypt, they declare, that they celebrate the paſſover every year, on the fourteenth day of the firſt month, on mount Gerizim; and that he who then did the office of high-prieſt, was called Eleazar, a deſcendant of Phineas, ſon of Aaron.—At preſent they have no high-prieſt. In the ſecond anſwer, which is in the name of the high-prieſt Eleazar and the ſynagogue of Sichem, they declare, that they keep the ſabbath in all the rigour wherewith it is enjoined in the book of Exodus; none among them ſtirring out of doors, but to the ſynagogue. They add, that on that night they do not lie with their wives; that they begin the feaſt of the paſſover with the ſacrifice appointed for that purpoſe in Exodus; that they ſacrifice no where elſe but on mount Gerizim; that they obſerve the feaſts of harveſt, the expiation, the tabernacles, &c. They add further, that they never defer circumciſion beyond the eighth day; never marry their nieces, as the Jews do; have but one wife; and, in fine, do nothing but what is commanded in the law: whereas the Jews frequently abandon the law to follow the inventions of their rabbins.

At the time when they wrote to Scaliger, they reckoned one hundred and twenty-two high-prieſts; affirmed that the Jews had no high-prieſts of the race of Phineas; and that the Jews belied them, in calling them Cutheans, whereas they are deſcended from the tribe of Joſeph, by Ephraim.

The truth is, the Jews impoſe abundance of things on the Samaritans: they frequently confound them with the Sadducees, as if they were infected with their errors.—Rabbi Benjamin, who lived in the XIIth century, confirms the beſt part of what we have ſaid of the Samaritans: he obſerves, they had prieſts of the tribe of Aaron, and who never married with any but thoſe of the ſame tribe: that they ſacrificed on mount Gerizim, where they had an altar of ſtone raiſed by the Iſraelites after paſſing over Jordan. He adds, that they are of the tribe of Ephraim; that they change their habit to go to the ſynagogue, and waſh before they put it on.

SAMARITAN *Medals*, (*Dict.*)—Theſe medals have been infinitely canvaſſed by the critics, both Jewiſh and Chriſtian; particularly rabbi Alaſcher, rabbi Bartenora, rabbi Azarias, rabbi Moſes, father Kircher, Villalpandus Waſerus, Conringius, Hottinger, father Morin, Walton, Hardouin, Spanheim, &c.

The learned jeſuit Souciet, in an expreſs diſſertation on the Samaritan Medals, rejects all Hebrew medals, whoſe inſcriptions are in Chaldee characters, as ſpurious; and allows of none to be genuine but the Samaritan.—Of theſe there are four kinds.

The firſt bear expreſly the name of Simon, and the ſubject for which they were ſtruck, viz. the deliverance of Jeruſalem. The ſecond kind have not the name Simon, but only the deliverance of Sion, or Jeruſalem. The third kind have neither Simon, nor the deliverance of Sion, but only the epocha's, firſt year, ſecond year, &c. The fourth claſs have neither any inſcriptions, nor any thing whence one may judge of the time when they were ſtruck.

The three firſt kinds were certainly ſtruck after the return from the Babyloniſh captivity, and in the time of Simon Maccabeus, after Jeruſalem had been freed from the yoke of the Greeks. But, though ſtruck after the captivity, father Souciet obſerves, their character ſhews itſelf to be that of the ancient Hebrew, which was uſed before the captivity, and the uſe whereof was loſt by the people, during their ſojourn in Babylon and Chaldea; but reſtored, after their return, on the ſame footing as before. He adds, that the inſcriptions are pure Hebrew, ſuch as it was ſpoke before the captivity; that the character, therefore, is the true ancient Hebrew character: that it was cuſtomary to write each language in its proper character: that, if they had departed from this rule, they had doubtleſs uſed the new character they brought with them from Babylon: that there could be no other reaſon, but that of ſettling all things on the ſame foundation they were on before the deſtruction of Jeruſalem, that could have induced them to uſe this character on their coins. And, laſtly, that theſe medals were not ſtruck by the Samaritans, but by the Jews, and in Jeruſalem.

F. Souciet is very full on all theſe points, and, to the proofs drawn from medals, adds two others foreign thereto: the firſt drawn from the reſemblance of the Greek letters, introduced by Cadmus the Phœnician, with this Hebrew character; which was the ſame with that of the Phœnicians, as the language of thoſe people was the ſame with that of the Hebrews. —The ſecond drawn from ſeveral various readings in the ſcriptures, which cannot be well accounted for otherwiſe, than by ſuppoſing, that the books wrote before the captivity were in the ſame character with theſe medals, and which ſhew, that it is the conformity which certain letters have in that character, that has deceived the copyiſts.

From the whole, he concludes, that this character of the medals is the true antient Hebrew character; and, that to judge of the various readings of the Hebrew text, and the differences of the ancient Greek and Latin tranſlations, either from themſelves, or from the Hebrew text, recourſe muſt be had to this character.

SA'MLET, an Engliſh name for a fiſh of the truttaceous kind, caught in Herefordſhire, and ſome other parts of England, and called, by Willughby, ſalmulus. *Willughby's Hiſt. Piſc.*

SAMP, in our American colonies, a name given to a ſort of bread made of the maiz, or Indian corn.

They firſt water the corn for about half an hour, and then beat it in a mortar, or grind it in a hand mill; they then ſift out the flour, and winnow the huſks from it; they then mix this into a thin paſte with water, and bake it in flat loaves, which they call Samp loaves, or Samp bread.

Beſides this they have another diſh prepared of this corn, which they eſteem a great delicacy, and call by the name of Samp, without the addition of loaf or bread. To make this, they only bruiſe or grind the corn to the ſize of rice, and then, winnowing away the huſks, they boil it gently till it is thoroughly tender, and then add to it milk and butter, and ſugar: this is not only a very wholeſome, but a very pleaſant diſh. It was the firſt diet of our planters when newly ſettled there, and is ſtill in uſe, as an innocent food in ſickneſs as well as health.

The Indians, who feed on this ſort of food, are found never to be ſubject to the ſtone, and to eſcape ſeveral other painful diſeaſes.

The Engliſh have found a way of making a very good ſort of beer of the grain of this Indian corn: they do this either by uſing the bread made of it, or elſe by malting it as we do our own corn. When they make the beer of the maiz breed, they break or cut it into lumps as big as a man's fiſt; they maſh theſe in the ſame manner that we do malt, and boil up the wort in the ſame manner, either with or without hops. *Phil. Tranſ.* Nº. 142.

SA'NCTUARY, among the Jews, was the holieſt and moſt retired part of the temple of Jeruſalem; wherein was preſerved the ark of the covenant, and into which nobody was allowed to enter but the high-prieſt, and that only once a year, to intercede for the people.

The Sanctuary, called alſo ſanctum ſanctorum, or holy of holies, is ſuppoſed to be a type or figure of heaven, and of Jeſus Chriſt the true high-prieſt, who is aſcended thither to make interceſſion for us.

Some will have it, that the whole temple was called the Sanctuary; and that the ſanctum ſanctorum, where the ark was kept, was only a little chapel or oratory therein.

To try or examine a thing by the weight of the Sanctuary, is to examine it by a juſt and equal ſcale; in regard, among the Jews, it was the cuſtom for the prieſts to keep ſtone weights, to ſerve as ſtandards for regulating all weights by; though theſe did not differ from the royal, or profane weights.

SANCTUARY, *or aſylum*, alſo ſignified, a place of refuge or protection.

Some pretend, the firſt aſylum in Greece was that eſtabliſhed by order of the oracle of Jupiter Dodonæus, which commanded the Athenians to grant their lives to all thoſe who fled for Refuge into the Areopagus, to the altars of the Goddeſſes. But others ſay, the firſt aſylum was built at Athens, by the Heraclidæ, and was a refuge for thoſe who fled from the oppreſſion of their fathers. The aſyla of altars and temples were very ancient in the time of Pauſanias; who writes, that Neoptolemus, the ſon of Achilles, was ſlain near the altar of Apollo at Delphos, as a juſt puniſhment for his killing Priam, king of Troy, who had fled to the altar of Jupiter Herceus for refuge. The temple of Diana at Epheſus was the moſt famous aſylum. The privileges of the aſyla were inviolable; whence Tacitus complains, that the Grecian temples were filled with the worſt of ſlaves, with inſolvent debtors, and criminals, who fled from juſtice; and that no authority was ſufficient to drive them from thence. Yet we meet with inſtances of obliging ſuch perſons to quit their Sanctuary, by ſtarving them, or by ſetting fire to their place of refuge. All temples were not Sanctuaries, but ſuch only as received that privilege from the manner of their conſecration; and, of thoſe which enjoyed this privilege, ſome were free for all men, others appropriated to certain perſons or crimes. Nor was this honour paid to the Gods only, but alſo to the ſtatues, or monuments, of princes, and other great perſons.

When Romulus built Rome, he left a place, covered with wood, between the capitol and the Tarpeian rock, as an aſylum to all perſons, who ſhould fly thither, whether freemen, or ſlaves. This aſylum at Rome remained ſacred, and was not violated, till the reign of Tiberius, who, ſeeing its abuſes, aboliſhed it. At laſt the aſyla were ſo little regarded, that they ſerved only as a protection for ſmall offenders; for the magiſtrates made no ſcruple of forcing great criminals from the very altars.

The Jews had their aſyla; among theſe, the moſt remarkable were the cities of refuge; in order to provide for the ſecurity of thoſe who, by chance, and without any deſign, happened to kill a man. They were ſix in number, three on each ſide Jordan. They were commanded likewiſe, when they ſhould enlarge their borders, to add three more: but, as this command was never fulfilled, the Rabbins ſay, the Meſſiah, when he comes, will accompliſh it. Beſides the cities of refuge, the temple, and eſpecially the altar of burnt-offerings, enjoyed the privilege of an aſylum.

This privilege began to be enjoyed by the Chriſtians about the time of Conſtantine; but whether that prince made any laws concerning it, is doubted by learned men; for none appear that are older than the time of Theodoſius. At firſt, only the altar, and inward fabric of the church, was a place of refuge; but afterwards any outer buildings, or precincts of the church, had the ſame privilege granted them; ſuch as the houſes or lodgings of the biſhop, and clergy, gardens, baths, courts, and cloyſters: and, in after-ages, this exemption was extended to the graves and ſepulchres of the dead, to croſſes, ſchools, monaſteries, and hoſpitals. This privilege, originally, was not intended to patroniſe wickedneſs, or ſcreen the guilty from juſtice; but as a refuge for the innocent, the injured, and the oppreſſed; or, in doubtful cauſes, to give men protection, till they might obtain an equitable and fair hearing: in all ſuch caſes, they were allowed thirty days protection. But, that no one might expect this indemnity, who had not a juſt and legal title to it, ſeveral crimes and caſes were excepted by law, for which the church could grant no protection; as, firſt, protection was denied to public debtors, who had either embezzled, or kept back by fraud, the public revenues of the ſtate; ſecondly, the Jews, who pretended to turn Chriſtians, only to avoid paying their debts, or ſuffering legal puniſhment for their crimes; in other caſes, they had the common benefit of the Sanctuary with other men: the third ſort of perſons, to whom this privilege was denied, were heretics and apoſtates; the fourth, ſlaves, who fled from their maſters; and the fifth, robbers, murderers, conſpirators, raviſhers, adulterers, and other criminals of the like nature. This ſhews, that the original intention of Sanctuaries in the Chriſtian church was only to protect the innocent and injured, and, in dubious caſes, to grant the ſuppoſed offender a little reſpite. The conditions, upon which protection was granted, were, firſt, not to fly with arms to the church; ſecondly, to raiſe no clamour or tumult in flying thither; and, thirdly, not to eat, or lodge, in the church, but to be entertained in ſome outward building.

Paulinus, in the Life of St. Ambroſe, relates a remarkable inſtance of the violating of the aſyla.

Modern Sanctuaries are a great abuſe of theſe ancient aſyla of the Chriſtian church, in giving protection to almoſt all ſorts of criminals, and ſo enervating the force of the civil laws. The canon law of Gratian, and the decretals of the popes, grant protection to all criminals, except houſe-breakers, high-way-men, and ſuch as commit enormous crimes in the church itſelf, upon preſumption of its protection. Polydore Virgil cenſures the Engliſh for granting protection to all ſorts of criminals, not excepting traitors and rebels: but at preſent we have no ſuch practice; no ſanctuary in England, to ſcreen offenders from juſtice.

SAND, *arena*, in natural hiſtory, a genus of foſſils, the characters of which are: that it is found in minute concretions forming together a kind of powder. the genuine particulars of which are all of a tendency to one determinate ſhape, and appear regular, though more or leſs complete concretions; not to be diſſolved or diſunited, by water, or formed into a coherent maſs by means of it, but retaining their figure in it; tranſparent, vitrifiable by extreme heat, and not diſſoluble in, nor effervеſcing with acids. *Hill's Hiſt. of. Foſſ.*

Theſe are ſubject to be variouſly blended and intermixed either with homogene, or heterogene particles, particularly with flakes of talc; and according to theſe, and their different colours, are to be ſubdivided into ſeveral kinds, as red, white, &c.

Dr. Liſter divides the Engliſh Sands into two claſſes; the firſt, ſharp or rag Sand, conſiſting of ſmall tranſparent pebbles, naturally found on the mountains, and not calcinable: theſe he farther divides into fine and coarſe, and ſubdivides each, according to the colours, into white, grey, reddiſh, brown, &c.

The ſecond, ſoft or ſmooth, which he ſubdivides into that with flat particles broken from lime-ſtones, that with ſilver-like particles, and that with gold-like particles.

As to Sand, its uſe is to make the clayey earth fertile, and fit to feed vegetables, &c. for earth alone, we find, is liable to coaleſce, and gather into an hard coherent maſs, as is apparent in clay: and earth thus embodied, and, as it were, glued together, is no-ways diſpoſed to nouriſh vegetables: but if with ſuch earth, Sand, &c. i. e. hard cryſtals, which are not diſſolvable in water, and ſtill retain their figure, be intermixed, they will keep the pores of the earth open, and the earth itſelf looſe and incompact, and by that means give room for the juices to aſcend, and for plants to be nouriſhed thereby,

Thus a vegetable, planted either in Sand alone, or in a fat glebe, or earth alone, receives no growth or increment at all, but is either ſtarved or ſuffocated; but mix the two, and the maſs becomes fertile. In effect, by means of Sand, the earth is rendered, in ſome manner, organical; pores and interſtices being hereby maintained, ſomething analogous to veſſels, by which the juices may be conveyed, prepared, digeſted, circulated, and at length excerned, and thrown off into the roots of plants.

Grounds that are ſandy and gravelly, eaſily admit both of heat and moiſture; but then they are liable to theſe inconveniencies, that they let them paſs too ſoon, and ſo contract no ligature, or elſe retain it too long, eſpecially where there is a clay bottom; and by that means it either parches or chills too much, and produces nothing but moſs, and cankerous infirmities; but if the ſand happens to have a ſurface of good mould, and a bottom of gravel, or looſe ſtone, though it do not hold the water, it may produce a forward ſweet graſs; and, though it may be ſubject to burn, yet it quickly recovers with the leaſt rain.

Sea Sand is accounted a very good compoſt for ſtiff ground; for it effects the two things following, viz. it makes way for the tree or ſeed to root in ſtiff ground, and makes a fume to feed it.

Sand indeed is apt to puſh the plants, that grow upon it, early in the ſpring, and make them germinate near a month ſooner than thoſe that grow upon clay, becauſe the ſalts in the Sand are at full liberty to be raiſed, and put into motion, upon the leaſt approach of the warmth of the ſun; but then, as they are haſty, they are ſoon exhaled and loſt.

It is remarkable that Sand, though it appear a very hard, denſe, and indiſſoluble body, yet is contained inviſibly in the brine, or ſalt water of our ſalt ſprings; and even on the ſhooting of the ſalt, after evaporation, there ſtill remain the particles of it in the clear pellucid Salt; and this, though wholly ſoluble in water, yet when a brine, made by ſuch a ſolution, is boiled, depoſits as much of the Sand as the common brine of the pits, or ſea water.

Dr. Plot, who was very curious to know the true hiſtory of this ſingular effect, procured experiments to be made in the following manner: eight folds of fine Holland, and as many of much finer cambric, were put together, and, a quantity of the brine of the Staffordſhire ſalt pits being ſtrained through this, there was nothing ſeparated from it but a ſmall quantity of black duſt, which ſeemed to have fallen in by accident, and which was not at all like Sand; yet, on evaporating this brine, it was found to contain no leſs than one fourth part as much Sand as ſalt; the quantity of brine, yielding a buſhel of ſalt, yielding alſo a peck of Sand.

Some have ſuppoſed from theſe, and the like obſervations, that the Sand was generated during the time of the boiling the liquor, but the more careful examiners think otherwiſe; it appearing to them, that the particles of this Sand may be ſeen in the brine, by the help of a microſcope, before the boiling, in form of rectangular oblong plates, ſome nearly ſquare; theſe were ſo ſmall, as readily to paſs the ſtrainer with the water; and appearing as numerous in it after, as before the ſtraining, ſhew that they are no more to be kept, by ſuch means, than the ſalt.

The pores of the fineſt ſtrainers, examined by the microſcope, appear twenty times bigger than theſe plates, or particles of the Sand, and therefore it is not to be wondered at, that they let them through. There requires, therefore, no more to the formation of the Sand, than the coaleſcing of ſeveral of theſe particles into one larger granule, and ſo on; and this is very likely to be done by means of the evaporation of a part of the fluid which kept them ſeparate, and of the motion given to them in boiling, which naturally and neceſſarily brought them into the ſpheres of their own mutual attractions, at a time when their attraction with the fluid they ſwam in, was alſo much diminiſhed with its quantity. This attraction ſeems even evidently to increaſe between the particles, as the water becomes evaporated, and, when finally the Salt is drawn from it, and it is examined, as it drops from the baſkets, in which the ſalt is put to drain, it is ſeen to contain more numerous particles of this ſandy matter than before; and theſe are found to coaleſce into yet larger concretions, by degrees, as the remainder of the fluid evaporates from them on the glaſs.

The particles of this ſtony matter, when once thus united, are no more to be ſeparated by water, nor is the matter any longer ſoluble in that fluid. The common ſpar found in form of ſtalactites and incruſtations on the roofs, walls, and floors of old caverns, ſhews that it was once diſſolved in water, and by that means brought to thoſe places, and made into thoſe forms; and it ſhould ſeem, that this Sand, as it is called, was only this ſort of ſpar, which is contained more or leſs in all water; and which, on the evaporating of that water and ſeparation of the ſalt, which might help in making the water a menſtruum proper for the retaining it, ſhoots out into its own natural concretions; for the figure of theſe thin plates is the true and natural thin parallellopiped or rhomboidal figure of the ſmaller concretions of that matter, and even of thoſe pieces into which it falls on breaking. *Phil. Tranſ.* N°. 145.

Sand ſeems to have been the firſt ſubſtance added to proper ſalts for the making of glaſs. Joſephus, Tacitus, Strabo, Pliny, Agricola, &c. all mention this, and tell us of the ſtores, from which the Sand for this uſe was brought, being inexhauſtible. Latter ages have found that ſtones which have cryſtal for their baſis make a finer glaſs than Sand; of this kind are flints, &c. but theſe are all ſo expenſive in their preparation, that Sand is ſtill uſed in much greater abundance than any other ingredient. All the preparation it requires, is, that it be well waſhed before it is uſed; which much of what is uſed is found ready to their hands, being brought from the ſhores and beds of rivers.

Our glaſs-houſes, in London, uſe for their white glaſs the common white Sand uſed in writing, and have it from Maidſtone in Kent in vaſt quantities. For their green glaſs they uſe a common coarſe and greeniſh looking Sand, of which there are vaſt ſtrata at Woolwich. *Merret's Notes on Neri.*

Common Sand is a very good addition by way of manure to all ſorts of clay lands; it warms them, and makes them more open and looſe. The beſt Sand for the farmers uſe is that which is waſhed by rains from roads, or hills, or that which is taken from the beds of rivers; the common Sand that is dug in pits never anſwers nearly ſo well. Sand mixed with dung is much better than laid on alone: and a very fine manure is made by covering the bottom of ſheep-folds with ſeveral loads of Sand every week, which are to be taken away, and laid on cold ſtiff lands, impregnated as they are with the dung and the urine of the ſheep.

Beſides clay land there is another ſort of ground very improveable by Sand; this is that ſort of black foggy land on which buſhes and ſedge grow naturally, and which they cut into turf, in ſome places. Six hundred load of Sand being laid upon an acre of this land, according to the Cheſhire meaſure, which is near double the ſtatute acre, meliorate it ſo much, that without plowing, it will yield good crops of oats or tares, though before it would have produced ſcarce any thing. If after this crop is taken off, the land be well dunged, and laid down for graſs, it will yield a large crop of ſweet hay.

Once ſanding this land will improve it for a vaſt number of years, and it will yield two crops of hay in the year, if there be weather to make it in. Some land in Cheſhire has been, by this means, rendered of twelve times its former value to the owner. The bogs of Ireland, when drained, have been rendered very fruitful land, by mixing Sand in this manner among the earth, of which they conſiſt. Add to this, that in all theſe boggy lands, the burning them, or firing their own turf upon them, is alſo a great advantage. The common peat, or turf aſhes, mixed with the Sand for theſe purpoſes, add greatly to its virtue.

Sea Sand, which is thrown up in creeks and other places, is by much the richeſt of all Sand for manuring the earth; partly its ſaltneſs, and partly the fat and unctuous filth that is mixed among it, give it this great virtue. In the weſtern parts of England, that lie upon the ſea coaſts, they make very great advantages of it. The fragments of ſea ſhells alſo, which are always in great abundance in this Sand, add to its virtues; and it is always the more eſteemed by the farmers, the more of theſe fragments there are among it.

The ſea Sand uſed as manure in different parts of the kingdom is of three kinds: that about Plymouth, and on other of the ſouthern coaſts, is of a blue grey colour like aſhes, which is probably owing to the ſhells of muſcles, and other fiſh of that or the like colour, being broken and mixed among it in great quantity. Weſtward, near the land's end, the ſea Sand is very white, and about the iſles of Scilly it is very gliſtering, with ſmall particles of talc; on the coaſts of the north ſea the Sand is yellowiſh, brown, or reddiſh, and contains ſo great a quantity of fragments of cockle ſhells, that it ſeems to be chiefly compoſed of them. That ſea Sand is accounted beſt, which is of a reddiſh colour: the next in value to this is the bluiſh, and the white is the worſt of all.

Sea Sand is beſt when taken up from under the water, or from Sand banks, which are covered by every tide.

The ſmall-grained Sand is moſt ſudden in its operation, and is therefore beſt for the tenant who is only to take three or four crops; but the coarſe or large-grained Sand is much better for the landlord, as the good it does laſt many years.

Where the Sand is dredged out of the Sea, it is uſually twice as dear as where it is taken from the Sand banks.

When the land has been well manured with the large Sand, they take four crops of corn from it, and then lay it down for paſture for ſix or ſeven years before they plow it again. The graſs is ſo good, that they commonly mow it for hay the firſt year; it always abounds very much with the white-flowered clover. If the graſs grows but ſhort, it is the farmer's intereſt to feed his cattle upon it, and it will turn to as good account this way, being very ſweet and rich, and making the cattle fat, and the cows yield a very large quantity of milk. *Mortimer's Huſbandry.*

Indian SAND. The ſubſtance, commonly called Indian Sand, is famous for anſwering to the magnet. It is brought into ſeveral parts of Europe, and is ſaid to be gathered on the ſea ſhore in Perſia. After it is gathered, it is boiled in water to waſh away the ſea Salt and other impurities it may contain. After this operation, it is dried and ſent abroad in form of a black powder, conſiſting of grains of different ſizes. Some of theſe grains are very rough in every part of their ſurface, and others have one ſide only rough, the others perfectly ſmooth and gloſſy. Their figure is very irregular, and reſembles that of the grains of common Sand only; the grains of this Indian Sand are uſually ſmaller than thoſe of our common Sands.

Theſe little lumps have neither taſte nor ſmell, and are ſo friable, that they are eaſily reduced to an impalpable powder by rubbing. Some of the particles are ſtrongly attracted by the loadſtone, and others are ſo inactive as to be ſcarce at all affected by it. Thoſe particles, which are of the deepeſt duſky black, are moſt of all affected by the loadſtone; thoſe which are not affected by it, ſeem rather of the colour of lead, of a bluiſh black and ſhining; theſe are in the greateſt quantity, and the others are ſelected from among theſe by the loadſtone. *Philoſ. Tranſ.* N°. 432.

SAND *flood.*— Violent winds break through the turf that covers theſe hills, and then the Sand, lying looſe and naked, is ſoon carried down upon the plains, where it covers and buries the graſs, and in a very little time eats through the light turf, and mixing itſelf with the Sand underneath, becomes one bed of this dry matter never to be covered with turf again. A large body of Sand being thus got together, nothing ſtops it progreſs; but it, at every ſtorm, rolls over more and more ground, ſo that in a few years it extends itſelf a vaſt way, eſpecially where the ground, over which it paſſes, is of the ſame ſandy nature, and only covered with a thin turf.

In ſome parts of Suffolk the ground encourages this change ſo greatly, that a bed of Sand broke looſe from a neighbouring hill, and covering only a few acres, perhaps eight or ten, will, before it has travelled four miles forward, which it does in a ſmall courſe of years, deluge a thouſand acres. It travels down hill faſter than any way elſe, but will not be ſtopped by aſcent, but will move up the ſteepeſt hill, only that it requires more time. The making of fences, in the common way, to keep it out, is vain. It runs through the hedges, and flies over the tops of the banks; and, when it reaches a village, in its courſe, will bury the cottages, unleſs preſerved at more charge than they are worth. It will in a very little time beat up to the eves of a houſe, of the low kind, that are uſually built in a country village, and has often weight enough to break down walls in its paſſage.

The beſt way of ſtopping its progreſs is by hedges of furze, planted one over another, as they become levelled; theſe, if well kept up, will, by degrees, ſtop or divert the progreſs; and ſome who have tried this, with reſolution, after they have had the Sand raiſed twenty feet high, have found it ſtop its increaſe, and then, having manured this adventitious ſoil with dung, found it as good ground as that which made the ſurface before.

About Thetford, the villages were wholly deſtroyed by this about ninety years ago, and the branch of the river Ouſe, called then Thetford river, ſo blocked up by it, that very ſmall veſſels only could go up it, where very large ones uſed before. The river has been of great ſervice in ſtopping its progreſs into Norfolk, where otherwiſe its courſe would have carried it, and its vaſt ſpreading ſideways, in proportion to its going forward, would have made it bury vaſt quantities of land in a few years.

The moſt probable conjecture, as to the cauſe of this ſtrange ſort of deluge in theſe parts of England, is, that this portion of the county of Suffolk lies eaſt-north-eaſt of a part of the great level of the fens, and is by this expoſed to very impetuous winds, which acquire more than ordinary force, by their paſſing thro' ſo large a tract of country uninterrupted; the ſtorms ſeem to be one great cauſe of the miſchief, and the ſandy nature of the ſoil the other. There are old ſtories, in the country, of ſuits at law commenced among the farmers, for grounds blown out of the owners poſſeſſion; but the people who gain this ſort of wandering land are the greateſt ſufferers. A little Sand ſprinkled by the winds over a tract of land, where there is a bed of Sand under the turf, ſoon eats through that obſtacle; and what was at firſt only a thin coat of Sand, becomes then a deep plain of it, capable of being blown away to the depth of eight, ten, twenty, or more feet, and is carried over every thing in its progreſs before the winds, when once taken up by them. *Philoſ. Tranſ.* N°. 37.

SAND-*lands*, a term uſed by our farmers to expreſs ſuch grounds as conſiſt wholly of a pure ſheer Sand.

This is of different colours, as white, blackiſh, reddiſh, or yellowiſh, and is very different in its nature, and in the ſize of its particles, ſome being harſher and ſome milder, and ſome very light, ſeeming only to be mere duſt. The grey, black, and aſh-coloured Sand-land are the worſt of all, and generally are found on heaths and commons. Gravelly lands approach much to the nature of theſe, and thoſe which conſiſt of the largeſt ſtones, and are mixed with the harſheſt Sands, are of all the moſt barren.

The propereſt plants for arable land, of this kind, are white oats, rye, black wheat, and turneps. The natural produce, in weeds, is quick graſs, ſorrel, broom, furze, fern, and heath.

The beſt manure for them is either marl, or ſuch clay as will break with the froſts. Cow dung is alſo a good manure for theſe lands, and many uſe with ſucceſs chalk, mud, and the half rotten ſtraw from dunghils.

When the farmer has a mind to raiſe corn on theſe lands, he muſt order them the ſame as they do the clays; but where they are over-run with broom, furzes, and ſuch ſort of weeds, marl is to be laid on in great quantities. This is the practice in Staffordſhire, and by it they rid themſelves of theſe troubleſome weeds, and procure good crops of corn, though at ſome expence.

The firſt ſowing of this land is with black wheat, and for this they make three fallowings in winter, and ſtir them in the May following; at this time they ſow them, allowing one buſhel of ſeed to an acre, which generally yields them ſixty again. Then once plowing theſe lands, after this crop is off, they are fit to ſow rye on.

In Oxfordſhire, they ſeldom give theſe lands more than two fallowings for wheat, except they are very much over-run with weeds; and they eſteem the white and Lammas wheat the moſt agreeable for this ſort of land, and then after a fallow rathripe barley. They afterwards generally fallow them every other year, and reckon them unfit for beans and peas, though they ſometimes ſow them with winter vetches. If they ſow peas on them, they eſteem the rathripe kinds the beſt.

In Herefordſhire, they are much ſubject to moſs growing upon their ſandy lands, and they make a great improvement by burning it on the ground, and mixing the aſhes with lime, which they plow in.

They generally ſow them with rye after this manure, and that yields a very great increaſe upon them, and brings on a very good kind of graſs, if they are laid down after a crop or two. *Mortimer's Huſbandry.*

SA'NDIVER (*Dict.*)—It is reported, by many authors of great credit, that this ſalt, in its genuine form, and no way differing from ſuch as is ſeparated from glaſs, is thrown out in great abundance in the eruptions of the burning mountains, and lies about in lumps of a ſpungy texture and great ſize, or in ſmaller ſolid ones among the ſciarri and aſhes thrown out at thoſe times. The more firm and ſolid pieces are the moſt pure, and are generally of a fine white; the others not unfrequently are tinged bluiſh or yellow, and have ſometimes ſome of the melted matter of the ſciarri blended among the maſs, and filling up ſome of the cavities. In the catalogue of the ſpecimens of ſubſtances thrown out of Mount Ætna in one of its eruptions, and ſent as a preſent to the Royal Society, we find mention of ſeveral pieces of Sandiver, but without any particular deſcription. *Philoſ. Tranſ.* N°. 53.

SANGUINA'RIA, *puccoon*, in botany, the name of a genus of plants whoſe characters are:

The flower is incloſed in a ſheath, compoſed of two oval concave leaves, which fall off: the flower hath eight oblong petals, which are alternately narrow: theſe ſpread open, and in the center is ſituated the pointal, attended by ſeveral ſhort ſtamina: the pointal afterwards becomes an oblong ſwelling pod, opening both ways, and including many round-pointed ſeeds.

It is a native of moſt of the northern parts of America, where it grows plentifully in the woods; and in the ſpring, before the leaves of the tree come out, the ſurface of the ground in many places is covered with the flowers, which have ſome reſemblance to our wood anemone; but they have ſhort naked pedicles, each ſupporting one flower at the top: ſome of theſe flowers will have ten or twelve petals; ſo that they appear to have a double range of leaves, which has occaſioned their being termed double flowers: but this is only accidental, the ſame roots, in different years, producing different flowers: the roots of this plant are tuberous, and the whole plant has a yellow juice, with which the Indians uſe to paint themſelves.

SANGUI'NEOUS *Fevers*, a term uſed by the medical writers to expreſs a kind of fever, in which there is always a plethora or fulneſs of blood, which nature is attempting to leſſen by means of this accelerated motion of it, either by forming ſome hæmorrhage, or by throwing a part of it off in form of ſweat. It is very obvious to reaſon, therefore, that bleeding is the firſt thing neceſſary in theſe fevers.

The continent fevers, ſuch as the ephemera and ſynocha, are of this kind. *Junker's Conſp. Med.*

SANHE'DRIM, or SANHEDRIN (*Dict.*)—Many of the learned agree, that the Sanhedrim was inſtituted by Moſes, Numbers ch. xi. and conſiſted at firſt of ſeventy perſons, all inſpired of the Holy Ghoſt, who judged finally of all cauſes and affairs; and that it ſubſiſted, without intermiſſion, from Moſes to Eſdras. — Others will have it, that the council of ſeventy elders, eſtabliſhed by Moſes, Numb. ch. xi, was temporary, and did not hold after his death; adding, that we find no ſign of any ſuch perpetual and infallible tribunal throughout the whole Old Teſtament.

The Jews, however, contend ſtrenuouſly for the antiquity of their great Sanhedri: M. Simon backs and defends their proofs, and M. le Clerc attacks them.— Be the origin and eſtabliſhment of the Sanhedrim how it will, it is certain it was ſubſiſting in the time of our Saviour; that it was held at Jeruſalem; and that the deciſion of all the moſt important affairs belonged to it.—The preſident of this aſſembly was called Naſi.

There were ſeveral inferior Sanhedrims in Paleſtine, all depending on the great Sanhedrim at Jeruſalem. The inferior Sanhedrim conſiſted each of twenty-three perſons; and there was one in each city and town. Some ſay, that, to have a right to hold a Sanhedrim, it was requiſite there were one hundred and twenty inhabitants in the place. Where the inhabitants came ſhort of the number of one hundred and twenty, they only eſtabliſhed three judges.

Into the great as well as the inferior Sanhedrim were admitted prieſts, levites, and laymen, of all the tribes, provided they were of noble extraction, rich, wiſe, without any blemiſh of body, and expert in magic; which laſt was eſteemed a neceſſary qualification, to enable them to obviate and deſtroy it: very old people and eunuchs were excluded.

In each Sanhedrim there were two ſcribes; the one to write down the ſuffrages of thoſe who were for condemnation; the other to take down the ſuffrages of thoſe who were for abſolution. Selden has a learned work on the ſubject of the Jewiſh Sanhedrim, de Synedriis, printed at London in 1635, in three volumes, quarto.

SANI'CULA, *ſanicle*, or *ſelf-heal*, in botany, the name of a genus of plants, whoſe characters are:

It is an umbelliferous plant, whoſe flower conſiſts of five leaves placed orbicularly, but are generally bent back to the center of the flower, reſting on the empalement, which becomes a fruit compoſed of two ſeeds, that are gibbous and prickly on one ſide, but plain on the other: ſome of the flowers are always barren.

This plant is found wild in woods and ſhady places, in moſt parts of England; but being a medicinal plant, may be propagated in gardens for uſe: it may be increaſed by parting of the roots, any time from September to March; but it is beſt to do it in autumn, that the plants may be well rooted before the dry weather in ſpring comes on: they ſhould have a moiſt ſoil and a ſhady ſituation, in which they will thrive exceedingly.

SANI'DIUM, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, but neither of the rhomboidal nor columnar kinds, nor any other way diſtinguiſhable by its external figure, being made up of ſeveral plain flat plates.

SANS *Pareille*, in conchyliology, the name of a peculiar ſpecies of buccinum, which has its mouth opening a contrary way to that of all other buccina. This is a ſingle ſpecies among the recent buccina, but we find more than one with this peculiarity among the foſſil ſhells, and that in great abundance in many places in England.

SANTOLI'NA, *lavender-cotton*, in botany, the name of a genus of plants, whoſe characters are:

It hath a globoſe floſculous flower; conſiſting of many florets, divided into ſeveral ſegments, ſitting on the embryo, contained in the intermediate little leaves, hollowed like a gutter, and a ſquamous hemiſpherical empalement: the embryo afterwards becomes a ſeed, not at all furniſhed with down: to theſe notes muſt be added larger flowers than thoſe of wormwood and ſouthernwood, alſo the whole face of the plant.

Theſe plants may be propagated by planting ſlips or cuttings of any of the kinds during the ſpring, which ſhould be put into a border of light freſh earth, and watered and ſhaded in hot dry weather, until they have taken root; after which they will require no farther care, but to keep them clear from weeds till autumn, when they ſhould be carefully taken up, and tranſplanted where they are deſigned to remain: but, if the ground is not ready by that time to receive them, it will be proper to let them remain in the border until ſpring; for, if they are tranſplanted late in the autumn, they are liable to be deſtroyed by a little cold in winter.

Theſe plants are very hardy, and, if planted in a lean, gravelly, or ſandy dry ſoil, will continue many years, and reſiſt the cold very well: but, if they are in a wet or rich ſoil, they are often deſtroyed in winter. *Miller's Gard. Dict.*

SA'NTSI, in botany, a name given by the Chineſe to a plant famous among them for its medicinal virtues.

It is deſcribed by the writers, who have been on the ſpot, in ſo remarkable a manner, that it cannot eaſily be miſtaken, provided their deſcriptions are juſt. They tell us that it grows wild on the mountains in ſome of the provinces of China, and that each root of it uſually ſends up eight ſtalks, the middle one greatly higher than the reſt.

They have no branches, and have each only three leaves at the top, and the middle ſtalk bears cluſters of flowers. The root they ſay is four inches thick, and puſhes out ſeveral ſide branches, of the thickneſs of a finger. The bark of theſe roots is rough and brown, and their internal parts ſoft and yellow.

The ſmall roots only are uſed in medicine, the great ones being ſeldom found. The plant flowers in the month of July, and the ſpring ſeaſon is accounted the beſt for taking up the roots.

The way of multiplying the plant is to cut the great root into ſlices tranſverſly, and plant theſe an inch deep in a good ſoil; they will ſoon ſhoot up the natural number of branches, and in three years the plant will grow to its utmoſt perfection.

The great uſe of the plant is in hæmorrhages, in which caſe it is ſaid to be almoſt infallible. *Obſerv. ſur les Cout. de l'Aſie.*

SAP (*Dict.*)—The notion of the Sap's circulation was entertained by ſeveral authors much about the ſame time, without any communication from one another; particularly M. Major, a phyſician of Hamburgh, M. Perrault, Mariotte, and Malpighi. It has met, however with ſome conſiderable oppoſers, particularly the excellent M. Dodart, who could never be reconciled to it.

One of the great arguments for it is, that the ſame experiments of ligature and inciſion, which evince a circulation of the blood in animals, ſucceed in the like manner in plants, particularly in ſuch as abound with a milky Sap, as the great tithymale, milk-thiſtle, &c. if the ligature be faſtened tight round them, the part above is found to ſwell very conſiderably, and that below it, a little: whence it appears, that there is a juice aſcending from the branches; and that the latter is thicker than the former, which quadrates exactly with the common ſyſtem; the juice being ſuppoſed to ariſe in capillary veſſels, in form of a ſubtile vapour, which, condenſed in the extremes of the plant, by the neighbourhood of the cold air, turns back in form of a liquor, through the more patent pipes of the inner bark. M. Dodart, inſtead of the ſame juices going and returning, contends for two ſeveral juices; the one imbibed from the ſoil digeſted in the root, and from thence tranſmitted to the extremes of the branches, for the nouriſhing of the plant; the other received from the moiſture of the air entering in at the extremities of the branches: ſo that the aſcending and deſcending juices are not the ſame.

One of his chief arguments is, that if two trees of the ſame kind be tranſplanted in one day, after firſt cutting off their roots and branches, and if, after they have taken root again, ſome of the new ſhoots put forth each year be cut off one of them, it will not thrive half ſo well, notwithſtanding its root and trunk being intire as the other.

This he conceives to be a proof of the plants deriving nouriſhment by the branches, and concludes it to be of an aerial nature, becauſe formed of the moiſture of the air, dew, &c. whereas that imbibed from ſoil is terreſtrial, &c. *Hiſt. de l'Acad. Roy. Ann.* 1709.

The humour or Sap of a plant, then, is a juice furniſhed by the earth, and changed into the plant, conſiſting of ſome foſſil parts, other parts derived from the air and rain, and others from putrified animals, plants, &c. Conſequently, in vegetables, are contained all kinds of ſalts, oil, water, earth, &c. and, probably, all kinds of metals too, inaſmuch as the aſhes of vegetables always yield ſomewhat which the loadſtone attracts.

This juice enters the plant in form of a fine and ſubtile water; which the nearer it is to the root, the more it retains of its proper nature; and, the farther from the root, the more action it has ſuſtained, and the nearer it approaches to the nature of the vegetable.

Conſequently, when the juice enters the root, the bark whereof is furniſhed with excretory veſſels, fitted to diſcharge the excrementatious part, it is earthy, watery, poor, acid, and ſcarce oleaginous at all.

In the trunk and branches it is further prepared, though it ſtill continues acid; as we ſee by tapping or perforating of a tree in the month of February, when it diſtils a watery juice apparently acid.

The juice being here carried to the germs or buds is more concocted; and here, having unfolded the leaves, theſe come to ſerve as lungs for the circulation and further preparation of the juice.

For theſe tender leaves, being expoſed to the alternate action of heat and cold, moiſt nights, and hot ſcorching days, are alternately expanded and contracted, and the more on account of their reticular texture.

By ſuch means is the juice ſtill further altered and digeſted, as it is further in the petala or leaves of the flowers which tranſmit the juice, now brought to a further ſubtility, to the ſtamina: theſe communicate it to the farina or duſt in the apices, which is, as it were, the male ſeed of the plant, where having undergone a further maturation, it is ſhed into the piſtil, which performs the office of an uterus or womb; and thus, having acquired its laſt perfection, it gives riſe to a new fruit or plant.

The root or part whereby vegetables are connected to their matrix, and by which they receive their nutritious juice, conſiſts of an infinite number of vaſa abſorbentia, which, being diſperſed through the interſtices of the earth, attract or imbibe the juices of the ſame: conſequently, every thing in the earth that is diſſoluble in water, is liable to be imbibed; as air, ſalt, oil, fumes of minerals, metal, &c. and of theſe do plants really conſiſt.

Theſe juices are drawn from the earth very crude; but by the ſtructure and fabric of the plant, and the various veſſels they are ſtrained through, become changed, further elaborated, ſecreted, and aſſimilated to the ſubſtance of the plant.

The motion of the nutritious juices of vegetables is produced, much like that of the blood in animals, by the action of the air; in effect, there is ſomething equivalent to reſpiration throughout the whole plant.

The diſcovery of this is owing to the admirable Malpighi, who firſt obſerved, that vegetables conſiſt of two ſeries or orders of veſſels.

Firſt, ſuch as receive and convey the alimental juices, anſwering to the lacteals, veins, &c. of animals.

Secondly, tracheæ or air veſſels, which are long hollow pipes, wherein air is continually received and expelled, i. e. inſpired and expired; within which tracheæ he ſhews all the former ſeries of veſſels are contained.

Hence, it follows, that the heat of a year, nay, of a day, of a ſingle hour, or minute, muſt have an effect on the air included in theſe tracheæ, i. e. muſt rarefy it, and conſequently dilate the tracheæ; whence ariſes a perpetual ſpring or ſource of action, to promote the circulation in plants.

For, by the expanſion of the tracheæ, the veſſels containing the juices are preſſed, and by that means the juice contained is continually propelled, and ſo accelerated; by which propulſion, the juice is continually comminuted, and rendered more and more ſubtile, and ſo enabled to enter veſſels ſtill finer and finer, the thickeſt part of it being at the ſame time ſecreted, and depoſited into the lateral cells or loculi of the bark, to defend the plant from cold, and other external injuries.

The juice having thus gone its ſtage, from the root to the remote branches, and even the flower; and having in every part of its progreſs depoſited ſomething both for aliment and defence; what is redundant paſſes out into the bark, the veſſels whereof are inoſculated with thoſe wherein the Sap mounted; and through theſe it re-deſcends to the root, and thence to the earth again: and thus a circulation is effected.

Thus is every vegetable acted on by heat and cold, during the day-time eſpecially, while the ſun's force is conſiderable, the Sap-veſſels ſqueeſed and preſſed, and the Sap protruded and raiſed, and at length evacuated, and the veſſels exhauſted; and, in the night again, the ſame tracheæ being contracted by the cold of the air, the other veſſels are eaſed and relaxed, and ſo diſpoſed to receive freſh food for the next day's digeſtion and excretion.

What courſe the juice takes, after it is imbibed by the roots, is not very clear; the veſſels that take it up, to convey it to the plant, are too fine to be traced; and hence it has been controverted, whether it is by the bark, or the pith, or the woody part, that the plant is fed.

The more common opinion is for the bark: the juice, raiſed by the capillaries of the wood, is here ſuppoſed to deſcend by the larger fibres, placed in the inmoſt part thereof, immediately over the wood; in which deſcent, the Sap, now ſufficiently prepared, adds a part of its ſubſtance to the contiguous wood, and thus increaſes by appoſition; and hence it may be, that hollow, carious, or rotten trees, which have neither pitch nor wood except juſt enough to ſuſtain the bark, do grow and bear.

Some contend for the wood, which they obſerve to conſiſt of ſlender capillary tubes running parallel to each other from the root up to the trunk, being proper to receive in a fine vapour; in the aſcent whereof the fibres become opened, and their ſubſtance increaſed: and thus the trunks of trees are ſaid to increaſe in their circumference.

As for the pith; as the woody ſubſtance of the trunk becomes more woody, the pith is compreſſed and ſtreightened to ſuch a degree that in ſome trees it quite diſappears: whence it ſeems, that its office in vegetation is not very important, ſince its uſe is not perpetual. By its ſpongious ſubſtance, it ſhould ſeem fitted to receive any ſuperfluous moiſture tranſuding through the pores of the woody fibres: and, if by the exceſs of ſuch moiſture, or the like cauſe, it corrupt and rot, as it frequently happens in elms, the tree does not grow the worſe for it; which is a convincing proof it is of no great uſe.

The learned Dr. Boerhaave diſtributes the juices of plants into ſix claſſes.

Firſt, the firſt claſs comprehends the crude nutritious juice, or the juices of the root and ſtem of plants, which are little more than the mere matter of the element, as drawn by the root from the body it adheres to, whether it be earth, water, or the like.

This juice is found in every part of the plant, and therefore may be held an univerſal juice; yet he conſiders it as the juice of the root and ſtem, becauſe it is chiefly found in them.

This he takes to be a ſubacid watery lymph, without any ſpecific taſte or ſmell, as not being yet arrived to the maturity of oilineſs.

To this claſs belong thoſe juices which diſtil in great abundance from wounds or inciſions made in the woody parts of plants; ſuch, for inſtance, is that tart liquor ouſing from the root of the walnut-tree, when cut off in the month of May.

Such alſo is that limpid, ſubacid humour, flowing out very plentifully at an inciſion in the birch-tree in the month of March, to the quantity of ſeveral gallons in a few days.

Such alſo is the juice iſſuing out of the vine wounded in the ſpring-time, which always taſtes tartiſh, and ferments like the grapes themſelves.

This juice may be eſteemed as yet foſſil, being generated of and in the earth; for the juice of the earth, being received into the canals of this plant, retains its nature during two or three circulations; nor does immediately commence a vegetable juice.

This claſs of juices therefore he accounts as the chyle of the plant, being chiefly found in the firſt order of veſſels, viz. in the roots and the body of the plant, which anſwers to the ſtomach and inteſtines of animals.

Secondly, the ſecond claſs of the juices is that of the leaves, which are the real lungs of plants, and accordingly make a further change of the juice, which they receive from the roots and ſtem by force of the air. The juice of leaves is different therefore from the firſt juice, as being more ſulphureous, and farther elaborated; not that it derives any ſulphur from the ſun, but that, its watery part exhaling, it becomes more oily, and leſs volatile.

The juice of leaves he diſtinguiſhes into three kinds:

The firſt is the nutritious juice of the leaves; which is that already deſcribed, only further elaborated in the minute veſiculæ of the leaves, and conſequently leſs watery, and more oily and ſaccharine.

The ſecond is wax, which, exuding out of the leaves, adheres to the ſurface, and is ſcraped off by bees with their rough thighs, to build their combs withal. This is chiefly afforded by lavender and roſemary: upon the latter of which, the wax may be plainly perceived ſticking to the leaves of it.

The third is manna: not that with which the Iſraelites were fed in the deſart, but a drug ſold among us: it is an eſſential ſaccharine ſalt, exuding chiefly by night, and, in the ſummer-ſeaſon, from the leaves of a ſort of aſh growing in Calabria and Sicily, and adhering thereto in the form of a cruſt, to be gathered the next morning before the ſun is up.

The like ſubſtance is found to exude from the leaves of the linden-tree and poplar, in the heats of May and June; at which time they have an honey-taſte, and are even ſeen with a fatty juice on them, which, at the approach of the cold evening, gathers into grains.

Thirdly, the third claſs of juices are thoſe of flowers, or the genital parts of plants; in theſe are:

Firſt, a pure, elaborated, volatile oil or ſpirit, wherein the particular ſmell of the plant or flower reſides, and which, by reaſon of its extreme volatility, exhales ſpontaneouſly; inſomuch that, if the flower be laid for ſome time in a warm place, the odorous juice or ſpirit will be all fled.

The ſecond is the juice expreſſed from the flower, which in reality is the ſame with that of the root and leaves, only farther prepared; it is thicker than the former, and has ſcarce any ſmell at all: thus, if you bruiſe an hyacinth, or other fragrant flower, and expreſs the juice, it will be found altogether inodorous.

The third is the ſweet juice called honey, which exudes from all flowers; aloes, colocynthis, and other bitter flowers, not excepted.

In all male flowers, that have utricles at the bottom of the petala, which Dr. Linnæus ſtiles the nectarium, is found a viſcid, ruddy, ſweet juice in ſome plenty; and accordingly we ſee the children gather cowſlips, fox-gloves, honeyſuckles, &c. and ſuck the honey from them: the bees too viſit theſe flowers, and, putting in their proboſcides or trunks, ſuck out the honey, and load their ſtomachs therewith, to be afterwards diſcharged and laid up in their combs: ſo that honey is a vegetable juice.

Fourthly, the fourth claſs of juices are thoſe of the fruit and ſeed; the preparative whereof is nature's final work: which performed, the plants ſeem to die for a time, as all animals are ſeen to languiſh after the emiſſion of their ſemen.

The juice of the fruit is like that of the root, only farther elaborated.

The juice of the ſeed is an eſſential oil or balm, elaborated and exalted to its laſt perfection. This juice or oil is not found in the very point or embryo in the center of the placenta; all we meet with in that part, is a few fine watery particles ſecreted from the placenta: but it is in the placentula or cotyledons themſelves, which conſiſt of innumerable little folliculi or cells, wherein this only juice is contained, ſerving to defend the embryo, and preſerve it from being corrupted by water, which, it is well known, will hardly paſs through oil.

Thus, if you take, for inſtance, fennel-ſeed, cut it through the middle, and apply it to the microſcope, you will eaſily perceive a clear ſhining oil in the cells of each lobe, inveſting the tender embryo. Without this oil, it were impoſſible a ſeed ſhould live a month, and, much leſs, a year or two, intire and uncorrupted in the ground.

This oil is found in the ſeeds of all plants; in ſome, for inſtance, in almonds, cocoa-nuts, &c. in very great quantities; in others leſs, as pepper, arum, &c. where one would ſcarce imagine any oil at all: and theſe ſeeds loſe their vegetative quality very ſoon.

Fifthly, the fifth claſs of juices are thoſe of the bark; which is an artful congeries or bundle of perſpirative ducts, and abſorbent veſſels.

Of theſe juices there are divers ſpecies; for the ſeveral humours raiſed and diſtributed through the leaves, flowers, and other parts of the plants, have all circulated through the bark, and accordingly are frequently found to diſtil from wounds made therein. In ſome caſes, even the whole plant is no more than bark, the pulp having been eaten out; as in willows, poplars, &c. which will live a long time in that ſtate.

The bark ſerves divers purpoſes; for it not only tranſmits the nutritious juices of the plants, but alſo contains divers fat oily humours, to defend the fleſhy parts from the injuries of the weather.

Sixthly, as animals are furniſhed with a panniculus adipoſus, uſually replete with fat, which inveſts and covers all the fleſhy parts, and ſcreens them from external cold; ſo are plants incompaſſed with a bark replete with fat juices, by the means whereof the cold is kept out, and in winter-time the ſpiculæ of ice prevented from fixing and freezing the juices in their veſſels; whence it is that ſome ſorts of trees remain ever-green the year round, by reaſon their barks have more oil than can be ſpent and exhaled by the ſun; and their leaves are covered with a thick oily film over their ſurface, which prevents their perſpiring ſo much as other plants, and alſo defends them from the cold, &c.

All the juices of barks are reducible to eight, viz.

Firſt, the crude, acid, watery juice, called the chyle of the plant.

Secondly, an oily juice, which, burſting the bark in the beginning of the ſummer, exudes out of ſeveral plants; as cypreſs, pine, fir, ſavin, juniper, and other ever-greens; and ſuch alone: this oil diſſolves by the ſmalleſt degree of warmth, and is eaſily inflamed, and is that which defends the plant; which is the reaſon why moſt of theſe plants will not thrive in very hot climates.

For balm, or fatty liquor, more glutinous than oil, is nothing but the laſt-mentioned oily juice, which was more fluid during the ſpring-time; but which, by the greater heat of the ſun, has evaporated all its moſt ſubtile parts, and is converted into a denſer liquor. Thus the finer part of oil of olives being exhaled by the ſummer's warmth, there remains a thick balſam behind: thus alſo oil of turpentine, having loſt its more liquid parts by heat, becomes of the thick conſiſtence of a balm.

Thirdly, a pitchy juice, which is the body of the oil itſelf, inſpiſſates, and turns black, when put into a great warmth: this is the moſt obſerved in the pine and fir.

Fourthly, reſin, which is an oil ſo far inſpiſſated, as to become friable in the cold, and may be procured from any oil, by boiling it much and long. Thus, if turpentine be ſet over a gentle fire, it firſt diſſolves, and becomes an oil, then a balſam, then pitch, and then a reſin; in which ſtate it is friable in the cold, fuſible by fire, and withal inflammable and combuſtible; diſſoluble in ſpirit of wine, but not in water, which makes the character of reſin.

Hence the oil is moſt abundant in the barks in the winter-time, the balſams in ſummer, and the reſin in autumn.

Fifthly, colophony, which is a Reſin ſtill farther exhauſted of its volatile part, being pellucid, friable, and approaching to the nature of glaſs.

Sixthly, gum, which is an humour exuding out of the bark, and, by the warmth of the ſun, concocted, inſpiſſated, and rendered tenacious, but ſtill diſſoluble in water, and at the ſame time inflammable, and ſcarce capable of being pulveriſed. This oily mucilage ſerves as a pigment to cover over, and defend the buds of trees, from the injuries of wet and froſt in winter; but will melt with a moiſt warmth, and eaſily run from them, when the gentle warmth of the ſpring approaches: nor is ever ſo far hardened into a cruſt, as to do any injury to the incloſed ſhoot. This oily ſubſtance always contains in it an acid ſpirit; which is a preſervative againſt putrefaction.

Seventhly, a gummous reſin; which is an humour ſecreted in the bark, and dried by the heat of the ſun; and thus conſtituting a body that is partly gummous, and, as ſuch, tenacious, and ſoluble in water; and partly reſinous, and therefore friable, and ſoluble in oil, or ſpirit of wine, but not in water.

Botaniſts are now generally agreed, that all plants are furniſhed with organs and parts neceſſary both for chylification and ſanguification; that they have veins, arteries, heart, lungs, adipoſe cellules, &c. If ſo, it is obvious, that there muſt be ſome difference between the juices, which have not undergone the action of thoſe parts, and ſuch as have already circulated a number of times.

The ſeveral juices, hitherto recounted, are the firſt or nutritious juice, called alſo the chyle of the plant, under ſuch alterations, and new modifications, as it undergoes in being received, and kept ſome time, in parts of a peculiar ſtructure; as leaves, flowers, ſeed, &c. This laſt juice, called the blood, is the ſame nutritious juice farther altered, by being divers times paſſed through each of thoſe parts, and remixed, and at length converted into a new juice, with properties different from any of them all.

To prove the circulation of the Sap, inſtances are brought from experiments made by Mr. Fairchild; as, his budding or inoculating of a paſſion-tree, whoſe leaves are ſpotted with yellow, into one of that ſort of paſſion-tree whoſe leaves are plain: for though, the buds did not take, yet, after it had been budded a fortnight, the yellow ſpots began to ſhew themſelves about three feet above the inoculation; and, in a little time after that, the yellow ſpots appeared on a ſhoot, which came out of the ground from another part of the plant; which has been accounted a plain proof of the Sap's circulation.

Another inſtance is, a ſecond experiment of the ſame perſon, who grafted the ever-green oak, or ilex, upon the common oak. The leaves of the common oak, which was the ſtock, decayed, and fell off, at the uſual ſeaſon of the year; but the ever-green oak, which was the cyon grafted upon it, held its leaves, and continued ſhooting in the winter. From whence it is concluded, that, when trees drop their leaves, the Sap keeps full in motion, and is not gone into the root, as ſome perſons think.

There are alſo other experiments of the ſame perſon, which were ſhewn before the Royal Society; as the New-England cedar, or rather juniper, grafted on the Virginian: and what is taken to prove the circulation in it, is, the branch which was grafted was left ſeveral inches below the grafting; which continued growing as well as the upper-part above the grafting.

And alſo another, which is the viburnum, with the top planted in the ground, which was become roots; and the roots turned up, which were become branches: which plant was in as good a ſtate of growing, as it was in its natural ſtate.

A third experiment of his was on a pear-tree, which he inarched upon two pear-ſtocks, in March 1721-2, having the roots out of the ground; and was in a good flouriſhing ſtate, with a branch in bloſſom, that receives no other nouriſhment but by the juices that return down the other two branches; which, though it had been done above two years, yet it continued ſhooting ſuckers out of the root; which is eſteemed as a proof, that the branches are as uſeful to ſupport the roots, as the roots the branches: and thence he infers, that it is not ſtrange, that ſo many trees miſcarry in planting, when there are no branches left to the head to maintain the circulation to the roots.

A fourth experiment he made on the cedar of Lebanon, grafted on the larix, which dropped its leaves in the winter, yet maintained the cedar in a flouriſhing condition, as if it had been on a tree which held its leaves all the winter; and the circulation of juices ſupported the graft below the grafting, and kept it in as good health as above the grafting.

In oppoſition to the notion of the circulation of the Sap in trees like to that in animal bodies, the rev. Dr. Hales, in his excellent treatiſe on Vegetable Statics, preſents us with various experiments, and ſays:

When the Sap has firſt paſſed through that thick and fine ſtrainer, the bark of the root, we then find it in greateſt quantities in the moſt lax part, between the bark and wood, and that the ſame through the whole tree.

And if, early in the ſpring, the oak, and ſeveral other trees, were to be examined near the top and bottom, when the Sap firſt begins to move, ſo as to make the bark run, and eaſily peel off, he believes it would be found, that the low bark is firſt moiſtened; whereas the bark of the top branches ought firſt to be moiſtened, if the Sap deſcends by the bark. As to the vine, he ſays, he is pretty well aſſured, that the lower bark is firſt moiſtened.

He adds, that it is to be ſeen in many of the examples of the experiments he has given in that book, what quantities of moiſture trees daily imbibe and perſpire: now the celerity of the Sap muſt be very great, if that quantity of moiſture muſt moſt of it aſcend to the top of the tree, then deſcend, and aſcend again, before it is carried off by perſpiration.

The defect of a circulation in vegetables ſeems, in ſome meaſure, to be ſupplied by the much greater quantity of liquor, which the vegetable takes in, than the animal, whereby its motion is accelerated: for, by the firſt example he gives, we find the ſunflower, bulk for bulk, imbibes and perſpires ſeventeen times more freſh liquor than a man every twenty-four hours.

Beſides, nature's great aim in vegetables being only, that the vegetable life be carried on and maintained, there was no occaſion to give its Sap the rapid motion which was neceſſary for the blood of animals.

In animals, it is the heart which ſets the blood in motion, and makes it continually circulate: but in vegetables we can diſcover

cover no other cauſe of the Sap's motion, but the ſtrong attraction of the capillary Sap-veſſels, aſſiſted by the briſk undulation and vibration cauſed by the ſun's warmth; whereby the Sap is carried up to the top of the talleſt trees, and is there perſpired off through the leaves: but, when the ſurface of the tree is greatly diminiſhed by the loſs of its leaves, then alſo the perſpiration and motion of the Sap are proportionably diminiſhed; as is plain from many of his experiments.

So that the aſcending velocity of the Sap is principally accelerated by the plentiful perſpiration of the leaves, thereby making room for the fine capillary veſſels to exert their vaſtly attracting power; which perſpiration is effected by the briſk rarefying vibrations of warmth; a power that does not ſeem to be any-ways well adapted to make the Sap deſcend from the tops of vegetables, by different veſſels, to the root.

If the Sap circulated, it muſt needs have been ſeen deſcending from the upper part of large gaſhes, cut in branches ſet in water, and with columns of water preſſing on their bottoms in long glaſs tubes, in his forty-third and forty-fourth experiments. In both which caſes it is certain, that great quantities of water paſſed through the ſtem; ſo that it muſt needs have been ſeen deſcending, if the return of the Sap downwards were by truſion or pulſion, whereby the blood in animals is returned through the veins to the heart; and that pulſion, if there were any, muſt neceſſarily be exerted with prodigious force, to be able to drive the Sap through the finer capillaries.

So that, if there be a return of the Sap downwards, it muſt be by attraction, and that a very powerful one, as may be ſeen by many of theſe experiments, and particularly by experiment the eleventh. But it is hard to conceive what and where that power is, which can be equivalent to that proviſion nature has made for the aſcent of the Sap, in conſequence of the great perſpiration of the leaves.

The inſtances of the jaſmine-tree, and of the paſſion-tree, have been looked upon as proofs of the circulation of the Sap; becauſe their branches which were far below the inoculated bud, were gilded. But we have many viſible proofs in the vine, and other bleeding trees, of the Sap's receding back, and puſhing forwards alternately, at different times of the day and night; and there is great reaſon to think, that the Sap of all other trees has ſuch an alternate receding and progreſſive motion, occaſioned by the alternacies of day and night, warm and cold, moiſt and dry.

For the Sap in all vegetables does probably recede, in ſome meaſure, from the tops of branches, as the ſun leaves them; becauſe, its rarefying power then ceaſing, the greatly rarefied Sap and air mixed with it will condenſe, and take up leſs room than they did, and the dew and rain will then be ſtrongly imbibed by the leaves, as is probable from experiment 42d, and ſeveral others; whereby the body and branches of the vegetable, which have been much exhauſted by the great evaporation of the day, may, at night, imbibe Sap and dew from the leaves.

For, by ſeveral experiments in the firſt chapter of the book of Vegetable Statics, plants were found to increaſe conſiderably in weight in dewy and moiſt nights.

And by other experiments on the vine, in the third chapter, it was found, that the trunk and branches of vines were always in an imbibing ſtate, cauſed by the great perſpiration of the leaves, except in the bleeding ſeaſon; but, when at night the perſpiring power ceaſes, then the contrary imbibing power will prevail, and draw the Sap and dew from the leaves, as well as moiſture from the roots.

And we have a further proof of this in experiment 12th, where, by fixing mercurial gauges to the ſtems of ſeveral trees which do not bleed, it is found that they are always in a ſtrongly imbibing ſtate, by drawing up the mercury ſeveral inches; whence it is eaſy to conceive, how ſome of the particles of the gilded bud in the inoculated jaſmine may be abſorbed by it, and thereby communicate their gilding miaſma to the Sap of other branches; eſpecially when, ſome months after the inoculation, the ſtock of the inoculated jaſmine is cut off a little above the bud, whereby the ſtock, which was the counter-acting part to the ſtem, being taken away, the ſtem attracts more vigorouſly from the bud.

Another argument for the circulation of the Sap is, that ſome ſorts of grafts will infect and canker the ſtocks they are grafted on; but by experiments twelfth and thirty-ſeventh, where mercurial gauges were fixed to freſh-cut ſtems of trees, it is evident, that thoſe ſtems were in a ſtrongly imbibing ſtate; and, conſequently, the cankered ſtock might very likely draw Sap from the graft, as well as the graft alternately from the ſtock; juſt in the ſame manner as leaves and branches do from each other in the viciſſitudes of day and night.

And this imbibing power of the ſtock is ſo great, where only ſome of the branches of the ſtock will, by their ſtrong attraction, ſtarve thoſe grafts; for which reaſon, it is uſual to cut off the greateſt part of the branches of the ſtock, leaving only a few ſmall ones to draw up the Sap.

The inſtance of the ilex grafted upon the Engliſh oak ſeems to afford a very conſiderable argument againſt a circulation, for, if there were a free uniform circulation of the Sap through the oak and ilex, why ſhould the leaves of the oak fall in winter, and not thoſe of the ilex?

Another argument againſt an uniform circulation of the Sap in trees, as in animals, may be drawn from Dr. Hales's thirty-ſeventh experiment; viz. where it was found, by three mercurial gauges, fixed to the ſame vine, that, while ſome of its branches changed their ſtate of protruding Sap into a ſtate of imbibing, others continued protruding Sap, one nine, and the other thirteen days longer.

That the Sap does not deſcend between the bark and the wood, as the favourers of a circulation ſuppoſe, ſeems evident from hence, viz. that, if the bark be taken off for three or four inches breadth quite round, the bleeding of the tree above that bared place will much abate; which ought to have the contrary effect, by intercepting the courſe of the refluent Sap, if the Sap deſcended by the bark.

But the reaſon of the abatement of the bleeding, in this caſe, may be well accounted for, from the manifeſt proof we have in theſe experiments, that the Sap is ſtrongly attracted upwards by the vigorous operation of the perſpiring leaves and attracting capillaries; but, when the bark is cut off for ſome breadth below the bleeding place, then the Sap which is between the bark and the wood below that diſbarked place is deprived of the ſtrong attracting power of the leaves, &c. and conſequently the bleeding wound cannot be ſupplied ſo faſt with Sap, as it was before the bark was taken off.

But the moſt conſiderable objection againſt this progreſſive motion of the Sap, without a circulation, ariſes from hence, viz. that it is too precipitate a courſe for a due digeſtion of the Sap, in order to nutrition: whereas in animals nature has provided that many parts of the blood ſhall run a long courſe before they are either applied to nutrition, or diſcharged from the animal.

But when we conſider that the great work of nutrition in vegetables, as well as animals (I mean after the nutriment is got into the veins and arteries of animals) is chiefly carried on in the fine capillary veſſels, where nature ſelects and combines, as ſhall beſt ſuit her different purpoſes, the ſeveral mutually attracting nutritious particles, which were hitherto kept disjoined by the motion of their fluid vehicle; we ſhall find, that nature has made an abundant proviſion for this work in the ſtructure of vegetables: all whoſe compoſition is made up of nothing elſe but innumerable fine capillary veſſels, and glandulous portions or veſicles.

Upon the whole, he thinks we have, from theſe experiments and obſervations, ſufficient ground to believe, that there is no circulation of the Sap in vegetables; notwithſtanding many ingenious perſons have been induced to think there was, from ſeveral curious obſervations and experiments, which evidently prove, that the Sap does, in ſome meaſure, recede from the top, towards the lower part of plants; whence they were, with good probability of reaſon, induced to think, that the Sap circulated.

SAPI'NDUS, *the ſoap-berry*, in botany, the name of a genus of trees, whoſe characters are:

It hath a flower, which, for the moſt part, is compoſed of four leaves, expanding in form of a roſe: from whoſe four-leaved empalement ariſes the pointal, which afterwards becomes a ſpherical fruit, having a thick oily cover, incloſing a nut of the ſame form.

This tree is very common in Jamaica, Barbadoes, and moſt other places in the Weſt-Indies, where it riſes to the height of thirty-feet, or more; but in Europe it is preſerved by thoſe perſons who are curious in cultivating exotic plants, for the ſingular ſtructure of the leaves, which are very long and narrow, having borders on each ſide, which, at about every two inches, have pinnæ, or wings, oppoſite to each other, and terminated by an odd one. The flowers are produced at the ends of the branches, which are ſmall and white, growing in cluſters. Theſe are ſucceeded by ſpherical brown berries, about the ſize of cherries, which have very little pulp; but a brown ſkin covering the nut, which is round, black, and hard. Theſe nuts were formerly brought into England to make buttons; for which purpoſe they were very proper, becauſe they never crack. The ſkin which ſurrounds the nut will lather like ſoap, and is uſed in America to waſh linen, though many people ſay it will burn it, when it is often uſed. *Miller's Gard. Dict.*

SA'PPHIRE-*colour*.—To give this elegant and beautiful blue to glaſs, the workers in the glaſs-houſes uſe the following method: take an hundred weight of rochetta frit, and add to it a pound of prepared zaffer, and to this one ounce of mangeneſe; mix all well together, and put them into the furnace to melt and purify, and, when it is become perfectly pure and fine, work it into veſſels, &c. This ſmall quantity of manganeſe, with the zaffer, gives a moſt beautiful violet blue.

SAPPHIRE-*paſte*. The method of making the counterfeit Sapphires in paſte is this: take of cryſtal prepared two ounces, minium, or common red lead, ſix ounces, zaffer prepared five grains, manganeſe prepared ſeven grains; mix all the powders perfectly together, and put them into a crucible; cover it with a ſtrong lute, and put the whole into a potter's kiln, to ſtand in the hotteſt place for twenty-four hours; it will be of a moſt beautiful deep Sapphire-colour. Blue paſtes of two other degrees of blue are alſo made in the following manner: for a ſky blue take cryſtal prepared two ounces, red lead ſix ounces, prepared zaffer twenty-one grains; mix all well together, and bake them as before. For a deep violet

let blue take cryſtal two ounces, and lead four ounces, and four grains of painters blue ſmalt; mix all, and bake together in the kiln. Theſe both make good blues, but much inferior to the firſt proceſs. *Neri's Art of Glaſs.*

SAPPHIRI'NA *Aqua*, or blue eye water, is thus made: pour a pint of ſtrong and freſh lime water into a copper veſſel; add to it a drachm of crude ſal armoniac, and throw in ſome filings, or ſmall pieces of copper; it ſoon acquires a beautiful blue colour, and is not only uſed as an eye water, but alſo to deterge old ulcers; and ſometimes is mixed with other things in injections for gonorrhœas.

SAPPHI'RO-RUBI'NUS, in natural hiſtory, a name given by ſome modern writers on gems to a ſtone, partly a ſapphire, and partly a ruby, or, more properly ſpeaking, a ſapphire tinged in ſome part with the ruby colour, while the reſt remains blue. The Indians call this nilacundi.

SARCI'TES, *the fleſh-ſtone*, a name given by ſome authors to the cornelian, from its being of the colour of fleſh, as it is very exactly in ſome pieces.

SARCITES, *or* SAURITES, is alſo a ſtone ſuppoſed to be found in the belly of a lizard; it ſeems to have been a ſpecies of pale cornelian. Pliny mentions it, but gives no deſcription of it.

SARCITES, *the fleſh-ſtone*, in natural hiſtory, is alſo a name given by ſome authors to a ſpecies of ſtone, whoſe fibres were ſuppoſed to repreſent thoſe of beef. It was of a black colour and firm texture.

SA'RCLING-*time*, is the time or ſeaſon when huſbandmen weed their corn.

SA'RCOMA *of the eyes*, a fleſhy excreſcence or tubercle formed on the inner ſurface of the eye-lids. Theſe tubercles, in their beginnings, are uſually ſmall; but they, by degrees, advance often to a very conſiderable bulk. Some of theſe are of ſmooth ſurfaces, others rough and unequal, like a raſberry, or mulberry.

They are always to be cured by extirpation, getting them out by a hook, a pair of pliers, or a needle and thread, and then cutting them out to the roots with ſciſſars; the wound ſhould be ſuffered to bleed a while, and afterwards waſhed with a collyrium made of aloes, tutty, and ſugar of lead mixed in roſe-water, till it is perfectly healed. Some uſe the cauſtic to theſe humours, but the ſciſſars are more ſafe and leſs painful. *Heiſter's Surgery.*

SA'RDA, *the cornelian*, in natural hiſtory, the name of a genus of the ſemi-pellucid gems: the characters of which are that they are ſemi-pellucid ſtones, compoſed of cryſtal with a ſmall admixture of earth, of a plain uniform ſtructure, not tubulated, nor cruſtated, and uſually of one ſimple colour. See CORNELIAN in the Dictionary.

SARDA'NUS, in zoology, the name of a fiſh of the harengiform kind, caught in the Mediterranean, and common in the markets of Rome and Venice. Its body is broader than that of the pilchard, and its back green, and the line which runs along the belly is much leſs rough than in that fiſh. It is indeed eaſy to be diſtinguiſhed from the pilchard, but not ſo eaſy to ſhew in what it differs from the common herring more than in ſize. It ſeems very probable, that it is no diſtinct ſpecies of fiſh; but that the herring, like the pilchard, is always ſmaller in the Mediterranean than in the ocean. *Willughby's Hiſt. Piſc.*

SAR'DAR, in the Turkiſh military orders, the title of an officer choſen from among the caias of the Janizaries on ſome particular occaſion, ſuch as to head a detachment ſent to war, or on any other occaſion. The word is of Perſian origin, and is derived from *ſar*, which in that language ſignifies a head or chief.

This officer is a colonel of a detached body; he is attended in his expedition by his deputy, and two ſecretaries, and his office expires at his return from the buſineſs he was diſpatched on. *Pocock's Ægypt.*

SARDO'NYX, in natural hiſtory, the name of a genus of the ſemi-pellucid gems, which are conſiderably tranſparent, of the true onyx ſtructure, either zoned or tabulated, and are compoſed of the true matter of the onyx, variegated with zones of that of the red or yellow cornelian.

Of this genus there are four known ſpecies: 1. The thin-zoned red Sardonyx, or whitiſh onyx, with thin, ſnow-white, and red zones; this is one of the moſt beautiful of the ſemi-pellucid gems: the ground of this is a cryſtalline matter, ſomewhat whitiſh, otherwiſe very little differing from pure cryſtal, either in colour or tranſparence; and the zones are always extremely fine and ſlender, and laid with a beautiful regularity over one another; they are of the true matter of the cornelian, and ſome are of the plain red cornelian, others of the white, and others often of a pale fleſh colour, made by an admixture of the two former. It is only found in the Eaſt-Indies, and is greatly valued among our lapidaries. *Hill's Hiſt of Foſſ.*

SARO'NIA, Σαρώνια, among the Greeks, a feſtival kept in honour of Diana, ſurnamed Saronia, from Saro, the third King of Trœzene, by whom a temple was erected, and this feſtival inſtituted to her. *Potter, Archæol. Græc.*

SA'ROS, σαρὸς, in chronology, a period of 223 lunar months. The etymology of the word is ſaid to be Chaldean, ſignifying reſtitution, or return of eclipſes; that is, conjunctions of the ſun and moon in nearly the ſame place of the ecliptic.

SA'ROSEL, in the glaſs trade, the name of the room into which the mouth of the leer opens, and in which the glaſs veſſels are placed, when taken out of the leer.

The men who attend to do this are called the ſaroſemen. *Neri's Art of Glaſs.*

SA'RPLAR *of wool*, a quantity of wool otherwiſe called a pocket, or half ſack; a ſack containing eighty tod, a tod two ſtone, and a ſtone 14 pounds. In Scotland it is termed ſarpliath, and contains eighty ſtone.

SARRACE'NA, *the ſide-ſaddle flower*, in botany, the name of a genus of plants, whoſe characters are:

It hath a flower conſiſting of ſeveral leaves which are placed circularly, and expand in form of a roſe, and reſting in a many-leaved empalement: from the middle ariſes the pointal, which is membranaceous, and ſhaped like an hood, and afterwards becomes a roundiſh fruit divided into five cells, which contain oblong ſeeds.

Theſe ſtrange plants are natives of New-England, Virginia, and ſeveral places in North-America, where they grow on bogs, and ſuch places where the waters uſually ſtand in winter.

The name was given to this plant by Dr. Tournefort, in honour of Dr. Sarrazin, a curious botaniſt, who ſent the plant from Canada to Dr. Tournefort at Paris.

As theſe plants grow on bogs, it is very difficult to cultivate them in England: for, although the winters are much more ſevere in the places of their natural growth than they generally are in England, yet, their ſummers being much warmer, they thrive much better, and produce their flowers and fruit annually, whereas it is with great difficulty they are kept alive for a year or two in England.

SARRI'TION, *ſarritio*, among Roman authors, the term uſed to expreſs what we call hoeing in huſbandry, or ſomething analogous to it, that is, a way of ſtirring up the earth about young plants, and deſtroying the weeds that would grow among them. When the plants had been ſome time come up, they ſtirred the land with wooden rakes or harrows, and then went over the fields, and pulled up the weeds by hand.

SA'SSAFRAS (*Dict.*)— The culture of this tree is a hard taſk, it being a very difficult tree to keep long alive, though it will do very well for ſome time. It will not live in green-houſes, and hard winters kill it in the open air.

The beſt way to manage it is to remove it in April into a warm and well defended place, where it will be ſafe from the cold winds, and from too much open ſun. It muſt not, however, be under the droppings of other trees. In winter ſome mulch muſt be laid on the ground round the ſtem, and in the ſummer ſeaſon all the weeds muſt be cleared away about it.

It is brought from Virginia and Carolina, in both which places it is common. Ximenes, an author of conſiderable credit in the world, has ventured to tell us, that the chips of the Saſſafras tree put into ſea-water will, in a few days, render it freſh and potable. He was probably impoſed on by ſome perſon, in whom he placed too much confidence in this article, for experiments ſhew it to be falſe; ever ſo large a quantity of this wood, kept for ever ſo long a time in ſea-water, having no ſuch effect. *Redi's Eſperienza.*

The oil of Saſſafras forms into cryſtals like the oil of thyme, obſerved by Mr. Neuman, and which he ſuppoſed like to camphor.

SASSARO'LLO, in zoology, the name of a peculiar ſpecies of pigeon, called by ſome columba rupicola, or the rock pigeon.

It is of the ſhape of a common pigeon, but ſmaller, and has red legs, and a grey variegated back. It ſeems the ſame with the livia of other authors. *Aldrovand de Avib.*

SA'TTIN *, or SATIN, a kind of ſilken ſtuff, very ſmooth and ſhining, the warp whereof is very fine, and ſtands out; the woof coarſer, and hid underneath: on which depends that gloſs, and beauty, which gives it its price.

* The word comes from the French *ſatin*, which Menage derives further from the Latin *ſeta*, a briſtle, or hair; others from the Hebrew *ſadin*; or from the old French *ſade* and *ſadinet*, handſome, genteel.

There are ſome Sattins quite plain, others wrought, ſome flowered with gold or ſilk, others ſtriped, &c.—All the varieties in the fabric of Sattins are made by uſing new warps, or woofs. The fineſt Sattins are thoſe of Florence and Genoa; yet, the French will not allow thoſe of Lyons any thing inferior thereto.— The Sattins of Bruges have their warp of ſilk, and their woof of thread.

India Sattins, or Sattins of China, are ſilken ſtuffs, much like thoſe manufactured in Europe.— Of theſe, ſome are plain, either white, or of other colours; others worked, either with gold, or ſilk, flowered, damaſked, ſtriped, &c. They are moſtly valued becauſe of their cleaning, and bleaching eaſily, without loſing any thing of their luſtre. In other reſpects they are inferior to thoſe of Europe.

F. le Comte obſerves, that the Chineſe prepare their Sattins in oil, to give them the greater luſtre; but this makes the duſt liable to hang to them.

SA'TTINET *, or SATTINADE, a very ſlight, thin ſort of ſattin, chiefly uſed by the ladies for ſummer night-gowns, &c. and ordinarily ſtriped.

* The word is a diminutive of *ſattin.*

SATURA'TION, in chemiſtry, is the impregnation of an acid with an alkali, or of an alkali with an acid, till either will receive no more, and the mixture becomes neutral.

SATURE'IA, *ſavory*, in botany, the name of a genus of plants, whoſe characters are:

It is a plant of the verticillate kind, with a labiated flower, whoſe upper lip, or creſt, is divided into two parts; but the lower lip, or beard, is divided into three parts, the middle part being crenated: theſe flowers are produced from the wings of the leaves, in a looſe order, and not in whorles or ſpikes, as are moſt of this tribe of plants.

The winter ſavory is an abiding plant, and may be propagated by ſlips or cuttings, which, if planted in a bed of light freſh earth in the ſpring, and carefully watered, will take root in a ſhort time, and may then be tranſplanted where they are to remain. There ſeem to be two ſpecies of this, differing in their manner of growth, and alſo in the ſize of their flowers. This plant ſhould have a dry ſoil, in which it will endure the cold very well, as may be ſeen by its growing in ſome places upon the tops of walls, where it defies the ſevereſt cold of our climate.

SA'TURN (*Dict.*)—The ring of Saturn ſometimes diſappears, concerning which, we have a paper in the *Philoſ. Tranſact.* N°. 471.

This Phænomenon is rare. It ought to happen every fifteen years; but from the ſituation of the earth, with reſpect to the ſun and to Saturn, it happens not above once in 30 or 45 years.

SATURNA'LIA (*Dict.*)—The Saturnalia held three days; beginning on the 16th, others ſay, the 17th, and others the 18th day of December.

During the ſolemnity the ſlaves were reputed maſters; they were allowed to ſay any thing; and, in fine, were ſerved at table by the maſters themſelves.—Every thing run into debauchery and diſſoluteneſs, and nothing was heard or ſeen in the city of Rome, but the din, riot, and diſorder of a people wholly abandoned to joy and pleaſure.

M. Dacier obſerves, that the Saturnalia were not only celebrated in honour of Saturn, but alſo to keep up the remembrance of the golden age, when all the world was on a level. It was a piece of religion not to begin any war, or execute any criminal, during this feaſt.

The Saturnalia were not only obſerved at Rome, but alſo in Greece; and were, in reality, much older than Rome itſelf.—Some aſcribe their inſtitution to the Pelaſgi, who were caſt upon the iſland of Delos; others to Hercules, and others to Janus.—Goropius Becanus makes Noah the author of them. Orig. lib. 4. That patriarch, he tells us, in the ark, inſtituted a feaſt to be held in the tenth month, in memory of this; that, in that month, the tops of the mountains began to appear above the water; and this he makes the origin of the Saturnalia: but it is very probable the year then begun in autumn, and, of conſequence, December could not be the tenth month. Voſſius goes ſtill higher, and will have it, that the Saturn, in honour of whom this feaſt was inſtituted, was Adam.

SATU'RNUS *glorificatus*, the name of a compoſition uſed in making artificial gems.—The preparation is as follows:

Take of good litharge, or rather good ceruſe, what quantity you pleaſe, grind it into a ſubtile powder, put it in a large glaſs cucurbit; pour on it good diſtilled vinegar, till it riſe about three inches above the ceruſe.

Then put this veſſel on a ſoft aſh fire, or ſand heat, and, when the vinegar is well coloured and impregnated with the ſalt, decant it off into another veſſel; continue to put new vinegar on your matter, which ſtir well with a ſtick, to facilitate the ſolution of the ſalt; and do it ſo often, till your vinegar ſhall have extracted all the tincture from the ceruſe. Then take all your coloured vinegar, rectify it four times on tartar calcined to whiteneſs, then filtre it carefully, and put it in a glaſs cucurbit on a ſand heat or aſh fire, where gently evaporate it till a pellicle appears on the ſurface. Then put the veſſel into a cold place, having taken care to cover it, for fear of any foulneſs tumbling into it, and in a little time you will find pure cryſtals, which you muſt take out of your veſſel; then put your veſſel on the ſame fire to evaporate the remaining vinegar, till a pellicle appears; then ſet it in a cool place to cryſtalliſe as before.

When you have taken out all the cryſtals, dry them well, and reduce them to a ſubtile powder; and keep them in a veſſel well ſtopped. Thus you have Saturnus glorificatus.

SAW (*Dict.*)—The Saw is one of the moſt uſeful machines, in the mechanic arts, ever invented: the fable, which is perhaps founded on ſome ſurer tradition, attributes the invention thereof to Icarus; who, vying with his father Dædalus, enriched the riſing arts with ſeveral diſcoveries.—It is added, he took the firſt hint from the ſpine or backbone of a flat fiſh, ſuch as the ſoal. The Saw is made of ſteel, with teeth, but thoſe differently filed and turned, according to the uſe it is deſigned for.—There are alſo a kind of Saws without teeth, uſed in the ſawing of marbles and other ſtones.

The beſt Saws are of tempered ſteel, ground bright and ſmooth; thoſe of iron are only hammer-hardened: hence, the firſt, beſides their being ſtiffer, are likewiſe found ſmoother than the laſt.—They are known to be well hammered by the ſtiff bending of the blade; and well or evenly ground, by bending equally into a bow.

The edge, wherein the teeth are, is always thicker than the back, in regard the back is to follow the edge.—The teeth are cut and ſharpened by a triangular file; firſt fixing the blade of the Saw in a whetting-block.

When filed, the teeth are to be ſet, that is, to be turned aſkew, or out of the right line, to make the wider kerf or fiſſure, that the back may follow the better. This is done by putting an inſtrument, called a Saw-wriſt, between every other two teeth, and giving it a little wrench, which turns one of the teeth a little towards you, and the other a little from you.—The teeth are always ſet ranker for coarſe cheap ſtuff, than for hard and fine; in regard, the ranker the tooth is ſet, the more ſtuff is loſt in the kerf; and, if the ſtuff be hard, the greater the labour of ſawing it.

The workmen, who make the greateſt uſe of the Saw, are, the ſawyers, carpenters, joiners, eboniſts, ſtone-cutters, carvers, ſculptors, &c. The lapidaries too have their Saw, as well as the workers in moſaic; but theſe bear little reſemblance to the common Saws.

SA'WING (*Dict.*)—There are wind-mills and water-mills, which do the office of Sawing wood, with infinitely more expedition and eaſe than is performed by the hand.

They conſiſt of ſeveral parallel ſaws, which are made to riſe and fall perpendicularly, by means of one of the grand principles of motion.—A very few hands are here needed, viz. only to puſh forward the pieces of timber, which are laid on rollers, or ſuſpended by ropes, in proportion as the Sawing advances. Theſe mills are frequently found abroad, and were lately begun to be introduced in England; but the parliament, in conſideration of this, that they would ſpoil the ſawyers trade, and ruin great numbers of families, thought fit to ſuppreſs them.

SCA'BIOUS (*Dict.*)—All the ſhrubby ſorts of Scabious may be propagated by cuttings, which may be taken off during any of the ſummer-months, and ſhould be planted in a ſhady border, and duly watered in dry weather, which will promote their taking root; and then they may be potted, and placed in a ſhady ſituation, till they have taken new root, after which time they may be placed amongſt other hardy exotic plants, in a ſheltered ſituation, where they may remain until the end of October, when they muſt be moved into ſhelter. In ſome favourable ſeaſons theſe plants will produce good ſeeds in England, ſo that the plants may be raiſed from theſe, by ſowing them in an open border of light earth about the middle of March; and, if the ſpring ſhould prove very dry, it will be neceſſary to water the ground now-and-then, which will forward the vegetation of the ſeed; ſo that the plants will appear in about three weeks after the ſeeds are ſown. When they come up, they muſt be kept clear from weeds, and in dry weather duly watered; and, when they are ſtrong enough to tranſplant, they ſhould be planted in pots, and managed in the ſame manner as thoſe plants which are propagated by cuttings.

All the ſorts of Scabious continue a long time in flower, for which they are regarded; for there is no very great beauty in many of their flowers: but, as moſt of the hardy ſorts produce flowers near three months ſucceſſively, ſo they may be allowed a place in the borders of large gardens, becauſe they require very little care to cultivate them. And as the ſhrubby kinds continue in flower moſt part of the year, ſo they make an agreeable variety amongſt hardy exotic plants in the winter. *Miller's Gard. Dict.*

SCÆ'NANTH, or SCHÆNANTH, in the Materia Medica, the dried ſtalk of a plant brought to us from Arabia.

This plant is called, by the generality of botaniſts, juncus odoratus and aromaticus; but Linnæus gives it thename of iſchæmum.

The ſtalk is uſually eight or ten inches in length, ſometimes conſiderably more; it is ſmooth and gloſſy on the ſurface, and about the thickneſs of a wheat-ſtraw, but much more rigid and firm. It is very light, yet conſiderably hard, and is of a fragrant or aromatic ſmell, in which we may diſcover ſomething of a mixed ſcent, between that of the roſe and penny royal. Its taſte is acrid and bitteriſh, but not unpleaſant.

It ſhould be choſen freſh, ſound, and clean, not duſty or decayed, of a good ſmell and ſtrong and acrid taſte. *Hill's Hiſt. Mat. Med.*

SCALE *of muſic* (*Dict.*)—That muſical intervals are founded on certain ratio's or proportions expreſſible in numbers, is an old diſcovery. It is well known, that all muſical ratio's may be analyſed into the prime numbers two, three, and five; and that all intervals may be found from the octave, fifth, and third major; which reſpectively correſpond to thoſe numbers. Theſe are the muſicians elements, from the various combinations of which all the agreeable variety of relations of ſounds reſult. This ſyſtem is ſo well founded on experience, that we may look upon it as the ſtandard of truth. Every interval that occurs in muſic is good or bad, as it approaches to, or deviates from, what it ought to be on theſe principles. The doctrine of ſome of the ancients ſeems different. Whoever looks into the numbers given us by Ptolemy, will not only find the primes 2, 3, and 5, but 7, 11, &c. introduced. Nay, he ſeems to think all fourths good, provided their component intervals may be expreſſed by ſuperparticular ratio's. But theſe are juſtly exploded conceits; and it ſeems not improbable, that the contradictions of different numerical hypotheſes, even in the age of Ariſtoxenus, and their inconſiſtency with experience, might lead him to reject their numbers altogether. It is pity he did: had he made a proper uſe of them, we ſhould have had a clearer inſight into the muſic of his times. However, what remains of the writings of this great muſician, joined to my own obſervation and experience, has enabled me, I hope, to throw ſome light upon the obſcure ſubject of the ancient ſpecies of muſic.

By the manner in which Euclid and others find the notes of their Scale, it muſt have been compoſed of tones major and limma's. Hence, the ſeven intervals of one octave would be thus expreſſed in numbers, $\frac{9}{8}$, $\frac{256}{243}$, $\frac{9}{8}$, $\frac{9}{8}$ $\frac{256}{243}$, $\frac{9}{8}$, $\frac{9}{8}$.

Some modern authors have from this inferred the imperfection of the Greek muſic. They alledge we here find the ditonus, or an interval equal to two tones major expreſſed by $\frac{81}{64}$, inſtead of the true third major expreſſed by $\frac{5}{4}$. As there can be no queſtion of the beauty and elegance of the latter, the former therefore muſt be out of tune, and out of tune by a whole comma, which is very ſhocking to the ear. In like manner the trihemitone of the ancients falls ſhort of the third minor by a comma; which is alſo the deficiency of their hemitone or limma, from the true ſemitone major, ſo eſſential to good melody. Theſe errors would make their Scale appear much out of tune to us. This I readily grant; and add, that it appeared out of tune to them; ſince they expreſly tell us, that the intervals leſs than the diateſſaron or fourth, as alſo the intervals between the fifth and octave, were diſſonant and diſagreeable to the ear. Their Scale, which has been called by ſome the ſcala maxima, was not intended to form the voice to ſing accurately, but was deſigned to repreſent the ſyſtem of their modes and tones, and to give the true fourth and fifths of every key a compoſer might chuſe. Now if, inſtead of tones major and limma's, we take the tones major and minor, with the ſemitone major, as the moderns contend we ſhould, we ſhall have a good Scale indeed, but a Scale adapted only to the concinnous conſtitution of one key; and, whenever we proceed from that into another, we find ſome fourth or fifth erroneous by a comma. This the ancients did not admit of. If, to diminiſh ſuch errors, we introduce a temperature, we ſhall have nothing in tune but the octave. We ſee then the Scale of the ancients was not deſtitute of reaſon; and that no good argument againſt the accuracy of their practice can from thence be formed.

It was uſual among the Greeks to conſider a deſcending as well as an aſcending Scale; the former proceeding from acute to grave, preciſely by the ſame intervals as the latter did from grave to acute. The firſt ſound in each was the proſlambanomenos. The not diſtinguiſhing theſe two Scales has led ſeveral learned moderns to ſuppoſe, that the Greeks, in ſome centuries, took the proſlambanomenos to be the loweſt note in their ſyſtem; and, in other centuries, to be the higheſt. But the truth of the matter is, that the proſlambanomenos was the loweſt, or higheſt note, according as they conſidered the aſcending, or deſcending Scale. The diſtinction of theſe is conducive to the variety and perfection of melody; but I never yet met with above one piece of muſic, where the compoſer appeared to have any intelligence of this kind. The compoſition is about 150, or more, years old, for four voices; and the words are, ‘ Vobis datum eſt noſcere myſterium regni Dei, cæ‘ teris autem in parabolis; ut videntes non videant, et audientes ‘ non intelligant’. By the choice of the words, the author ſeems to allude to his having performed ſomething not commonly underſtood.

I ſhall here give an octave only of the aſcending and deſcending Scales of the diatonic genus of the ancients, with the names of their ſeveral ſounds, as alſo the correſponding modern letters.

Aſcending.				Deſcending.
A		Proſlambanomenos		*g*
	$\frac{9}{8}$		$\frac{8}{9}$	
B		Hypate Hypaton		*f*
	$\frac{256}{243}$		$\frac{243}{256}$	
C		Parhypate Hypaton		*e*
	$\frac{9}{8}$		$\frac{8}{9}$	
D		Lychanos Hypaton		*d*
	$\frac{9}{8}$		$\frac{8}{9}$	
E		Hypate Meſon		*c*
	$\frac{256}{243}$		$\frac{243}{256}$	
F		Parhypate Meſon		*b*
	$\frac{9}{8}$		$\frac{8}{9}$	
G		Lychanos Meſon		*a*
	$\frac{9}{8}$		$\frac{8}{9}$	
a		Meſe		*G*

Where the ſame Greek names ſerve for the ſounds in the aſcending and deſcending Scales.

In the octave here given, four ſounds, viz. the proſlambanomenos, hypate hypaton, hypate meſon, and meſe, were called ſtabiles, from their remaining fixed throughout all the genera and ſpecies.

The other four ſounds being the parhypate hypaton, lychanos hypaton, parhypate meſon, and the lychanos meſon, were called mobiles, becauſe they varied according to the different ſpecies and varieties of muſic.

I come now to determine the queſtion, What theſe different genera and ſpecies were? We know, that by genus and ſpecies was underſtood a diviſion of the diateſſaron, containing four ſounds, into three intervals. The Greeks conſtituted three genera, known by the names of enharmonic, chromatic, and diatonic. The chromatic was ſubdivided into three ſpecies, and the diatonic into two. The three chromatic ſpecies were the chromaticum molle, the ſeſquialterum, and the toniæum. The two diatonic ſpecies were the diatonicum molle, and the intenſum; ſo that they had ſix ſpecies in all. Some of theſe are in uſe among the moderns, but others are as yet unknown in theory or practice.

I now proceed to define all theſe ſpecies, by determining the intervals, of which they ſeverally conſiſted; beginning by the diatonicum intenſum, as the moſt eaſy and familiar.

The diatonicum intenſum was compoſed of two tones, and a ſemitone: but to ſpeak exactly, it conſiſts of a ſemitone major, a tone minor, and a tone major. This is in daily practice; and we find it accurately defined by Didymus, in Ptolemy's Harmonics publiſhed by Dr. Wallis.

The next ſpecies is the diatonicum molle, as yet undiſcovered, as far as appears to me, by any modern author. Its component intervals are, the ſemitone major, an interval compoſed of two ſemitones minor, and the complement of theſe two to the fourth, being an interval equal to a tone major, and an enharmonic dieſis.

The third ſpecies is the chromaticum toniæum. Its component intervals are, a ſemitone major, ſucceeded by another ſemitone major; and, laſtly, the complement of theſe two to the fourth, commonly called a ſuperfluous tone.

The fourth ſpecies is the chromaticum ſeſquialterum, which is conſtituted by the progreſſion of a ſemitone major, a ſemitone minor, and a third minor. This is mentioned by Ptolemy, as the chromatic of Didymus. Examples among the moderns are frequent.

The fifth ſpecies is the chromaticum molle. Its intervals are two ſubſequent ſemitones minor, and the complements of theſe two to the fourth; that is, an interval compounded of a third minor, and an enharmonic dieſis. This ſpecies I never met with among the moderns.

The ſixth and laſt ſpecies is the enharmonic. Salinas and others have determined this accurately. Its intervals are, the ſemitone minor, the enharmonica dieſis, and the third major. Examples of four of theſe ſpecies may be found in modern practice. But I do not know of any theoriſt who ever yet determined what the chromaticum toniæum of the ancients was: nor have any of them perceived the analogy between the chromaticum ſeſquialterum and our modern chromatic. The enharmonic, ſo much admired by the ancients, has been little in uſe among our muſicians as yet. As to the diatonicum intenſum, it is too obvious to be miſtaken.

Ariſtoxenus and others often mention the tone as divided into four parts, and the ſemitone into two; thereby making ten diviſions or dieſes in the fourth. And this is true, if we conſider theſe ſounds in one tenſion; that is, either aſcending or deſcending: but, accurately ſpeaking, when we conſider all the dieſes or diviſions of the fourth, both aſcending and deſcending, we ſhall find thirteen; five to each tone, and three to the ſemitone major. But then it is to be obſerved, that ſome of theſe diviſions will be leſs than the enharmonic dieſis: for, if we divide the ſemitone major into the ſemitone minor, and enharmonic dieſis, aſcending, for inſtance, E, ♯ E, F, and then divide in like manner deſcending, F, ♭ F, E, we ſhall have the ſemitone major divided into three parts thus, E ♭ F, ♯ E, F; where the interval between ♭ F and ♯ E is leſs than the enharmonic dieſis between E and ♭ F, and between ♯ E and F, as is eaſily proved.

Now, if we ſuppoſe theſe ſmall intervals equal, by increaſing the leaſt diviſion, and diminiſhing the true enharmonic dieſis, we ſhall then have a fourth divided into thirteen equal parts; and, conſequently, the octave divided into three ſuch equal parts; which gives us the celebrated temperature of Huygens, the moſt perfect of all.

From this it appears, that the diviſion of the octave into thirty-one parts was neceſſarily implied in the doctrine of the ancients. The firſt of the moderns who mentioned ſuch a diviſion was Don Vincentino, in his book intitled L'Antica Muſica ridotta alla moderna Prattica, printed at Rome, 1555, folio. An inſtrument had been made according to his notion: which was condemned by Zarlino and Salinas, without ſufficient reaſon. But Mr. Huygens, having more accurately examined the matter, found it to be the beſt temperature that could be contrived. Though neither this great mathematician, nor Zarlino,

lino, Salinas, nor even Don Vincentino, ſeem to have had a diſtinct notion of all theſe thirty-one intervals, nor of their names, nor of their neceſſity to the perfection of muſic.

In Huygens's temperature the tones are all equal: but, in a true and accurate practice of ſinging, they are not ſo. And I muſt add, that the tone divided in every ſpecies muſt be the tone minor; for the diviſion of the tone major is harſh and inelegant. So that, in the diviſion of the fourth, it is to be obſerved, that in every ſpecies, the tone major muſt either be an undivided interval, or make part of one. *Philoſ. Tranſ.* N°. 481.

SCALES, in natural hiſtory. What the naturaliſts underſtand by Scales, are certain flat and ſemipellucid bodies, common to the fiſh, the ſerpent, and the lizard kind; conſiſting of a ſubſtance ſomewhat analogous to that of the horns and hoof of other animals, as is found by cutting and burning them, and by their ſmell.

The Scales in fiſhes are of ſo many different kinds and ſhapes, that they afford, in many caſes, very good characters for the diſtinction of the ſpecies. The differences of theſe parts of fiſh ariſe from their number, ſituation, figure, and proportion, and to ſome other qualities peculiar to a few of them. Their differences, in regard to number, are theſe: there are none on ſeveral kinds of fiſh, as on the petromyza, the dolphin, and the whales. Upon ſome other fiſhes they are but very few in number, as on the conger, the eel, the clariæ, &c. And they are on others found in vaſtly great numbers, and placed in cluſters one over another, as in the pearch, ſalmon, &c. Theſe Scales are not ſuppoſed to be ſhed every year, nor during the whole life of the fiſh, but to have an annual addition of a new Scale growing over, and extending every way beyond the edges of the former, in proportion to the fiſh's growth; ſomewhat in the manner as the wood of trees increaſes annually, by the addition of a new circle next the bark. And, as the age of a tree may be known by the number of ringlets its trunk is made up of, ſo in fiſhes, the number of plates, compoſing their Scales, denote to us their age. It is alſo probable, that as there is a time of the year when trees ceaſe to grow, or have any farther addition to their bulk, the ſame thing happens to the Scales of fiſhes; and that afterwards, at another time of the year, a new addition, increaſe, or growth begins.

Mr. Lewenhock took ſome Scales from an extremely large carp, forty-two inches and a half long, Rynland meaſure, which were as broad as a dollar; theſe he macerated in water, to make them cut the eaſier, and then cutting obliquely through one of them, beginning with the firſt formed, or very little ſhell in the center, he by his microſcope plainly diſtinguiſhed forty lamellæ, or Scales, glewed as it were to one another; whence he concluded the fiſh to be forty years old.

It is generally imagined that an eel has no Scales; but, if the ſlime be wiped clean away, and the ſkin then examined by a microſcope, it is found covered with extremely ſmall Scales, ranged in a very orderly and pretty manner; and probably very few fiſhes, except ſuch as have ſhells, are truly free from Scales.

The way of preparing Scales for the microſcope, is to take them off carefully with a pair of nippers, waſh them very clean, and then place them between the leaves of a book to make them dry flat; and, when thoroughly dry, they are to be put between two ſlips of talc. The ſnake, viper, and eel afford alſo a very beautiful and very different ſeries of Scales from thoſe of fiſhes.

SCA'LLION, or **ESCALLION**, a ſort of onion that never forms any bulb at the root, but is uſed green in ſpring, before the other ſorts ſown in July are large enough.

This is however very ſcarce in London, the gardeners uſually ſelling in its place the ſhoots of ſuch decayed common onions, as have ſprouted in the houſe. Theſe they plant in a bed early in the ſpring, and they ſoon grow large enough for uſe, when they pull them out; and, taking off all the old outer coat of the roots, they lay them in bunches, and ſell them at market for Scallions.

The true Scallion is eaſily propagated by parting the roots in autumn, and planting them three or four together in a hole, at ſix inches diſtance. Theſe will grow in any ſoil or ſituation, and will multiply very quickly, and in a very great abundance; and their being hardy enough to endure the ſevereſt weather, and fit for uſe ſo early in ſpring, makes them worthy a place in all kitchen gardens. *Miller's Gard. Dict.*

SCAL'LOP. — The anatomy of this fiſh lets us greatly into the knowledge of the ſtructure of the parts of other bivalve fiſh.

The Scallop is compoſed of two ſhells, which, as in many others, are one concave, and the other plane or flat. The cardo, or hinge, is lightly bent from the concave ſhell, and thence carried over a part of the plane ſhell, and all the way between it is firmly connected to a cartilage. In the middle of the length of the cardo there is placed another ſhort, black, and very ſtrong cardo.

It is eaſy to ſee, from hence, to what is owing that remarkable ſtrong power, which this creature has of ſhutting and opening its ſhell; and it is very poſſible, that, by means of ſo ſtrong an apparatus of tendons or ligaments as it has in this part, it may be able to move the plane ſhell in ſo ſwift and regular, as well as forcible and eaſy a manner, that it may uſe it in moving from place to place, and poſſibly it may make a ſort of wing of it, to beat againſt the water as the pinion of a bird does againſt the air; and what the antients have ſo frequently ſaid of its moving about in a very ſwift manner, from place to place, may be true, though we have been wanting in later obſervations to ſee it.

When the two ſhells are opened, the following particulars offer themſelves to the view. Firſt, the mouth; this is covered with a ſort of membranous hood, as in the oiſter; it does not ſtand on the center of the head, but towards the right-hand, and the covering is only an elongation of the branchiæ, or gills of the fiſh: theſe are of a membranous nature, and ſurround the whole body from the mouth to the anus, which ſtands towards the left hand from the mouth, where they are connected again.

That branchia of the exterior part, to which the flat or plane ſhell adheres, is fixed in its center to an immenſely ſtrong muſcle, which grows from the ſhell, and is fixed into the body of the fiſh at right angles: this branchia is fixed to the upper limb of that muſcle, and the other branchia is, in like manner, connected to the lower limb of the ſame ſtrong muſcle. Theſe two exterior, or ſpurious branchiæ, from this muſcle to a conſiderable extent, are formed only of a thin and pellucid membrane, and, being carried to the middle of the valves on each ſide, they are fixed down in ſuch a manner, that they cannot be removed by any means, without injuring or deſtroying them.

The uſe of theſe is to defend the body of the animal from the injuries of the water, and other ſubſtances let in with it, on the opening of the ſhell. From the place of this adheſion there is propagated a ſtrong and thick muſcle, of a truly wonderful ſtructure; this is a ſort of limb or verge to the animal. It is contracted inward when the animal is dead, but, while it is alive, it is expanded, at the creature's pleaſure, a great way out beyond the edges of the ſhell; and is jagged, and variegated with lines and ſtreaks in an amazing and elegant manner.

The uſe of this part ſeems eaſily gueſſed, it being, when expanded out of the mouth of the ſhell, a ſort of net, for the catching whatever the creature chuſes to feed upon. It is, at the pleaſure of the animal, either laid flat on the ſurface of the mud or rock, or arched into a part of a circle: when, in any of theſe poſitions, any thing comes in its way which is proper food for the creature, it immediately gathers up like a net round about it, and, withdrawing itſelf into the ſhell, takes in the prey with it. In this caſe, the uſe of its being cut, or fringed, is alſo plainly ſeen; for it can, by means of this ſtructure, let out the water taken in with the prey through the jags, and yet retain the prey itſelf. *Philoſ. Tranſ.* N°. 229.

The uſe of this admirable muſcle is not only the ſerving as a net for the taking the food, and afterwards as a ſtrainer for the ſeparating the water from it; but its muſcular force is ſo great, that it alſo ſerves as a weapon of death to the little animal it has ſeized, by compreſſing it to pieces, if neceſſary, at leaſt by ſqueeſing it till no life remains. This is a very neceſſary article in the preying of an animal which can neither follow or reſiſt an animal in motion, but this is not all. When the prey is brought into the ſhell, it might there remain, where firſt laid down, without being of any uſe to the Scallop, who cannot turn about her mouth to come at it: in this caſe the ſame wonderful muſcle, by its undulatory motion, ſerves to convey the prey to a part of the ſhell nearer the mouth of the animal; and when there, taking it up between the jags of the fringe, it holds it to the opening of the mouth; in this laſt office ſerving in the place of a hand. Theſe are the many and neceſſary uſes of this part.

But to come to the branchiæ, or gills, properly ſo called; the true branchiæ are four in number; they are of a yellowiſh colour, and are fringed in a very elegant manner; theſe every way ſurround the great central muſcle, and ſerve as a covering to the uterus of the animal, or its ovary; certainly, however, to the parts of generation, by what ever name they may be called.

The lower part of the body of the Scallop is yellow, and its upper part white, and near its mouth there is very plainly to be diſcovered a proceſs with a double aperture. It ſeems probable, from all obſervation, that the Scallop is an hermaphrodite animal, and contains the parts of generation of both ſexes in each individual; and it appears that the female part of generation is, on occaſion, puſhed out from one of theſe apertures, and the penis, or male part, from the other. The mouth of the Scallop is furniſhed with reddiſh lips, reſembling the branchiæ, or gills, in their ſtructure, but very ſhort and ſmall; and near the hinge there are two large circular cavities, reſembling the eyes of the turbot. Near the head there is a large maſs of blackiſh matter towards the left hand, and under that, or rather behind it, is ſituated the creature's heart. The pericardium is pellucid, and is of ſo fine a ſtructure, that the heart is eaſily ſeen through it: it is of a reddiſh colour, and its aorta, or large artery, is divided into a great number of branches, which are ſent every way round to the gills.

It is ſome doubt, however, whether this their membrane, before deſcribed, ſerves alone in the capacity of a pericardium, or whether all this black matter, that lies about it in a ſort of rhombic form, does not alſo, in ſome degree, ſupply that office. The lower part of this gives place to the urinary bladder, and the ſtrait gut ariſes from the baſe of this black ſubſtance, and is thence carried ſtraight over the pericardium, whence it runs on to the branchiæ, and is at length affixed to the great central muſcle.

This central muſcle is of a rounded figure, very ſmooth, and white, and even in the greater part of its bulk, where it is connected to the ſhell; but on the left it is divided, and forms another white and lacerated muſcle, which runs along a part of the ſhell, and ſtrengthens the connection of the body of the fiſh with this part of the plane valve. *Philoſ. Tranſ.* N°. 229.

SCAL'PEL, *ſcalpellum*, in chirurgery, a kind of knife chiefly uſed in diſſections; but which may be occaſionally uſed in many other operations, as in amputations, and to cut off the fleſh and membranes that are between the two bones of an arm or leg, before the limb be ſawed off.

There are two kinds of Scalpels: the firſt cuts on both ſides, and is fixed in an ebony or ivory handle, which, being very flat and thin at the extremity, ſerves to part the membranous and fibrous parts in anatomical preparations.

The other has a back, that is, it only cuts on one ſide; it is crooked, and very commodious for ſtripping the fleſh off the bones in embalming, making ſkeletons, &c.

Scultetus, in his Arſenal, deſcribes ſeveral other kinds of Scalpels; as, a deceitful Scalpel, thus called, becauſe it deceives the patient by hiding its blade. It was much uſed by the ancients, in opening and dilating of ſinews; but as it is apt to deceive the ſurgeon himſelf, and is beſides very ſlow, it is better uſing a ſyringotomus.—A Scalpel, ſharp on both ſides for ſetons.—A little crooked Scalpel for ſeparating the coherence of the eyelids.—A ſharp, double-cutting Scalpel, with a bone-handle, for the cutting off an ægilops.—Scalpels like ſcolopomachærions, &c. Even the ſcolopomachærion itſelf is a kind of Scalpel.

SCA'LPRA *dentalia*, inſtruments uſed by the ſurgeons to take off thoſe black, livid, or yellow cruſts, which infeſt the teeth, and not only looſen and deſtroy them, but taint the breath.

The manner of uſing them is to begin near the gums, ſupporting the blade with the left hand, and ſcraping all along the teeth, till the cruſt is taken off, taking care not to wound the gums, or diſplace the teeth. *Heiſter's Surgery.*

SCAPE-*goat*, in the Jewiſh antiquities, the goat ſet at liberty on the day of ſolemn expiation. For the ceremonies on this occaſion, ſee Levit. XVI. 5, 6, &c.

Some ſay that a piece of ſcarlet cloth, in form of a tongue, was tied on the forehead of the Scape-goat. *Hofm. Lex univ. in voc. Lingua.*

Many have been the diſputes among the interpreters, concerning the meaning of the word Scape-goat, or rather of azazel, for which Scape-goat is put in our verſion of the Bible. Spencer is of opinion that azazel is a proper name, ſignifying the devil or evil dæmon. See his reaſons in his book de Leg. Hebr. Ritual, Diſſert. VIII. Among other things he obſerves that the antient Jews uſed to ſubſtitute the name Samaël for azazel, and many of them have ventured to affirm, that at the feaſt of expiation they were obliged to offer a gift to Samaël to obtain his favour. Thus alſo the goat, ſent into the wilderneſs to Azazel, was underſtood to be a gift or oblation. Some Chriſtians have been of the ſame opinion. But Spencer thinks that the genuine reaſons of the ceremony were, 1. That the goat loaded with the ſins of the people, and ſent to Azazel, might be a ſymbolical repreſentation of the miſerable condition of ſinners. 2. God ſent the goat thus loaded to the evil dæmons, to ſhew that they were impure, thereby to deter the people from any converſation or familiarity with them. 3. That, the goat ſent to Azazel ſufficiently expiating all evils, the Iſraelites might the more willingly abſtain from the expiatory ſacrifices of the Gentiles.

Fracture of the SCA'PULA.—The Scapula is uſually fractured either near its acromion, or head, where it joins the clavicle, or in ſome more diſtant part. If the fracture happens in proceſs of the acromion, the reduction will be eaſily made, by lifting up the arm to relax the deltoide muſcle, and puſhing the arm evenly upwards, making the fractured parts meet together with the fingers: but, notwithſtanding their reduction is ſo eaſy, they eaſily ſlip away again from any ſlight cauſe, and ſo are difficultly agglutinated. They are not in particular very eaſily ſeparated by the weight and motion of the arm, and by the contraction of the deltoide muſcle; inſomuch that there is ſcarce ever an inſtance of a fractured acromion being ſo perfectly cured, as to admit afterwards of a free motion of the arm upwards: all means muſt, however, be uſed to endeavour to keep the replaced bones in their proper ſituation. A compreſs, wet with ſpirit of wine, is to be applied to the fracture; a ball is to be put under the arm-pit to ſupport it; the whole is to be bound up with the bandage commonly called ſpica, and the arm is to be ſuſpended in a ſaſh or ſling hung about the neck. But if the neck of the Scapula, which lies under the acromion or its acetabulum, ſhould be fractured, which is a caſe that indeed very ſeldom happens, and, when it does, is very difficult to diſcover; it is a hundred to one but, from the vicinity of the articulation of the tendons, muſcles, ligaments, nerves, and large veins and arteries, there will follow a ſtiffneſs and loſs of motion in the joint; great inflammation is alſo to be expected, and abſceſſes with the worſt ſymptoms, and ſometimes death itſelf.

SCA'NDAL, * ΣΚΑ'ΝΔΑΛΟΝ, in the ſcripture language, denotes any thing that may draw us aſide, or ſollicit us to ſin.

* The word is formed from the Greek σκάνδαλον, or the Latin ſcandalum, which, according to Papias, was originally uſed for a ſudden, extemporary quarrel, quæ ſubito inter aliquos ſcandit vel oritur.

In which ſenſe, the word is uſed promiſcuouſly with offence and ſtumbling-block.

Scandal is either active or paſſive.

Active Scandal is a real induction to ſin; paſſive Scandal is the impreſſion which an active Scandal makes on the perſon induced to ſin.

Scandal, in the popular language, is ſome action, or opinion, contrary to good manners, or to the general ſenſe of a people.

Scandal alſo denotes a diſadvantageous rumour, or report; or an action whereby any one is affronted in public.

SCA'NDIX, *ſhepherd's needle, or Venus-comb*, in botany, a genus of plants, whoſe characters are:

It has a roſe-ſhaped umbellated flower, conſiſting of ſeveral petals, which are ranged orbicularly, and reſt on the empalement, which becomes a fruit conſiſting of two parts, having two ſeeds, which reſemble, when joined.

They may be propagated by ſeeds which ſhould be ſown in autumn, ſoon after they are ripe, in the place where they are deſigned to remain, which ſhould be in a ſhady ſituation; and, when the plants are come up, they will require no farther care, but to keep them clear from weeds. In May the plants will flower, and in the beginning of July they will perfect their ſeeds, and ſoon after decay. But, if the ſeeds are permitted to ſcatter, the plants will come up without any manner of care, and become weeds in the garden.

SCA'PHISM * Scaphismus, in antiquity, a kind of torture or puniſhment formerly in uſe among the Perſians. It conſiſted in locking the criminal cloſe up within the trunk of a tree bored to the dimenſions of his body, only with five holes for his head, arms, and legs to come through. In this ſtate he was expoſed to the ſun, and the parts thus appearing anointed with honey and milk, to invite the waſps and flies.

* The word is Greek, σκάφισμος; formed of σκάφος, digging, of σκάπτω, I dig, hollow.

To increaſe the torment, they forced the criminal to eat abundantly, till his excrements, cloſe pent up in the wood, rotted his body. Some authors obſerve, that perſons ordinarily lived forty days in this condition.

This invention is aſcribed to Pariſatis queen of Perſia, and mother of Artaxerxes Mnemon, and the young Cyrus. It is added, ſhe firſt ordered it to be practiſed on the perſon who brought the tidings of the death of Cyrus.

SCARABÆ'US, *the beetle.* This is an extremely numerous genus of inſects; and, in order to have a diſtinct idea of the differences of the ſpecies, they are arranged by Liſter into a ſort of method. The firſt general diſtinction is into thoſe which live on land, and thoſe which live in the water; of each of which there is a very great number. Thoſe beetles which live on land have ſome of them antennæ laminated at the end, and others have them ſharp-pointed. The outer wings, or caſes of the wings, in ſome are perfect, in others they ſeem mutilated. Some have the antennæ inſerted into a ſort of promuſcis. Theſe were called by the antients gurguliones, and in ſome there is only one juncture in this, in the middle; in others ſeveral near the end. Some have a ſharp-pointed inſtrument at their head; theſe are called cimices.

Scarabæus *tardipes*, the ſlow beetle. We have a very ſingular account of the longevity of this animal, and that without food, given by Mr. Baker from his own obſervation. In the year 1737 he found ſeveral beetles of this kind plunging themſelves in the mud at the bottom of an old ciſtern; theſe were about an inch in length, and of a ruſty black colour, and had long jointed antennæ: they had no wings, but only a thick ſhell, covering the whole body, and divided along the middle with a fiſſure, reſembling the meeting of the two caſe wings in other beetles; the tail turned up a little, and the legs were long, but moved ſlowly. Mr. Baker, chuſing one of the largeſt of theſe, threw it into a cup of ſpirits of wine; in a little time it appeared to be dead, and was ſhut up in a ſmall box, and laid by, but ſome months after it was found alive and well: it was then plunged again into ſpirits of wine, and left a much longer time; and after being taking out as dead, and put in the ſame box again for ſome time, when it was found again come to life. It had now thrice eſcaped from being plunged in ſpirits, and lived three months ſhut up without any ſuſtenance. After this the beetle was kept a month or two without ſuſtenance under a glaſs, and at the end of this time again put into ſpirits of wine, and left there a whole night; after this, however, it again recovered, and ſeemed the next day as well as before. He lived, in the whole, two years and an half, without any viſible food or drink. Several things were at times offered him by way of food, as bread, fruits, &c. and water ſet in his way, but he never touched either. It ſeems very probable that this creature received a ſufficient nouriſhment from the particles floating in the air; and it is very poſſible that lizards, ſnakes, &c. when they live ſo long without any viſible food, are ſupplied in the ſame manner, though at other times they are capable of digeſting more ſolid matters; as doubtleſs was alſo the caſe with the beetle, when in its own natural ſtate. This is an inſtance of a creature's ſubſiſting without viſible food, longer than we have any other account of any kind; but it is poſſible, that, though the larger animals cannot long ſubſiſt without ſupplies of ſolid food, yet many inſects may find nouriſhment enough for their tender bodies in the particles floating in the air, though we want obſervations for the proof of it.

While kept under the glaſs, it did not walk about much, but uſually placed its noſe cloſe againſt one edge of it for the benefit of the air: it was of an agreeable aromatic ſmell, and, when touched, communicated its ſcent to the fingers, which did not go off in a long time. Its ſmell is ſtronger in winter than in ſummer. This creature not only bears the plunging in ſpirits of wine much longer than any other animal, but it bears the exhauſted receiver of an air pump without any injury or uneaſineſs. It has been kept under it half an hour, and would walk about without any concern; only, when the air was let in, it appeared ſtartled, and drew up its legs for about a minute.

SCARABÆ'US *vorax*, the cankerworm. This laſt term is uſed, in the tranſlation of our Bibles, to ſignify a very deſtructive inſect, of the nature of the locuſt, and uſually mentioned as its companion. The Septuagint gives it the name βρȣ̃χος, bruchus, a name ſignifying an animal which makes a great noiſe, as this inſect does in eating and in flying. We generally underſtand by this word a reptile, but it certainly means no other than that ſort of beetle, which we call the cockchaffer, or dor; a flying inſect very remarkable for the humming noiſe it makes with its wings when in motion, and which, when it is found in ſwarms ſitting upon the hedges, makes a continual noiſe in eating like the ſawing of wood. This creature deſerves very well to be placed with the locuſt, as a deſtroyer of the fruits of the earth. Our own experience in Norfolk has given a very late proof of this; and the hiſtories of Ireland ſhew that this creature has, in that kingdom, devoured every green leaf from the trees, for whole tracks of land at a time. That we have a wrong tranſlation of the word bruchus in cankerworm, is evident from the ſcriptures themſelves; for the prophet Nathan expreſsly ſays it is a fly, and has wings, which cannot agree with any thing of the nature of what we underſtand by the word worm, which always ſignifies with us a reptile, or a creeping animal. This prophet has indeed deſcribed them ſo well, that it is wonderful that ſo obvious a thing ſhould not have been obſerved by the commentators. He ſays, they ſpoil and then flee away; they camp in the hedges in the day, and, when the ſun ariſeth, they flee away, and their place is not known where they are. That is, they then retire again to the hedges, and hide themſelves among the trees, where they lie quiet and concealed till the ſun ſets again. It is plain, by comparing theſe words with the common animal here mentioned, that the bruchus of the Old Teſtament is the ſame with our cockchaffer, and that the prophet has given us the natural hiſtory of the animal he deſcribes in this ſhort account.

SCA'RBOROUGH *Water*. — The water of this medicinal ſpring has been the ſubject of great conteſts and diſputes among the phyſical people; all allowing it conſiderable virtues, but ſome attributing them to one ingredient, others to another. Dr. Witty alledges that its material principles are alum, nitre, and vitriol of iron; but, though this author declares, that theſe principles are all to be ſeparated out of it, Dr. Tonſtall, on the other hand, affirms that it has no vitriol of iron in it, but a ſtone powder and a clay, leaving ſand at the bottom of the veſſel; and therefore that it is apt to breed the ſtone, and is bad in the gout, jaundice, and all other diſeaſes where indurations of the parts, or ſtony concretions in the body, are the cauſe: and this author ſeems to ſpeak very experimentally, when he alledges that he never had any ſymptoms of the ſtone till he drank the Scarborough water, but acquired that diſeaſe during the courſe of it.

Alum ſtone diſſolved in water is always found to yield a purple tincture with galls, and therefore the colouring an infuſion of this, or other vegetable ſubſtances, by the Scarborough water, which is by all allowed to contain this ſtone, is no proof of any vitriol of iron being contained in it, other than ſuch a ſmall portion of it, as is always found in this alum ſtone. All waters, which have diſſolved iron, will yield vitriol as a ſalt from that metal on evaporation. The cliffs about Scarborough yield abundance of ſalt in ſhoots and effervefcences, plainly owing to the waters of the ſpring; yet all theſe are nitro-aluminous, none of them at all vitriolic. If the Scarborough water is ſet by for ſome days, after it is taken freſh from the ſpring, it precipitates a ſediment; which, being examined, is found not to be of a ferrugineous nature, but a mere glebe of alum.

Upon the whole, the virtues of alum and vitriol are ſo far different, that it muſt be eaſy to ſee which of the two ſalts the water partakes moſt of, by its virtues; but as to the ſtony matter, which one of theſe diſputants calls an inſipid clay, and the other a ſandy ſtone, it is no other than ſpar, which is contained in all water; and which has been in general ſo far from being accuſed of breeding the ſtone in the bladder, that the general conſent of mankind has ſeemed to eſteem it a cure for that diſorder. The ſpar, in the form of the lapis Judaicus and oſtracites, and the very waters, which are ſo impregnated with it, as to incruſt every thing with it that is put into them, are given for the cure of this diſeaſe. *Phil. Tranſ.* N°. 85.

SCA'RFED, in the ſea-carpenters language, is the ſame as pierced, or faſtened or joined in; thus they ſay the ſtern of a ſhip is Scarfed into her keel. They alſo imply by it, that the two pieces are ſhaped away ſlanting, ſo as to join with one another cloſe and even; which they call wood and wood.

SCA'RY, in huſbandry, a term uſed by the farmers for a barren land, which has a poor or thin ſward, or coat of graſs upon it. *Plot's Oxford.*

SCATCH-*mouth*, in the manege, a bit-mouth, differing from a cannon-mouth in this, that the cannon is round, whereas a Scatch is more upon the oval. That part of the Scatch-mouth that joins the bit-mouth to the branch, is likewiſe different; a cannon being ſtayed upon the branch by a fonceau, and a Scatch by a chaperon, which ſurrounds the banquet. The effect of the Scatch-mouth is ſomewhat greater than that of the cannon-mouth, and keeps the mouth more in ſubjection. Commonly ſnaffles are Scatch-mouths.

SCENT-*bags*, in natural hiſtory, a name given by Tyſon to thoſe peculiar pouches, or bags, which certain animals, as the civet-cat and muſk animal, have for the receiving the matter of their perfume. Theſe bags are common to more animals than is generally ſuppoſed, and in all have much the ſame qualities, the matter they contain being in moſt of them fœtid and diſagreeable, while contained in the bag, and only becoming ſweet and pleaſant when dried, or taken at leaſt from the animal, and ſmelt in ſmall quantities. The weaſel and pole-cat with us have bags of this kind, and the famous bag, or pouch of the opoſſum, is of the nature of theſe; though it ſerves alſo to the other great purpoſe of receiving and ſheltering the young in time of danger. It contains, like the reſt, a tough and viſcous matter; which ouzes out of the glands, and is of a very offenſive ſmell, while the creature lives; but, as ſoon as it is taken out and dried, the ſmell changes into a fine perfume. The gland of the aper moſchiferus, as Tyſon calls it, is of this kind, containing a glutinous humour of a very offenſive ſmell when freſh, but, when dried, becoming ſweet and perfumed as muſk. *Philoſ. Tranſ.* N°. 239.

SCEP'TICISM (*Dict.*)— The ancient Scepticiſm conſiſted in doubting of every thing, in affirming nothing at all, and in keeping the judgment in ſuſpenſe on every thing. Sextus Empiricus makes Scepticiſm to conſiſt in a faculty of oppoſing all appearances, of making all, even contrary things, equally probable, and of proceeding firſt to an ἐποχὴ, ſuſpenſe of mind, and then to an intire undiſturbedneſs or tranquillity.

Hence theſe great maxims of theirs: Οὐ μᾶλλον τȣ̃το ἢ ἐκεῖνο, this no more that: Παντὶ λόγῳ λόγος, &c. every reaſon has another againſt it; and Οὐδὲν ὁρίζω, I determine nothing.

The proper character then of Scepticiſm is an ἀκαταλῆψια, neutrality, or ſuch a diſpoſition of mind as does not, upon any occaſion, incline to any thing more than the contrary thing.

This heſitancy of the ſceptics is well deſcribed by Ariſtocles in Euſeb. de Præpar. Evan. All things are equally indifferent, uncertain and undeterminate: neither our ſenſes, nor our opinions, give us either truth or falſhood: therefore, neither the one, nor the other, are to be credited; but all things to be left on a level, without admitting any opinion, inclination or motion of the mind at all.—It is added, that the ſceptics carried this ſuſpenſe of theirs ſo far, as to deny, that any thing is either good or evil, juſt or unjuſt, true or falſe, or that any thing is this, more than that.

It is from this acatalepſia of the ſceptics that Des Cartes ſeems to have borrowed his great principle of doubting of all things; as is owned by many of his followers. — It muſt be owned, there is ſome difference between the doubting of the ſceptics, and that of the Carteſians. In phyſical matters, it is true, there does not ſeem a great deal of difference; and Des Cartes, in that reſpect, may, without much injuſtice, be deemed a ſceptic: but this may be ſaid in his favour, that the great Socrates was ſo far a ſceptic himſelf; phyſical and ſenſible things, he held, were all dubious, and, at beſt, but probable.

The origin of Scepticiſm is ſomewhat obſcure. Pyrrho, who lived under Alexander the Great, and made the tour of India in his retinue, is uſually reputed the author; whence Pyrrhonians and ſceptics are ordinarily uſed indifferently.

It muſt be owned, however, that the great dogma of the ſceptics had been countenanced, and even cultivated before Pyrrho, by Democritus, Heraclitus, &c.—Sextus Empiricus ſays, expreſly, that all that Pyrrho did, was to improve, illuſtrate, and inforce the dogma, and form the retainers thereto into a ſect.

Democritus's philoſophy was near akin to Scepticiſm; for upon his obſerving, that honey ſeemed ſweet to ſome, and bitter to others, he concluded, that it was neither ſweet nor bitter; and thereupon, pronounced ȣ μᾶλλον, non magis, which is pure Scepticiſm.—Yet the ſame Sextus adds, that Democritus was no ſceptic.

Though Plato argues very ſtrenuouſly againſt the acatalepſy of the ſceptics; yet it is certain that dogma received a great part of its encouragement from Socrates's ſchool, and Plato's academy. Nay, it was a great controverſy among the ancients, whether Plato himſelf were a ſceptic or dogmatiſt? Indeed, Plato's deciſive way of ſpeaking, in many caſes, ſeems to leave no great room for ſuch a doubt; but it is certain, his followers of the new academy, founded by Arceſilas, gave much into this way; and Nihil ſcitu was held by them a principle.

Sextus Empiricus obſerves, that Socrates himſelf had a tincture of Scepticiſm; ſome even make him the author of it, from that cuſtomary ſaying of his, 'I know nothing but this, that I know nothing.' If this were the origin of Scepticiſm, it muſt be owned, it was mightily improved afterwards, before Metrodorus ſaid, 'I know nothing, not even this, that I know nothing.' The ſame Sextus however adds, that Plato, introducing his maſter, in his Gymnaſtic Dialogues, diſputing with the ſophiſts, makes him act the part of a ſceptic.

Some have even charged Job, and Solomon, with Scepticiſm, from their propoſing a great number of queſtions, without deciding any of them. The philoſopher of Kiel, who has publiſhed a diſſertation on Scepticiſm, fetches its origin ſtill higher: he will have the devil the author thereof, who made our firſt parents doubt of the word of God himſelf; and drew them in, the firſt proſelytes to Scepticiſm.

SCE'PTICS *, Sceptici, a ſect of ancient philoſophers, founded by Pyrrho, whoſe diſtinguiſhing tenet was, that all things are uncertain and incomprehenſible; contraries equally true; that the mind is never to aſſent to any thing, but to keep up an abſolute heſitancy or indifference. See SCEPTICISM.

* The term Sceptic, in its original Greek, σκέπτικος, properly ſignifies conſiderative and inquiſitive; or a man who is ever weighing the reaſons on one ſide and the other, without ever deciding between them: it is formed from the verb σκέπτομαι, I conſider, look about, deliberate.

SCIADE'PHORI, Σκιαδηφόροι, among the Athenians, an appellation given to the ſtranger women reſiding in Athens, becauſe they were obliged, at the feſtival Panathenæa, to carry umbrellas to defend the free women from the weather. *Potter, Archæol. Græc.*

* The word is derived from σκιάδεια, an umbrella, and φέρω, I carry.

SCIAMA'CHIA, the fighting with a perſon's own ſhadow, a ſort of exerciſe preſcribed by the ancient phyſicians, in which the motion of the arms, and other parts of the body, were of very great ſervice in many chronic caſes.

SCIA'RRI, in natural hiſtory, the matter which runs down in burning torrents from the craters of Mount Ætna.

This matter, when cold and hard, is hewed and employed at Catania, and other places. It is chiefly uſed for the baſements and coinage of buildings. It probably contains mineral and metallic particles, being a ponderous, hard, grey ſtone.

Some of the Sciarri are coarſe, and others fine and poliſhed on the ſurface; ſome of them are black, others reddiſh, and others of the colour of iron; and many of them have coverings of pure ſulphur over the whole ſurface, or a part of it. Some very fine and ſmooth ones, reſembling iron, but very light, are found in, or near the mouths of the eruption; and ſome are very hard and heavy, and of a mixed nature, ſeeming to be the reſult of many ſorts of minerals melted together. Theſe latter, when the mountains have poured out ſtreams of fire, always remain in the places, and are the ſubſtance that was on fire cobled again.

At the time of the moſt terrible eruptions of this kind, theſe heaps of Sciarri, which ſometimes appear to be ſolid rocks of metalline matter, are only a ſort of covered arches, under which the melted matter yet continues liquid and running, and burſts out, at times, in the ſeveral parts of their ſides or ſurfaces. The general appearance of a train of theſe Sciarri, left after the eruption of ſuch a rivulet of fire, is much like that of the Thames, or ſome other ſuch large river, in the time of a ſevere froſt, the rocks of Sciarri riſing above the general ſurface, like the clods of ice in that ſcene; the colour only differing, the great quantities of the Sciarri in theſe places being of a deep bluiſh hue.

It is remarkable, that the ſubſtance of theſe Sciarri, even while melted and running in ſtreams down the hill, is ſo firm and ſolid, that no weight will ſink into it, nor any inſtrument make its way through the ſurface, any more than a ſolid maſs of cold metal. It has been ſuppoſed by ſome, that the flowing matter concreted into the common pumice ſtone, but that is a vulgar error, the pumice being a wholly different ſubſtance. *Philoſ. Tranſ.* N°. 49.

SCIATHE'RICUM *Teleſcopium*, a horizontal dial with a teleſcope, adapted for obſerving the true time, both by day and night, to regulate and adjuſt pendulum-clocks, watches, and other time-keepers. It is the invention of the ingenious Mr. Molyneux, who has publiſhed a book with this title, containing an accurate deſcription of this inſtrument, its uſes and application.

SCI'LLA, *ſquills (Dict.)*— Although theſe roots are imported chiefly for medicinal uſe, yet are they worthy of being cultivated in every good garden, for the beauty of their flowers, which make a very handſome appearance, when they are ſtrong roots.

The beſt time to tranſplant theſe roots is in May, when their leaves are decayed: and, if their roots are brought from abroad, if they can be procured firm at the ſeaſon, or a little after, they ſhould be planted in pots of light ſandy earth, and placed in the windows of the green-houſe; where, if they are blowing roots, they will flower the July following.

Theſe plants muſt be preſerved in ſhelter during the winter-ſeaſon; becauſe, if their leaves are deſtroyed by froſt in winter, the roots are ſubject to periſh: but, in ſummer, they ſhould be expoſed to the open air, and in dry weather muſt be frequently watered; eſpecially during the ſeaſon their leaves are on, or that they are in flower: but, when the roots are in a ſtate of reſt, they ſhould have but little moiſture; for wet at that time will rot them. They are pretty hardy, and only require to be ſheltered from hard froſt; but muſt have as much free air as poſſible in open weather.

SCI'NCUS, *the ſkink*, in zoology, the name of a ſpecies of lizard, called alſo by ſome the land crocodile, crocodilus terreſtris, and well known in the druggiſts ſhops as an ingredient in ſeveral compoſitions.

It reſembles the ſmaller ſort of lizards, being uſually about ſix inches long, and its uſual thickneſs is that of a man's thumb. It is of a ſilvery greyiſh colour, ſcaly, and has a rounded tail; its head is of an oblong figure; its noſe ſharp; and its feet, as it were, alated, having five toes each, armed with very ſharp claws. It is very common in Egypt and Arabia. *Worm. Muſ.*

SCIRRHUS *hepatis*, in medicine, a diſeaſe conſiſting in an indurated tumor of the liver, occaſioned by a ſtagnation of the humours which grow thick there, from an exhalation of their more fluid and ſubtile parts.

This differs from the infarctus hepatis, not only in degree but in its ſymptoms, for it almoſt always is attended with a hectic, or with œdemato-hydropic ſwellings.

Signs of it. Theſe are a tumor and hardneſs in the right hypochondrium, or region of the liver, always evident to the patient, and often ſenſibly perceived by any body elſe, on touching the part. To this are to be added dull tenſive pains, and a ſenſe of weight hanging there, and uſually aſthmatic ſymptoms, and a dry cough. It becomes painful to lie on the left, or oppoſite ſide; and with theſe a hectic comes on, with a waſting of the upper parts, and ſwelling of the inferior ones; firſt of the feet, but afterwards upwards to the belly, which finally become very obſtinate and truly aſcitic. The urine in this caſe is ſmall in quantity, and of a deep orange colour, and thick conſiſtence. It has uſually a mucid ſediment, and ſometimes a thick one of a roſe colour.

Cauſes of it. Theſe are uſually either an omiſſion of artificial diſcharges of the blood, by habitual bleedings at ſpring and autumn, or a ſuppreſſion of the natural ones, by the menſes or hæmorrhoidal veſſels: an improper treatment of intermitting fevers with aſtringents, of quartans with large quantities of bark, and of acute fevers with too cooling a regimen, or a violent quantity of the volatile ſalts, or a condenſation of the humours in a ſimple infarction, by means of cold external applications. The ſtopping hæmorrhages, which nature had brought on for her relief in plethoras, have alſo been ſometimes known to occaſion a Scirrhus of the liver; as have alſo external injuries by blows, falls, and the like.

Prognoſtics. A recent Scirrhus of the liver admits of a cure, but this not without great difficulty, and in a more confirmed one there is very little hope. This tumor has a continual tendency to corruption, either by ſphacelation, or by an inflammatory ſuppuration; neither of which can happen ſucceſsfully, for the firſt muſt occaſion inſtantaneous death, and the latter exulceration, and a ſucceeding fatal hectic.

A Scirrhus of the liver often follows, and ſometimes precedes a jaundice of the moſt violent kind.

Method of treating it. The bowels are firſt to be cleanſed and relaxed by a clyſter, made of a decoction of mallows, camomile flowers, mullein, and fennel ſeed; after this, bleeding in the foot is to be ordered, and then the nitrous and other reſolvent medicines are to be given, ſuch as tartar of vitriol, and the like. After this medicated wines ſhould be drank as the common drink, prepared with bryony and arum roots, centaury, hyſſop, and maidhenhair leaves, ſaſſafras, ſenna, black hellebore, and rhubarb; and, externally, plaſters of the reſolvent and ſtrengthening kinds are to be applied. But, after all directions for the treatment, it is to be acknowledged, that an obdurate and inveterate Scirrhus admits of no remedy. *Junker's Conſp. Med.*

SCIU'RUS, *the ſquirrel*, in the Linnæan ſyſtem of zoology, makes a diſtinct genus of animals, the characters of which are: that the creatures have four toes on the fore-feet, and five on the hinder, with palms made for climbing and leaping, and all have woolly tails. *Linnæi Syſtem. Natur.*

We have five ſpecies of this little animal deſcribed to us. Firſt, the common Engliſh kind. Secondly, the great grey Virginia one. Thirdly, the black-backed kind of Ceylon. Fourthly, the American flying ſquirrel. And, fifthly the Barbary kind.

The common Engliſh ſquirrel is well known, and is diſtinguiſhed from the others by its ſize and colour. It is ſomething larger than the weaſel, but ſhorter-bodied; its back and ſides are reddiſh, its throat and belly white; and it generally carries its long hairy tail erect over its back, ſo that it ſerves it for a ſhade. It is common in our woods, and feeds on all ſorts of fruit, but principally on hazel nuts; which it gathers in the ſeaſon, and lays up for its winter ſtore. The ſame ſpecies of ſquirrels with ours is found in Poland and Ruſſia, grey or aſh-coloured.

The ſecond, or great grey American ſquirrel, is very common in Virginia, and is of the ſize of a rabbet. It is of a dark iron grey, ſuch as ſome rabbets are of; its fore feet have only four toes, its hinder ones five.

The third, or black-backed ſquirrel, is found in the iſland of Ceylon, and called by ſome rukkaia, from the noiſe it makes. The hair on its back is ſometimes grey.

The fourth, or flying ſquirrel, is a very ſmall kind; its back is of a duſky mouſe-coloured grey; its throat and belly white; its eyes ſmall, black, and prominent, reſembling thoſe of the mouſe kind; its tail is very long, and very broad and flat. It has a thin and lax ſkin on each ſide, which is fixed to the fore and hinder legs, and conſequently, on the extending its legs, this ſkin expands on each ſide like a ſort of a ſail: this it always does in leaping, and is by that means carried a great way; and hence has ariſen the opinion of its flying. It is very common in New Spain, and is ſometimes met with in the colder American countries. It very much approaches to the mouſe kind in many particulars, receding from the nature of the ſquirrel. Its fur is ſhort, like that of the rat or mouſe; not long, like the other ſquirrels. It never erects its tail on its back, nor turns, or twiſts it round, as the other ſquirrels do. It has a very beautiful black line on each ſide the face, near the eyes.

The fifth kind, or Barbary ſquirrel, is of a mixed colour, between black and reddiſh, and is very beautifully variegated all down the ſides with brown and white longitudinal ſtreaks, laid in a regular alternate order, and each reaching the whole length of the body. Theſe lines are, in ſome of theſe creatures, not brown and white, but black and white; and the tail, when in a ſtate reſt, is ſeen elegantly ſtreaked with the ſame colours, but when the creature erects it, the hairs ſtanding all upright, the beauty of this variegation is hid. The belly of this creature is blue and white. It is ſmaller than our ſquirrel, and has ſhorter ears, which are roundiſh, and lie cloſe on the head. The whole head has much of the figure of a frog's, in all other reſpects it is perfectly like our ſquirrel. *Ray's Synop. Quad.*

SCNIPS, in natural hiſtory, a name given by authors to the ſmall ſpecies of gnat, always found about the oak-tree feeding on the juices of its leaves, which it ſucks by means of its ſharp trunk.

SCOLO'PAX, in ichthyography, the name of a ſea-fiſh called in Engliſh the trumpet or bellows.

SCLA'REA, *clary*, in botany, a genus of plants, whoſe characters are:

It is a verticillate plant, with a labiated flower, conſiſting of one leaf, whoſe upper lip (or creſt) is hooked; but the under lip (or beard) is divided into three parts, the middle ſegment being hollow and bifid: out of the flower-cup riſes the pointal, attended by four embryoes, which afterwards turn to ſo many roundiſh ſeeds incloſed in an huſk, which was before the flower-cup.

SCOLOPEN'DRA, in zoology, an inſect of a very ſlender and long body, very ſmooth, and of a yellowiſh or reddiſh colour, furniſhed with a vaſt number of legs, and having two long antennæ, and a bifid tail.

It is uſed by ſome as a depilatory, being boiled in wine. *Dale's Pharmacop.*

There is a ſpecies of this animal, which naturally ſhines in the dark in the manner of a glow-worm, but with a fainter and more general light. Every part of the body of this animal will emit ſparks, if preſſed in the dark. It is covered with a ſoft down, or ſhort and fine hair, much reſembling in texture the downy matter which grows on the back of colt's-foot leaves. The two ſides of the animal are covered alſo with two other liſts or ſtripes; theſe go off from the main ſtripe at the top, and theſe are about a quarter of an inch broad; they are covered with a fine and ſoft hairineſs, of more than a quarter of an inch long, of a fine changeable-red and green colour, and of prodigious beauty and brightneſs. Among this long hair of the ſtripes on the ſides, there are ſet a vaſt number of long and ſharp prickles; they are about the ſame length with the hair, but they are as ſtiff as a hog's briſtle, and are very ſharp at the points, and of a black colour; there are ſeveral hundreds of theſe on the two ſides. The tail, or ſmaller end, terminates on the back in two ſcales, which are very bright and fine; under this is the anus, at which the creature voids its excrements. The larger end has no part in the common characters of a head except the mouth; but, as it has this, and ſtands oppoſite to the tail, it is properly enough called ſo in deſcription. It has no horns, no eyes, nor any other of the common organs of inſects heads.

The mouth is very wide, in proportion to the ſize of the creature, and is not placed at the extremity, but ſomewhat under the belly part; ſo that, when the back of the creature is viewed, the mouth is not ſeen. The belly is ſmooth and flat, and is covered with a thin ſkin, much paler-coloured than that of the back, and irregularly variegated with a number of brown ſpots, of different ſizes and ſhapes. Within an inch of the tail there are ſeen on this under part ſeveral marks, like thoſe of the annular diviſions of the bodies of inſects, but they do not ſhew themſelves on the back.

The legs are placed in two rows, each of the whole length of the body of the fiſh; they begin from the angle of the mouth on each ſide, and are continued to the tip of the tail.

Thoſe ſtanding near the mouth are longer than others, which gradually decreaſe till they are very ſhort at the tail; the longeſt are about a quarter of an inch in length, and the ſhorteſt not a ſixth of that length.

The whole number of legs is ſeventy-two, thirty-ſix ſtanding on each ſide. From within the body, through the middle of each leg, there paſſes a cluſter of three or four prickles; theſe are larger or ſmaller, according to the ſize of the leg, and vary alſo in number, the longeſt legs having moſt of them; they give ſtrength and firmneſs to the legs, ſerving them in the place of bones, and iſſuing out beyond the end of the leg, in the way of claws; they ſerve the creature for the laying faſt hold of any thing it pleaſes. On each ſide of the upper, or back part of the fiſh, there are alſo placed a number of ſoft, flat, and ſmooth fins; theſe ſtand near the legs, and are placed face to face in ſuch a manner, that each foot has its correſponding fin. The fins are exactly of the ſame number with the legs, and, like them, are largeſt towards the head, and go off gradually tapering towards the tail.

Theſe ſerve the creature in the office of a fiſh, giving it power to ſwim in the water, as the others ſerve it as a reptile to crawl upon the ground at the bottom. The fins on each ſide are fringed with the ſame changeable-coloured hair that the ſtripes on the back are.

On opening the body there appears a muſcular organiſation, elegantly contrived for working ſo great a number of legs and fins. This appears in form of one large and broad red muſcular congeries, and from this there are propagated on each ſide thirty-ſix pair of rays, or oblong and ſlender muſcles, every pair ſerving for the motion of one leg and one fin. Theſe are diſtinctly viſible, and repreſent the ſpine and ribs in ſome fiſh. And in this the wonderful care of nature is ſeen, in regard to this little animal, which, by means of theſe diſtinct muſcles, is able to move every ſingle leg or fin ſeparately, and conſequently can put as many, or as few as it pleaſes, in motion at a time. It is plain alſo, from the ſtructure of the body of this creature, that it can at pleaſure roll up its body into a round form, and in that caſe will appear as a globe covered with long and ſharp prickles: this is probably its practice, when in danger of being devoured, and may ſerve it on many occaſions. It has been thought by ſome that Rondeletius means this creature by his phyſalus; but this does not appear to be the caſe on a careful examination. *Philoſ. Tranſ.* N°. 225.

SCO'LYMUS, *the golden thiſtle*, in botany, a genus of plants, whoſe characters are:

The whole plant hath the appearance of a thiſtle: the flower conſiſts of many half-florets, which reſt on the embryoes; each of theſe are ſeparated by a thin leaf; and on the top of each embryo is faſtened a little leaf: theſe are contained in a ſcaly empalement, which incloſes the ſeed.

SCO'MBER, *the mackarel*, a well known ſea-fiſh of the thynnus kind, and diſtinguiſhed from the other fiſh of that genus by its extremely ſmall and thin ſcales; by its bluiſh green colour on the back, variegated with undulated and crooked black lines; by the forkedneſs of its tail, and the very ſubſtance of the fin of it, being almoſt entirely wanting at the angle of it; and by the largeneſs of its eye, in compariſon of the amia, and other fiſh of this kind, which moſt reſemble it in other reſpects. *Willughby's Hiſt. Piſc.*

SCONCE (*Dict.*) — Some Sconces are made regular, of four, five, or ſix baſtions; other are of ſmaller dimenſions, fit for paſſes, or rivers; and others for the field.—Such are,

Firſt, triangles with half baſtions; which may be all of equal ſides, or they may be ſomething unequal. However it be, divide the ſides of the triangle into three equal parts, one of theſe three parts will ſet off the capitals and the gorges; and the flanks, being at right angles with the ſides, make half of the gorge.—Secondly, ſquare, with half baſtions; whoſe ſides may be betwixt 100 and 200 feet, and let one third of the ſides ſet off the capital and the gorges, but the flank (which raiſe at right angles to the ſide) muſt be but one half of the gorge or capital, that is, on the ſixth part of the ſide of the ſquare.—Thirdly, ſquare with half baſtions and long.—Fourthly, long ſquares. Fifthly, ſtar redoubt of four points.—Sixthly, ſtar redoubt of five or ſix points.—Seventhly, plain redoubts, which are either ſmall, or great. The ſmall are fit for court of guards in the trenches, and may be ſquares of twenty feet to thirty. The middle ſorts of redoubts may have their ſides from thirty to fifty feet; the great ones from ſixty to eighty feet ſquare.

SCORBU'TUS, *the ſcurvy* (*Dict.*)— There are ſome who derive all diſeaſes from the ſcurvy, which indeed muſt be allowed to create, or mimic, moſt other maladies. Boerhaave tells us it produces pleuretic, cholic, nephritic, hepatic pains, various fevers, as hot, malignant, and intermitting; dyſenteries, faintings, anxieties, dropſies, conſumptions, convulſions, palſies, fluxes of blood; in a word, it may be ſaid to contain the ſeeds and origin of almoſt all diſtempers. A cachexy, or ill habit, is much of the ſame nature with the ſcurvy. It is ſuppoſed by phyſicians, that the immediate cauſe of the ſcurvy lies in the blood, the fibrous part of which is thick, and the ſerum too thin and ſharp; and that hence ariſes the great difficulty in the cure, becauſe, in the correcting of one part, regard muſt be had to the other. It is well known how extremely difficult it is to cure an inveterate ſcurvy; how many ſcorbutic patients have grown worſe by an injudicious courſe of evacuations; how many are even rendered incurable by the treatment of inconſiderate phyſicians; and how difficult, tedious, and uncertain the cure is, in the hands even of the beſt, who are obliged to uſe ſuch variety and change of medicines, in the different ſtages of that malady; which nevertheleſs may be cured, ſays the biſhop of Cloyne, by the ſole, regular, conſtant, copious uſe of tar-water. In the cure of the ſcurvy, the principal aim is to ſubdue the acrimony of the blood and juices; but as this acrimony proceeds from different cauſes, or even oppoſite, as acid and alkaline, what is good, in one ſort of ſcurvy, proves dangerous, or even mortal, in another. It is well known, that hot anti-ſcorbutics, where the juices of the body are alkaleſcent, increaſe the diſeaſe; and ſour fruits and vegetables produce the like effect in the ſcurvy cauſed by acid acrimony. Hence fatal blunders are committed by unwary practitioners, who, not diſtinguiſhing the nature of the diſeaſe, do frequently aggravate, inſtead of curing it. The biſhop ſays, if he may truſt what trials he has been able to make, this water is good in the ſeveral kinds of ſcurvy, whether acid, alkaline, or muriatic; and he believes it the only medicine that cures them all, without doing hurt in any. In a high degree of ſcurvy a mercurial ſalivation is looked on by many as the only cure; which, by the vehement ſhock it gives the whole frame, and the ſenſible ſecretion it produces, may be thought to be more adequate to ſuch an effect: but the diſorder, occaſioned by that violent proceſs, it is to be feared, may never be got over. The immediate danger, the frequent bad effects, the extreme trouble, and nice care attending ſuch a courſe, do very deſervedly make people afraid of it. And, though the ſenſible ſecretion therein be ſo great, yet in a longer tract of time the uſe of tar-water may produce as great a diſcharge of ſcorbutic ſalts by urine and perſpiration; the effect of which laſt, though not ſo ſenſible, may yet be greater than that of ſalivation; if it be true that inſenſible perſpiration is conſiderably more than all the reſt of the ſenſible ſecretions together.

SCO'RDIUM (*Dict.*)—This plant is propagated in our gardens for medicinal uſe; by parting the roots, or planting ſlips or cuttings in March, in beds of moiſt earth, at four or five inches diſtance, in July they will be in flower, and fit to cut for uſe. But every other year the bed ſhould be renewed, and that always on a freſh ſpot of ground, for they do not ſucceed well on the ſame. *Miller's Gard. Dict.*

SCO'RIA (*Dict.*)—Some authors call by this name that ſaline maſs, which is produced by melting ores and metals together with ſaline and reducing fluxes. But the word Scoria is not properly to be underſtood of all this maſs, but only of the vitrified particles which are lodged between, and adhere to the ſmall maſſes of the ſalts, and which may be ſeparated from them by water. *Cramer's Art of Aſſaying.*

SCORIFICA'TION, in metallurgy, is the art of reducing a body either entirely, or in part, into ſcoriæ.

It is uſed by metallurgiſts, in order that any metal, impriſoned in a ſolid body, may, on account of its weight deſcend and ſeparate itſelf therefrom; and, finally, if that be required, be itſelf wholly or in part converted into ſcoriæ.

All fixed bodies are ſubject to this alteration, not totally excepting even gold and ſilver. There are alſo, among the volatile bodies, ſome that may be fixed, and which aſſume the form of ſcoriæ, by adding fixed bodies to them.

It is often proper to make this Scorification in a veſſel that may abſorb the ſcoriæ, and retain only the metallic part of the maſs under trial. In this caſe the operation is called coppelling, and veſſels made of aſhes, called teſts and coppels, ſerve for this purpoſe. It is evident in theſe proceſſes, that a great attenuation of the ſcoriæ is neceſſary, that they may be able to paſs through the veſſel; nor is there any fitter body to promote this operation than lead, which, by its undergoing itſelf a like attenuation in the fire, diſpoſes other bodies to be reduced into a ſubtile ſcoriæ for the ſame attenuation.

SCO'RPION, in natural hiſtory, an inſect frequently found in the hot countries. The opinions of authors are very different as to the ſting of this creature, ſome aſſerting that there is an opening in it, through which a poiſonous liquor is thrown into the wound made by it, as is the caſe in the tooth of the viper, &c. and others affirming that there is no ſuch opening.

Galen affirms that there is none, but moſt of the writers of the middle ages aſſert that there is. But the whole is ſet in the cleareſt light by Signior Redi, who took the pains of examining microſcopically the ſtings of the Scorpions brought alive from Tunis, Egypt, and Italy. Theſe he nicely examined by the beſt glaſſes in the muſæum of the Great duke of Tuſcany, and could find no aperture: but, not ſatisfied with this, he preſſed the ſtings to try if he could make any liquor flow out of them; they were, however, ſo hard and horny, that ſqueeſing could have no effect on them; and, finally, he cauſed a Scorpion to ſtrike upon a plate of iron, but no liquid was found thereon; ſo that he began to conclude Galen's opinion right, when he accidentally diſcovered an exceedingly ſmall drop of white liquor upon the ſting, and this he afterwards found in all the trials he made with ſeveral Scorpions. And Mr. Lewenhock diſcoverd an opening on each ſide of the ſting of this creature, for the emiſſion of the poiſon, which he ſuppoſes is not diſcharged, till the ſting is buried in the wound. *Baker's Microſcope.*

Mr. de Maupertuis, having cauſed Scorpions to bite ſeveral animals, of which very few died, or ſuffered any more than the pain of the ſting, is of opinion, that oil of Scorpions and other vulgar antidotes to the poiſon of theſe animals have rather got their reputation from the innocence of the ſting of theſe creatures, than from any conſiderable virtue in the medicines. *Mem. de l'Acad. Scienc.* 1731.

Water SCORPION, *ſcorpio paluſtris*, a name given to a very remarkable ſpecies of water inſect. It is a very thin and light little creature, yet is but a very ſlow mover. Its head is very ſmall, and is hard to the touch, and of a paler brown than the reſt of the body; and this is terminated by a very fine and ſharp proboſcis, of the ſame colour and texture. The eyes are ſmall, but prominent, and very hard and black. The ſhoulders are broad and flat, they are of the ſame colour with the head, and are wrinkled on the ſurface. The triangular ſpot between the wings is black and ſhining, the body it of a bright red lead colour on the back, and of a faint duſky brown on the belly, and is compoſed of ſix joints, covered with a ſort of ſcales. The outer wings are very hard and firm, and lie very far over one another; they are opake, and of a dark muddy brown, without any variations: the inner wings are of a duſky white veined with a red-lead colour. The two fore-legs are broader and thicker than the reſt, and end in ſhort blunt claws; theſe the creature never walks with, but always uſes them as arms: the hinder pair are the longeſt, and both they and the middle ones end in a ſharp claw; they are all of a pale brown, and ſomewhat tranſparent. The tail is long and ſtraight; it is compoſed of two ſlender briſtles, of a pale brown; the creature ſcarce ever ſeparates theſe. It lives among the weeds in clear ſtanding waters, and is continually watching for its prey. It feeds on other inſects, and is particularly fond of the cicada aquatica, or worm of the great libella. It ſeizes its prey with the fore-legs, and holds it faſt in them, while the proboſcis pierces into the body, and ſucks the juices.

SCORPION *fly*, in natural hiſtory, a name given by Mouffet and other writers to a kind of fly, remarkable for carrying the end of its tail turned up in form of the Scorpion's ſting.

There are two very beautiful ſpecies of theſe. The one has ſilvery wings, variegated with three tranſverſe ſtreaks of black towards the ends; the head is black, and the breaſt, ſhoulders, and feet whitiſh; the reſt of the body is black. The tail, which repreſents a ſting, has five joints, three of which are red, and the others black; the end of the tail is alſo forked, and the forks black, turned up like the ſting of a Scorpion.

The other reſembles this in many reſpects, but the end of the tail is thicker, and the forks blunter; the head is dunniſh, the mouth long, and each wing variegated with ſix black ſpots, of a large ſize.

SCORPIU'RUS, *caterpillar*, in botany, a genus of plants, whoſe characters are:

It hath a papilionaceous flower, out of whoſe empalement riſes the pointal, which afterwards becomes a jointed pod, convoluted like a ſnail, or caterpillar, having a ſeed in each joint, which is, for the moſt part, of an oval figure.

SCORZONE'RA, *viper-graſs*, in botany, a genus of plants, the characters of which are:

It hath a ſemi-floſculous flower, conſiſting of many half florets, which reſt upon the embryoes, which are included in one common empalement, which is ſcaly: the embryoes afterwards become oblong ſeeds, which are furniſhed with down.

Theſe plants may be propagated by ſowing their ſeeds in the ſpring upon a ſpot of light freſh ſoil. The beſt method of ſowing them is, to draw ſhallow furrows by a line about a foot aſunder, into which you ſhould ſcatter the ſeeds, thinly covering them over about half an inch thick with the ſame light earth; and, when the plants are come up, they ſhould be thinned where they are too cloſe in the rows, leaving them at leaſt ſix inches aſunder; and, at the ſame time, you ſhould hoe down all the weeds to deſtroy them: and this muſt be repeated as often as is neceſſary; for, if the weeds are permitted to grow among the plants, they will draw them up weak, and prevent their growth.

SCRATCH, in the ſalt works, the name of a calcarious earthy or ſtony ſubſtance, which ſeparates from ſea-water in boiling it for ſalt.

This forms, in a few days, a thick cruſt on the ſides and bottoms of the pans, which they are forced to be at the pains of taking off once in a week or ten days, otherwiſe the pans burn away, and are deſtroyed. See SALT.

This is no other than the ſame ſubſtance which cruſts over the inſides of our tea-kettles, and is truly a ſpar, ſuſtained more or leſs in all water, and ſeparable from it by boiling. The ſhells of ſea-fiſh have great affinity in their ſubſtance and nature with this, both being powerful alkalies, and both eaſily calcining into lime.

The magneſia alba, ſo celebrated in Germany for its mild purgative and alkaline virtues, ſeems very nearly allied to this earth; and it is probable, according to Hoffman, that the purging virtues of many ſprings are owing to the quantities they contain of this ſubſtance.

SCRATCH *pans*, in the Engliſh ſalt-works, a name given to certain leaden pans, which are uſually made about a foot and half long, a foot broad, and three inches deep, and have a bow, or circular handle of iron, by which they may be drawn out with a hook, when the liquor in the pan is boiling. See SALT.

The uſe of theſe pans is to receive a calcarious earth, of the nature of that which incruſts our tea-kettles, which ſeparates from the water in boiling; this ſubſtance they call Scratch; and theſe pans, being placed at the corners of the ſalt pan, where the heat is leaſt violent, catch it, as it ſubſides there.

SCROBI'CULUM *cordis*, in anatomy, the pit of the ſtomach. See STOMACH, *Dict.*

SCROPHULA'RIA, *fig-wort*, in botany, the name of a genus of plants, whoſe characters are:

It hath an anomalous flower, conſiſting of one leaf, gaping on both ſides, and generally globular, cut, as it were, into two lips; under the upper one of which are two ſmall leaves: the pointal riſes out of the flower-cup, which afterwards turns to a fruit or huſk, with a roundiſh-pointed end, opening into two diviſions, parted into two cells by an intermediate partition, and full of ſmall ſeeds, which adhere to the placenta.

The root of Scrophularia is eſteemed externally as a remedy for the piles and the king's evil. It is generally made into an ointment for theſe purpoſes; but ſome give it alſo internally in diet drinks.

This root is of a very ſingular figure, by which it is eaſily diſtinguiſhed at ſight from all other medicinal roots. It is uſually of the thickneſs of a man's finger, or more, of an oblong figure, nearly as thick at the one end as the other, and full of protuberances on the ſurface, reſembling a kind of little kernels; and between there are a great many fibres, which ſtrike deep into the ground. The root itſelf has no great ſmell, but its taſte is ſomewhat acrid and diſagreeable.

SCU'LPTURE (*Dict.*)— To perform any thing in the way of Sculpture, they begin with making a model of earth, or wax.— For earthern models, they uſe but few inſtruments: their hands and fingers do almoſt the whole.— For waxen models, to a pound of wax they put half a pound of colophony; ſome add turpentine, melting the whole with oil of olive; ſome add a little vermilion, or other matter, to give it a colour. It is wrought and molded with the fingers, like earthern models.

For Sculpture in wood, which we properly call carving, the firſt thing required, is, to chuſe a wood proper for the particular kind of work.— If it be any thing large, and require a deal of ſtrength and ſolidity; the hardeſt and moſt durable wood is to be choſen, as oak, or cheſnut: for ſmaller works they uſe pear-tree and ſervice-tree. But, as theſe woods are very hard, for little delicate works, they uſe ſofter woods, only cloſe, and of a fine grain: ſuch is the linden-tree, which the chiſſel is found to cut more eaſily, and cleanly, than any other wood.

For large works, if it be only ſingle figures, it is better they conſiſt of ſeveral pieces, than of a ſingle one, by reaſon of the liableneſs of the latter to warp; for every large piece may probably not be dried to the heart, however it may appear without-ſide.— Obſerve, that the wood will not be fit for working, till after it have been cut at leaſt ten years.

SCULPTURE *in marble and ſtone.*— The firſt thing they do, is out of a great block of marble to ſaw another of the ſize required, which is performed with a ſmooth ſteel ſaw without teeth, caſting water and ſand thereon, from time to time: then they faſhion it, by taking off what is ſuperfluous with a ſtubbed point, and a heavy mallet; after this, bringing it near the meaſures required, they reduce it ſtill nearer with another finer point.— They now uſe a flat cutting inſtrument, having two notches in its edge, or three teeth; then a chiſſel to take off the ſcratches the former has left.— This laſt inſtrument they uſe with a deal of delicacy, giving thereby a ſoftneſs and tenderneſs to their figure; till, at length, taking raſps of different degrees of fineneſs, by degrees they bring their work into a condition for poliſhing.— To poliſh, or make the parts ſmooth and ſleek, they uſe pumice-ſtone and ſmalt; then tripoli, and when a ſtill greater luſtre is required, a ſkin and burnt ſtraw.

When any conſiderable work is undertaken, as a ſtatue, baſſo relievo, or the like, they always make a model, beforehand, of clay; but as this ſhrinks in drying, and eaſily cracks and breaks, they only uſe it to make a mould of plaiſter, or ſtucco, wherein they make a figure of the ſame matter, which ſerves them thenceforth for a model, and by which they adjuſt all their meaſures and proportions.

To proceed the more regularly; on the head of the model, they place an immoveable circle, divided into degrees, with a moveable ruler, or index faſtened in the center of the circle, and divided likewiſe into equal parts. From the end of the ruler hangs a thread with a plummet, which ſerves to take all the points to be transferred thence to the block of marble, from whoſe top hangs another plummet like that of the model.— See *Plate* XLII. *fig.* 6.

SCU'RVY-*graſs*, *cochlearia*, in medicine, is a powerful attenuant and reſolvent; and on that principle is an excellent medicine in all diſeaſes ariſing from a viſcid ſtate of the fluids, and particularly in the Scurvy. The beſt way of taking it, is to eat the whole herb by way of ſallad.

The Scurvy, however, is a diſeaſe ſo various, that the ſame medicine cannot be good for all the kinds. Accordingly Scurvy-graſs proves hurtful, where the Scurvy is attended with a redneſs in the face, palpitations of the heart, frequent feveriſh heats, head-achs, purgings, and the like; in all which, acrid medicines of any kind do harm.

SCUTELLA'RIA, *ſcull-cap*, in botany, the name of a genus of plants, whoſe characters are:

The empalement of the flower is of the lip-kind; the upper ſegment reſembling an helmet, and is divided into three ſegments; the middle being broad and concave; but the other two are narrow and plain: the beard, or lower lip, is divided into two equal ſegments: the calyx, having a cover, contains a fruit reſembling the heel of a ſlipper or ſhoe: which character is ſufficient to diſtinguiſh it from all the other genera of this claſs.

SCU'TUM, in natural hiſtory, the name of a genus ſea-ſhells, the characters of which are: that it is a ſhell of an irregular figure, which on the lower part repreſents, in ſome meaſure, a ſhield; on the ſurface it has the ſhape of a five-leaved flower; its mouth is in the middle of the baſe, and the aperture for the anus at the edge.

SCY'TALA *.— The Lacedæmonians invented a ſecret method of writing by means of the Scytala, which was a wooden roll. Two of theſe were made of an equal length and thickneſs; one the ephori, principal magiſtrates of Sparta, kept at home, the other was given to their general who marched to fight their battles. When theſe magiſtrates had a mind to ſend him ſecret orders, they took a long narrow ſlip of parchment, which they rolled exactly round the Scytala they kept for themſelves; on this they wrote their intentions, and what they wrote, while the parchment was applied on the Scytala, contained a complete and connected meaning; but, when it was taken off, the writing was disjoined, and the connection of the words ſeparated in ſuch a manner, that no body could underſtand the meaning, but the general, by applying the parchment on the fellow Scytala which he had in his poſſeſſion.

* The word is Greek σκυτάλη, a ſtaff.

SCY'THIAN, a word uſed very often in the old Greek writers on the Materia Medica, to diſtinguiſh the peculiar ſort of gum, or other drug, brought from that place. The Scythian and Indian drugs have been by many ſuppoſed different kinds of the ſame medicine; but this is an error, for it appears very obvious, on comparing the writings of Galen, Aëtius, Ægineta, and other of the later writers among the Greeks, with thoſe of Dioſcorides, Theophraſtus, and the other old ones, that the words Scythian and Indian mean the ſame thing, and that what the old writers have called Indian, theſe have called Scythian.

The meaning of this is, that thoſe things were called Scythian, which were brought from the country of Indo-Scythia, or that part of Scythia which lay at the coaſts of the river Indus: but it is to be obſerved, that though the later Greek writers mean this by their term Scythian, yet the word is uſed in a very different ſenſe by the Arabians, Avicenna, Serapio, and others; and that, wherever they mention a drug under the name of Scythian, they mean that it comes from the northern parts of Scythia, on the confines of Europe. Theſe authors having underſtood, of this Scythia, what the Greek writers have ſaid of the other, have made no ſmall errors in regard to the hiſtory of drugs, having given bdellium, and many other gums, the produce of only the Scythia of the Greek medical writers, to the frozen Scythia beforementioned.

SEA (*Dict.*)—The ſea differs in ſaltneſs in different parts; it is, in general, obſerved, that in the hotteſt climates the water is ſalteſt.

When ſalt water freezes, it hath been thought to let fall all its ſalt; the ice of Sea water, and the water melted from it, taſting freſh, and being good for boiling meat and peaſe in. Captain Middleton, being in Hudſon's Streights in July 1738, took ice from under the ſurface of the Sea, which he melted till he got forty quarts of water; theſe he evaporated to dryneſs, and out of that quantity had only ſix ounces of ſalt, or about $\frac{1}{113}$. *Phil. Tranſ.* N°. 461.

General motion of the SEA. Mr. Daſſie of Paris, in a work publiſhed about ſixty years ago, has been at great pains to prove that the Sea has a general motion, independent of winds and tides, and of more conſequence in navigation than is uſually ſuppoſed. He affirms that this motion is from eaſt to weſt, inclining towards the north, when the ſun has paſſed the equinoctial northward, and that during the time the ſun is in the northern ſigns; but the contrary way, after the ſun has paſſed the ſaid equinoctial ſouthward; adding, that, when this general motion is changed, the diurnal flux is changed alſo: whence it happens, that in ſeveral places the tides come in during one part of the year, and go out during the other; as on the coaſts of Norway, in the Indies, at Goa, Cochinchina, &c. where, while the ſun is in the ſummer ſigns, the Sea runs to the ſhore; when in the winter ſigns, from it. On the moſt ſouthern coaſts of Tonquin and China, for the ſix ſummer months, the diurnal courſe runs from the north with the ocean; but, the ſun having repaſſed the line toward the ſouth, the courſe declines alſo ſouthward. *Philoſ. Tranſact.* N°. 135.

Baſon of the SEA, *fundus maris*, a term uſed by geographers, and other writers, to expreſs the bottom of the Sea in general.

Our honourable Mr. Boyle is the firſt who has written any thing on that part of the globe, and he has given us a treatiſe expreſsly upon it; but this only gives an account of its irregularities, and unequal depths, and is founded on the obſervations communicated to him by mariners, and people of too little curioſity to be depended upon for great diſcoveries.

The ingenious Count Marſigli has, ſince his time, given us a much fuller account of this part of the globe, in a great part from his own experiments in many places, particularly along the coaſts of Provence and Languedoc.

The entire baſon of the Sea is of ſuch immenſe extent, and covered in many places with ſuch an unfathomable depth of water, that it is not to be expected that it can be traced in every part; but as the whole may be gueſſed at, from ſome part of it, and as its general figure is of no conſequence in a ſearch of this kind, the obſervations of this curious author are of great value, in forming a judgment of the whole.

The materials, which compoſe the bottom of the Sea, may very rationally be ſuppoſed, in ſome degree, to influence the taſte of its waters; and Marſigli has made many experiments to prove, that foſſil coal, and other bituminous ſubſtances, which are found in plenty at the bottom of the Sea, may communicate in great part its bitterneſs to it. We are not, however, to judge haſtily, that there are not ſo many beds of theſe at the bottom of the Sea, as would be neceſſary for ſuch a purpoſe, or to judge too haſtily againſt the exiſtence of any other ſubſtances there, becauſe we do not find proofs of them by the plummet, which in ſounding brings up other ſubſtances, and not theſe; for the true bottom of the Sea is very often covered and obſcured from us by another accidental bottom, formed of various ſubſtances mingled together, and often covering it to a conſiderable depth.

The entire gulf of Lyons, ſituated between Cape Quiez in Rouſillon, and Cape Croiſit in Provence, forms a bank above the ſurface of the water at the ſhore, of the exact and perfect figure of an arch; and within this there is formed another ſuch arch, making the bottom of the Sea in that place for a very great way from ſhore, which is of different depths in various places, but uſually between ſixty and ſeventy fathoms.

It is a general rule among ſailors, and is found to hold true in a great many inſtances, that the more the ſhores of any place are ſteep and high, forming perpendicular cliffs, the more deep the Sea is below; and that, on the contrary, level ſhores denote ſhallow Seas. Thus the deepeſt part of the Mediterranean is generally allowed to be under the height of Malta. The obſervation of the ſtrata of earth, and other foſſils, on and near the ſhores, may ſerve to form a very good judgment, as to the materials which are found in its bottom. The veins of ſalt and of bitumen doubtleſs run on the ſame, and in the ſame order in which we ſee them at land; and the ſtrata of rocks, that ſerve to ſupport the earth of hills and elevated places on ſhore, ſerve alſo, in the ſame continued chain, to ſupport the immenſe quantity of water in the baſon of the Sea. It is probable alſo that the veins of metals, and of other mineral ſubſtances, which are found in the neighbouring earth, are in the ſame manner continued into the depths of the Sea. The particles of metals, in this caſe, are probably carried off into deep water, and ſunk among the ſofter matter of the bottom; but ſome of the lighter minerals ſeem to have given colour to thoſe beautiful cruſts, which are found upon many Sea plants, and which loſe their luſtre in the drying. The ſubterranean rivers, and currents of water, make great changes in what would be the natural ſurface of the bottom of the Sea, where they ariſe, each having a peculiar baſon of its own. We are informed by numerous inſtances of ſubterranean currents, and, as we ſee them break out in rivers on the ſurface of the earth in ſome parts, ſo in others we may be well aſſured thrt they break up the bottom of the Sea, and empty their freſh waters into the ſalt maſs.

In this caſe, the ruſhing up continually of ſuch a body of water makes a roundiſh cavity, and its running ſome one way lengthens and carries on that cavity, till, by degrees it is loſt, as the freſh water by degrees becomes blended with the ſalt. Thus every river, that ariſes in the bottom of the Sea, alters the form of its ſurface, and makes a baſon for itſelf, in which it runs a conſiderable way. Many Seas near the ſhore, and when the water is tolerably clear, ſhew the traces of theſe currents to the naked eye from the ſurface, and the water taken up from them is found more or leſs freſh. The coral fiſheries have given us occaſion to obſerve, that there are many, and thoſe very large, caverns or hollows in the bottom of the Sea, eſpecially when it is rocky; and that the like caverns are ſometimes found in the perpendicular rocks, which form the ſteep ſides of thoſe fiſheries. Theſe caverns are often of great depths, as well as extent, and have ſometimes wide mouths, equal to their largeſt diameter in any part, but ſometimes they have only narrow entrances into large and ſpacious hollows. It is the common opinion of the people about the place, that theſe caverns are prepared by nature for the circulating of the Sea water; but that operation, however neceſſary, may be performed as well without, as with theſe caverns, and they ſeem in reality to be only accidental.

We daily meet with immenſe hollows and caverns, naturally made in rocky mountains; and as this part of the bottom of the Sea is almoſt all rock, and its ſides of the ſame nature, it is no wonder that the ſame accidents ſhould happen, and like hollows be found, though with no particular intent of providence in their uſe. Nay there is this farther reaſon to expect them in the rocks buried under the Sea than in thoſe in hills, that the latter are in a ſtate of reſt and quiet, whereas the former are in continual reach of water, which will inſinuate itſelf into every crack or crevice nature has left in them, and may be eaſily ſuppoſed to have burrowed its way in a ſmall hole made by nature, till it has formed of it a very large one.

It ſeems plain from the whole, that the baſon of the Sea was at the creation, or at its ſecond formation after the univerſal deluge, covered with, or compoſed of the ſame ſubſtances, as the ſurface of the reſt of the earth is, that is, of rocks, clay, and ſand, and other ſuch ſubſtances. The common obſervations of ſeamen ſeem indeed to make againſt this opinion, but they may be eaſily ſolved, ſo as not to overthrow it. The plummet which they let down in ſounding, uſually brings up with it a matter compoſed of mud, tartarous incruſtations, or of dead weeds and broken ſhells, or numbers of various bodies of this kind, cemented together into a firm maſs by ſome ſparry or tartarous matter, depoſited from among the water, and agglutinating them together: theſe form an artificial bottom, covering the natural one; but it is eaſy to ſee, that ſuch a cruſt or coat as this muſt needs have been formed over the true bottom, in places where numbers of animals and vegetables are produced, and decay again, and where the waters being at reſt have time to depoſit their ſtony matter, in the ſame manner as the waters of ſeveral of our petrifying, or rather incruſtating ſprings do. And that theſe decayed ſubſtances, and this ſtony matter, falling to the bottom together, and there lying undiſturbed, muſt neceſſarily have formed juſt ſuch a cruſt as is found; and the natural bottom of the Sea, whether of ſtone, of ſand, or of clay, muſt be covered by ſuch accidental concretions, and that probably to ſuch a depth, that it is not eaſy now to break through it. There are places however where, by ſome accidents, this ſort of adventitious cruſt either has never been formed, or elſe has been removed. In theſe places we find the natural bottom, as deſcribed, that is, of the ſame nature with the ſtrata in the body of the earth. The ſimile the Count Marſigli has made, between the baſon of the Sea and a caſk of wine, is very expreſſive and juſt. When wine has been a long time kept in a caſk, the whole internal ſurface of that caſk is ſo covered and incruſtated over with tartar, that it ſeems within to be really compoſed of it; yet, as we know that this caſk is of wood, we are very certain that the true inner ſurface of it is of the ſame texture and nature with the tree from which it was cut, though we cannot get off the accidental ſurface formed by the liquor kept in it, and wholly covering it.

We very frequently meet with fine and pure ſand at the bottom of the Sea, and in theſe places are apt to believe that we certainly have the true and original bottom, but this is rather to be looked on as a probability than a certainty; and, where the ſand is more than ordinarily fine, there is always reaſon to ſuſpect that the courſe of ſome ſubterranean river has brought it there, by opening into the Sea in this part; and that this is one of thoſe particular baſons, which theſe rivers form to themſelves within the baſon of the Sea, and which continue only to a ſmall diſtance from their ſource.

The bottom of the Sea is covered with a variety of matters, ſuch as could not be imagined by any but thoſe who have examined into it, eſpecially in deep water, where the ſurface only is diſturbed by tides and ſtorms, the lower part, and conſequently its bed at the bottom, remaining for ages perhaps undiſturbed. The ſoundings, when the plummet firſt touches ground on approaching the ſhores, gives ſome idea of this. The bottom of the plummet is hollowed, and in that hollow there is placed a lump of tallow; this, being at the bottom of the lead, is what firſt touches ground, and the ſoft nature of this fat receives into it ſome part of thoſe ſubſtances, which it meets with at the bottom: this matter, thus brought up, is ſometimes pure ſand, ſometimes a ſort of ſand made of the fragments of ſhells, beat to a ſort of powder; ſometimes it is made of a like powder of the ſeveral ſorts of corals, and ſometimes it is compoſed of fragments of rocks: but beſides theſe appearances, which are natural enough, and are what might very well be expected, it brings up ſubſtances which are of the moſt beautiful colours. Things of as fine a ſcarlet, vermilion, purple, &c. as the fineſt paint could make them, and as yellow as a ſolution of gamboge, are common; and ſometimes, though not ſo frequently, the matter brought up is blue, green, or of a pure ſnowy whiteneſs. Theſe coloured matters ſometimes ſeem to have made up the whole bottom or maſs of the ſurface, but more uſually they have been formed upon other things, as upon the mud, or upon larger pieces of ſhells, corals, and the like, in the manner of tartarous cruſts, and thoſe in ſome degree reſembling the cruſtaceous coats of ſome of the Sea plants. The colours of theſe ſubſtances are not merely ſuperficial and tranſient, but many of them are ſo real and permanent, that they may be received into white wax melted, and poured upon them, or kept in fuſion about them; and, when thus examined, they ſeem as if a proper care might make them of great value, as paints of the finer kinds, where little is to be uſed.

The ſame coloured matters that thus coat the ſubſtances, found at the bottom of the Sea in theſe places, are alſo ſometimes found extended over the ſurface of Sea plants of the harder kind, which grow in deep water. They are always, in this caſe, in a ſort of liquid form, being lodged within, or embodied among a ſort of jelly or glue of a tranſparent ſubſtance, which in theſe caſes perfectly coats over the whole plant. In this ſtate it gives the naturaliſt, who is preſent at the fiſhing up his treaſures, a tranſient proſpect of a very elegant kind; but this vaniſhes, while he admires it. A piece of coral, or other hard Sea plant, thus coated over, appears, as it riſes to the ſurface of the water, of a delicate green, blue, or purple; but, when taken above water, it is found that this fine colour is only in the coat of glue or jelly which covers the plant: as ſoon as this is wiped off, the colour is carried away with it, and the coral ſhews its own native tinge; and it is to no purpoſe to attempt the preſerving it, by ſuffering this glue to dry upon the plant, for the colour flies away by degrees, as the moiſture evaporates; and the coral or plant, whatever it be, is only ſo much the leſs beautiful, than it naturally would have been, as it is covered with a dry yellowiſh dirty looking horny matter. Theſe are beauties in the ſubmarine plants, therefore, which can be only ſeen by thoſe who venture out, in order to take them up.

The ſmall quantities of theſe elegant colours, which we thus find ſpread over the ſurfaces of plants and other bodies, as we approach deep water, may give a rational idea of what we ſhould find, were we able to examine the bottoms of the Sea in its deep and unfathomable receſſes. It is eaſy to conceive, that in theſe places we ſhould find great quantities of the moſt beautiful ſubſtances. *Marſigli*, *Hiſt. Phyſ. de la Mer.*

Dead Sea. Dr. Perry made ſeveral experiments on the water of the dead Sea, in order to find what particles it contained. Upon infuſing ſome ſcrapings of galls in it, it becomes of a bright purple colour, but that not till it has ſtood a conſiderable time. On adding oil of tartar per deliquium to it, it becomes turgid, and looks as if globules of fat were fluctuating in it; this unctuous matter, upon its long ſtanding in repoſe, comes together in form of a ſediment at the bottom. On pouring ſpirit of vitriol into it, it depoſits a milk-white greaſy ſediment, which, after ſtanding twelve hours, occupies about one fifth part of the liquor. On putting a ſmall quantity of ſaccharum ſaturni to it, it depoſits a ſmall quantity of a greyiſh powder. Being ſeverally and ſeparately mixed with a ſolution of ſublimate, with ſpirit of ſal armoniac, and with ſugar of violets, it neither ferments, nor depoſits any ſediment, nor changes colour, except with the ſugar of violets, with which it becomes green. It is highly ſaturated with ſalt, ſo that it is to common water in ſpecific gravity, as five to four; and it has ſo acrid and ſtyptic a taſte, that, on being held in the mouth, it conſtringes it in the manner of alum.

From all theſe experiments it appears, that this water is impregnated with a ſort of an acrid and alkaline nature, and a matter partly of a ſulphureous, partly of a bituminous nature. *Phil. Tranſ.* N°. 462.

Sea *adder*, an Engliſh name for a Sea fiſh of the acus kind, called by Willughby the acus lumbriciformis.

It is a ſmall fiſh of a cylindric ſhape, without ſcales, and of a greeniſh brown colour, with ſome admixture of a reddiſh yellow. The ſnout is long and hollow, and the mouth opens upwards at its end. The eyes are ſmall, and their iris red. The gills are four on each ſide, but are covered by a membrane, and the whole body divided into rings like the common earth-worm. It is uſually about three or four inches long, and of the thickneſs of a gooſe quill. It has but one fin, which is ſituated on the back. The anus is much nearer the head than the tail, and under the ſnout there is always a fleſhy tubercle. The fiſh is common on the coaſt of Cornwall. *Willughby*, *Hiſt. Piſc.*

Sea *breaches*, a term uſed by the farmers to expreſs the overflowing of their low lands near the Sea by the Sea water.

Sea ſalt, moderately uſed, is a great improvement to all lands, but too much of it kills all ſorts of vegetables, except ſuch as nature has intended to live among it. The Sea, breaking in upon lands thus, injures them greatly. The owner is to ſtop the breach by which it entered with all poſſible diligence, and then trenches and drains muſt be cut through all parts of the land, to carry the ſalt water into ſome one low place, from which it may be emptied by means of an engine; or, if it be ſmall in quantity, it may be laded out by hand over the bank; or, if yet leſs, the ſun and winds may dry it away: but, in either caſe, the place where it was ſuffered to reſt muſt be covered with a large quantity of freſh earth, to take off from the too great ſaltneſs of the other; and the whole land ſhould be plowed for three or four years, to let in the rains and air to freſhen it. *Mortimer's Huſb.*

Sea *bream*, in ichthyology, the Engliſh name for the fiſh called by the generality of authors the pagrus and phagrus. According to the new ſyſtem of Artedi, it is a ſpecies of the ſpari, and is diſtinguiſhed by the name of the red ſparus with the ſkin carried into a ſinus at the roots of the back fins, and the pinna ani.

Sea *cow*, the Engliſh name of the manati, a ſpecies of fiſh ſo different from all the other of the cetaceous tribe, to which it properly belongs, that Artedi, in his new ſyſtem of ichthyology, allots it a peculiar generical name, which is thricechus.

Sea *fox*, an Engliſh name for a fiſh of the ſqualus kind, called alſo the Sea ape; both names being given on occaſion of the length of its tail in proportion to the body.

Sea *plants*. Count Marſigli, who was at indefatigable pains in collecting the various Sea plants of ſeveral places, divides all thoſe productions into three claſſes.

The firſt claſs contains the ſoft, or herbaceous ones; the ſecond, the ligneous ones, or ſuch as are of a woody hardneſs; and the third, thoſe which are of the hardneſs of ſtone. Of the firſt claſs are the algas, called Sea wrecks, the fucuſes, or Sea oaks, the Sea moſſes, or confervas, and the different ſpecies of ſpunges.

Of the ſecond kind are thoſe called lythophyta by the ancients, as if their hardneſs approached to that of ſtone. All theſe conſiſt of two ſubſtances, a cortical and an internal: the cortical part, while in the Sea, is ſoft, but, in drying, it becomes as hard as chalk, or thereabouts, eaſily crumbling to pieces between the fingers; this is what deceived the ancients into an opinion of its being of a ſtony nature. The internal ſubſtance, properly ſpeaking, ſeems more of the nature of horn than of wood: if it is burnt, it throws out a ſpume or froth, like that which horns or feathers of animals yield in the fire, and their ſmell in burning is of the ſame kind. The branches of theſe plants are very pliable, bending in the manner of whale-bone, and they give the ſame reſiſtance to a knife in the cutting.

The ſtony plants, which ſhould properly be called the lythophyta, but which never are called ſo, are the ſeveral ſpecies of coral, madrepora, and the like. The madrepora differs from the coral, in having its ſurface pierced with almoſt innumerable holes.

The algas are the only Sea plants which have any roots, properly ſo called; theſe therefore grow out of the ſoft bottom of the Sea, as other plants out of the earth, but all the other Sea plants, without exception, appear fixed upon hard and ſolid bodies, incapable of affording them any nouriſhment; ſuch as ſtones, ſhells, pieces of iron, of wood, &c. and ſometimes on other plants; and they are not faſtened to theſe ſubſtances by fibres paſſing into, or ſurrounding them, but merely by a foot or pediment, capable of only fixing them down, not of drawing nouriſhment from the ſubſtances, were there any there. From this obſervation the author concludes, that all the plants which have no roots may be properly ſaid to be all root, or to perform the office of roots in their whole ſubſtance,

ſtance, or that they take in nouriſhment in every part by certain pores, which in many are viſible, and cover the whole ſurface.

This manner of receiving nouriſhment, he alſo obſerves, very well ſuits their condition, ſince they are always ſurrounded on all ſides, with that water by which they are to be nouriſhed; whereas the plants, which grow at land, have only a part of them buried in the earth, from whence they are to be ſupplied with the proper juices. The roots of land plants, therefore, have only the neceſſary organs for receiving ſupplies, whereas the Sea plants he finds to be all over covered with ſmall glandules, whoſe office it is to receive and to convey, into the internal parts of the plant, the proper juices for its nouriſhment, and theſe he obſerves are, in general, of a glutinous and milky nature. The great difference between the land and Sea plants is ſeen in this familiar inſtance; a land plant will remain freſh for a long time, in all its parts, on one end of the ſtalk only being plunged in water; but a Sea plant, if part of it be out of water and part in, will always be freſh and vigorous in that part which is under water, while the part that is dry will wither and decay. It is eaſy hence to ſee, that the ſeveral parts of the land plants have connections with, and dependences, on one another; whereas, in the Sea plants, every part takes in its own nouriſhment, and lives and flouriſhes wholly independent of the reſt. After having gone through this general ſyſtem, the author deſcends to ſeveral remarkable particulars. He mentions an inſtance of a fucus, whoſe ſtalk, when in its growing ſtate, is a quarter of an inch in diameter, yet in drying ſhrinks up ſo much, as to be no thicker than a ſingle thread. Another ſpecies, called by the fiſhermen the Sea orange, from its reſemblance to an orange in ſhape, he obſerves, is properly a fucus; it has neither ſtalk nor branches, but conſiſts wholly of this globular body; it is not a ſolid ſubſtance, but a membrane of about one-ninth of an inch in thickneſs, regularly diſtended into this ſhape, by being filled with Sea water. All over the ſides of this cavity there are fixed ſlender filaments, which traverſe the whole, and probably receive nouriſhment from the water contained in the cavity, and diſtribute it to the ſeveral parts of the ſides where they are inſerted.

Another Sea plant, this author mentions, only appears in the ſhape of a bark; it affixes itſelf to the branches of the lythophyta, when they have loſt their natural bark, and ſometimes, in the ſame manner, coats and cruſts over the ſurfaces of ſtones. When it is freſh, it is of a lively red, of the conſiſtence of a muſhroom, and about the thickneſs of the back of a common knife, and its external ſurface is full of ſmall prominences, which contain a glutinous juice; round about theſe alſo there ſtand ſeveral yellow tubercles, which, with the red of the ground of the plant, make upon the whole a very beautiful appearance. Its under ſurface is perfectly ſmooth and gloſſy. This ſeems a much more remarkable plant, as to the manner of its vegetation, than thoſe which grow on other plants at land.

The ſame author obſerves, that ſeveral of the ſpunges, when taken out of the Sea, have a motion of the nature of a ſyſtole and diaſtole, which laſts as long as there remains any of the Sea water in their cavities. Some of the Sea plants, which while growing are as ſoft as the fucuſes, yet when dried are as eaſily rubbed to powder between the fingers, as the bark of the lithophytons. There is one of the lithophytons, which carries ſo large a quantity of branches, that they make the reſemblance of leaves; but, as theſe leaf-like branches are all truly of the ſame nature with the reſt of the plant, this is no exception to the general rule, that the lithophyta have no leaves. One of the ſpecies of lithophyton is naturally deſtitute of a bark, and is covered in the place of one with a glutinous ſubſtance, of the nature of varniſh; this is moſt abundant at the foot. The whole plant is full of prickles, and theſe appear the moſt plainly on the ſummits of the branches, where this glutinous varniſh is more thinly ſpread. On this part of the plant, alſo, there appear certain globules of a glutinous matter, when it is taken out of the water, which, when it is again plunged into it, ſpread themſelves over the whole ſurface of the branches.

The madreporæ grow in the ſame places with the coral; they often hang pendulous from the hollow rocks, and often grow erect on the flat ones. They uſually change colour, when taken out of the water, and are of very different kinds, and different degrees of hardneſs; many of them are as hard as common ſtones, and many others are ſo brittle, that it is ſcarce poſſible to touch them without breaking their branches.

The flowers of the thorny and naked lithophyton appear to be wholly like thoſe of coral, and like them they are not found to contain any ſolid ſeed. *Mem. de l'Acad. Par.* 1710.

SEA-*ſickneſs* is ſaid to be prevented by drinking Sea-water mixed with wine.

SEA-*ſwallow*, the name of a bird of the larus, or gull kind, called by authors ſterna, and common on our coaſts. See the article STERNA.

SEA-*turtle-dove*, in zoology, the name by which we commonly call the little diver, called by Mr. Ray columba Greenlandica.

It very much reſembles the coulterneb or anas arctica of Cluſius, only it is much ſmaller, and its legs are red, and it has no hinder toe. Its beak is long, not compreſſed or flatted ſideways, as in that bird, and a little crooked and ſharp at the end. It has a large white ſpot on each ſide of the fore-part of its head, and, excepting that, it is all over black. *Ray's Ornithology.*

SEAL (*Dict.*)— The king's great Seal is that whereby all patents, commiſſions, warrants, &c. coming from the king, are ſealed. The keeping hereof is in the hands of the lord high chancellor, who is hence alſo denominated lord-keeper. —Indeed, there is ſome difference between the lord-chancellor and lord-keeper; not in office, but in the manner of creation, the latter being made by the delivery of the great Seal to him by the king, but the former having likewiſe a patent.

The king's privy Seal, is a Seal uſually firſt ſet to grants that are to paſs the great Seal.

The uſe of Seals is very ancient: in Daniel, chap. xiii, we read that Cyrus ſet his Seal on the temple of Bel: but Seals are ſtill older; for Jezebel, in 1 Kings, chap. xxi, ſeals the orders ſhe ſent for Naboth's death with the king's ring.— In effect, as the ancient Seals were all engraven on the collets, ſtones, &c. of rings, and as the original uſe of rings, it is aſſerted, was only to be in a readineſs for the ſealing of acts, inſtruments, &c. Seals ſhould be as ancient as rings themſelves.

Theſe ſealing-rings, called annuli ſignatorii, ſigillares, cirographi or cerographi, it is ſaid in ancient authors, were firſt invented by the Lacedæmonians, who, not content to ſhut their cheſts, armories, &c. with keys, added Seals to them: and to this end, at firſt, made uſe of worm-eaten wood, the impreſſions whereof they took on wax, or ſoft earth: but they at length found the art of engraving figures, or rings, the impreſſions of which they took in the ſame manner.— This, however, muſt be granted, that, even in Moſes's time, the art was known of engraving, not only on metals, but alſo on precious ſtones.

Indeed, it does not appear that the ring had any other uſe among the primitive Jews beſides ornament: but at length it was uſed to Seal inſtruments, contracts, diplomas, letters, &c. inſtances whereof we have in the third book of Kings, xxi. 8. Eſther viii. 10. Xenophon. Hellen. lib. I. Quint. Curt. lib. vi. Juſt. lib. xliii. cap. iii. where we learn, the keeping of the emperor's Seal was become a particular office. — Lucian adds, that Alexander gave his to Perdiccas, thereby appointing him his ſucceſſor.

Pliny obſerves, that in his time there were no Seals uſed any where but in the Roman empire: at Rome, he tells us, they were become of abſolute neceſſity, inſomuch that a teſtament was null without the teſtator's Seal, and the Seals of ſeven witneſſes: but it does not appear that the Romans had any ſuch things as public Seals; nor that their edicts, and contracts, were ſealed, not even in the times of the emperors.

In France, the cuſtom anciently was, inſtead of ſigning their inſtruments, &c. only to Seal them; as appears from an infinity of ancient charters, which are not ſigned at all: the reaſon whereof was, that in thoſe days very few people were then able to write; no body could read and write but clerks.

In England, the firſt ſealed charter we find extant, is that of Edward the Confeſſor, upon his founding of Weſtminſter-abbey: yet, we read of Seals in the MS. hiſtory of king Offa.

Before the time of William the Conqueror, the Engliſh did not Seal with wax, but only made a golden croſs on the parchment, and ſometimes an impreſſion on a piece of lead, which hung to the grant with a ſilken ſtring, and was deemed an abundant authoriſing of the grant itſelf, without either ſigning or witneſſes.— The colour of the wax wherewith the king's grants were ſealed, was uſually green, to ſignify that the act continued for ever freſh, and of force. The uſual impreſſion on all laymens Seals, till the year 1218, was a man on horſeback, with a ſword in his hand; afterwards, they began to engrave their coats of arms on their Seals: only the archbiſhops and biſhops, by a decree of cardinal Otto, who was legate here in 1237, were to bear, in their Seals, their title, office, dignity, and even their proper names.

Du Cheſne obſerves, that none below the dignity of a knight had any right to a pendent Seal, called authenticum.

The emperors long ſealed all their acts of importance with a golden Seal: and the golden bull of Charles IV, for the election of an emperor, takes its name from the gold Seal hanging to it, which is called bull.

The pope has two kinds of Seals: the firſt uſed in apoſtolical briefs, and private letters, &c. called, the fiſherman's ring.— This is a very large ring, wherein is repreſented St. Peter, drawing his net full of fiſhes.

The other is uſed in bulls, repreſenting St. Peter's head on the right, that of St. Paul on the left, with a croſs between the two: on the reverſe is ſometimes the pope's name, and arms.

The impreſſions of the firſt Seal are taken in red wax, thoſe of the ſecond, in lead.

SEASONS (*Dict.*)— *Plate* VII, *fig.* 9, in the Dictionary, repreſents the various Seaſons of the year. When the earth is in ♋, it is plain that the rays of the ſun S illuminate the north pole, and that all thoſe who live in north latitude, the days are longer than their nights; and thoſe who live in ſouth latitude the contrary, the ſouth pole being then wholly in darkneſs. And, when the earth is in ♑, the very contrary happens, the north pole then being wholly in darkneſs, and ſouth pole illuminated. When the earth is either in ♈ or ♎, the days and nights are equal in every part of the globe. The figure repreſents the earth in every one of the ſigns, whereby the viciſſitudes of the Seaſons are rendered very conſpicuous.

SE'BESTEN, Sebestena, *myxa*, in pharmacy, &c. a fruit reſembling a little plum or prune; which, when ripe, is of a deep red colour, bordering on black; very ſweet, and the fleſh, or pulp, glutinous, or ſticky.

The Syrians make a kind of glue, or birdlime, of the Sebeſtens, called birdlime of Alexandria. The fruit is eſteemed pectoral, cooling, and emollient; though not much uſed in medicine. The ſtone within it is triangular.—It brought its name from Arabia, whence Pliny obſerves it came in his time into Italy.

SEBUÆ'I, a ſect among the ancient Samaritans; whom St. Epiphanius accuſes of changing the time expreſſed in the law, for the celebration of the great annual feaſts of the Jews. Serrarius conjectures, that they were thus called, from their celebrating the feaſt of the paſſover on the ſeventh month, called by the Hebrews ſeba, ſeventh.—Druſius rather takes them to have been denominated from Sebaia, the leader of a ſect among the Samaritans; as the followers of Doſitheus were denominated Doſithei; which two ſects ſome Jewiſh doctors ſuppoſe to have ſubſiſted at the ſame time.—Scaliger derives the name from the Hebrew ſebua, week; as who ſhould ſay, Hebdomadites, becauſe of their celebrating every ſecond day of the ſeven weeks, between Eaſter and Whitſuntide. Yet the ſame Scaliger, in his anſwer to Serrarius, gives a different explication.—In effect, all that has hitherto been advanced, on the point, is mere conjecture.

SEBU'RAI *, Seburæi, a name which the Jews give to ſuch of their rabbins or doctors, as lived and taught ſome time after the finiſhing of the talmud.

* The word is derived from סבר, *ſebar*, I think, whence סברא, *ſebura*, opinion, ſentiment; and thence סבראי, *ſeburi*, or *Seburai*, opinionative.

The reaſon of this appellation, ſay the rabbins, is that, the Talmud being finiſhed, publiſhed, and received in all the ſchools and ſynagogues, theſe doctors had nothing to do, but diſpute for, and againſt, the Talmud and its deciſions. Others ſay, it was becauſe their ſentiments were not received as laws, or deciſions, as thoſe of the Miſchnic and Gemaric doctors were; but were held as mere opinions. Others, as the author of Scalſcheleth Hakkabala, or Chain of Tradition, tell us, that the perſecution, the Jews underwent in thoſe times, not allowing them to teach quietly in their academies, they only propoſed their opinions on the compoſition of the Miſchna.

The firſt and chief of the Seburai was R. Joſi, who began to teach in the year 787 of the æra of contracts; which, according to R. David Gautz, falls on the year of the world 4236; and who, according to R. Abraham, was 38 years preſident of the Jewiſh academy.

This æra of contracts is the ſame with that of the Seleucidæ, the 787th year whereof falls on the year of Chriſt 476, which, of conſequence, is the æra of the origin of the Seburai; whoſe reign did not hold long: Buxtorf ſays, not above ſixty years; but R. Abraham and others, not fifty. The laſt of them was R. Simona.—They were ſucceeded by the Gaons of Geonim.

SECA'LE, *rye*, in botany, the name of a genus of plants, whoſe characters are:

The flowers have no leaves, but conſiſt of ſeveral ſtamina, which are produced from the flower-cup: the flowers are collected into a flat ſpike, and are diſpoſed almoſt ſingly: from the flower-cup riſes the pointal, which afterwards forms an oblong ſlender ſeed, incloſed in an huſk, which was before the flower-cup; this differs from wheat in having a flatter ſpike, the awn larger, and more naked. See RYE.

SE'CULAR *Games* (*Dict.*)—The Secular games were alſo called Terentine games, ludi Terentini, either by reaſon Manius Valerius Terentinus gave occaſion to their inſtitution; for that, having been warned, in a dream, to dig in the ground in a place near the Campus Martius, called Terentum, he there found an altar inſcribed to Dis, or Pluto and Proſerpine: upon which, as had been foretold him in his dream, three of his children, born blind, recovered their ſight; and he, in gratitude, performed ſacrifices, on the ſame altar, for three days and three nights ſucceſſively.—Or by reaſon here was an altar of Pluto buried deep under ground, becauſe the water of the Tyber terram tereret, cat into the ground in this place.

The Secular games laſted three days, and as many nights; during which, ſacrifices were performed, theatrical ſhews exhibited, with combats, ſports, &c. in the circus.

Their origin, and inſtitution, is delivered at length by Val. Maximus: the occaſion thereof, according to this writer, was, to ſtop the progreſs of a plague. — The firſt who had them celebrated at Rome, was Valerius Publicola, the firſt conſul created after the expulſion of the kings, in the year of Rome 245.—The ceremonies to be obſerved therein were found preſcribed in one of the books of the Sibyls.

At the time of the celebration of the Secular games, heralds were ſent to invite all the world to a ſolemnity no body had ever yet ſeen, nor was ever to ſee again.

Authors are not agreed as to the number of years wherein theſe games returned; partly, becauſe the quantity of an age or ſeculum among the ancients is not known, and partly on other accounts: ſome will have it, that they were held once every hundred years, and that the ſeculum, or age, was our century.—This Varro and Livy ſeem to expreſs in very plain terms; yet others will have it, that ſeculum comprehended 110 years, and that the Secular games only returned in that period, that is, at the beginning of every 111th year; which opinion is countenanced by Horace, in his Secular poem, v. 21.

Be this as it will, it is certain they ſometimes did not ſtay for the 111th, nor even for the 100th year, for the celebration of theſe games. Auguſtus, for inſtance, held them in the year of Rome 736; and Caligula again in the year of Rome 800, and of Chriſt 38, viz. 64 years after the former; and Domitian, again, in ſtill leſs time, viz. in the year of Chriſt 87, at which Tacitus aſſiſted in quality of quindecimvir, as he himſelf tells us, Annal. lib. xi. c. 11. This was the ſeventh time that Rome had ſeen them from their firſt inſtitution.

The emperor Severus exhibited them the eighth time 110 years after thoſe of Domitian: Zoſimus ſays, theſe were the laſt; but he is miſtaken, for in the year of Rome 1000, fifty years after thoſe of Severus, the emperor Philip had them celebrated with greater magnificence than had ever been known.—We find them repreſented on medals.

SE'CUNDANS, in mathematics, an infinite ſeries of numbers, beginning from nothing, and proceeding as the ſquares of numbers in arithmetical progreſſion, as 0, 1, 4, 9, 16, 25, 36, 49, 64, &c.

SECU'NDINES (*Dict.*)—It very often happens that theſe are retained in the womb after child-birth, and great miſchiefs enſue from it. The aſſiſtance of a ſkilful hand is, in many caſes, neceſſary to the getting them out; and this is to be done with great care and ſpeed, before the uterus cloſes itſelf upon them, otherwiſe, they occaſion terrible hæmorrhages, faintings, and often inflammatory and putrid fevers.

The patient herſelf may greatly promote the expulſion of theſe, by any forcible emotion of the body, as by a forced cough, or by ſneezing; the midwife at the ſame time is gently to pull them by the navel ſtring, but this muſt be done very cautiouſly, for fear of its breaking. If this fails, the cautious introducing the hand often ſets all right, or the uſe of gently pellent medicines may be called in; and to theſe may be added broths, with ſaffron in them, and by the uſe of common clyſters great good is often done: but, if after all this care there yet remain ſome fragments of them behind, there uſually ariſes a fever within twelve hours; and, in this caſe, the utmoſt care muſt be taken to prevent putrefaction, and expel the remains of them. To theſe purpoſes medicines prepared with myrrh, amber, ſaffron, and the cortex Eleutherii, are of the greateſt ſervice; and to theſe may be added occaſionally the colliquating and attemperating ſalts, ſuch as tartarum vitriolatum and nitre. *Junker's Conſp. Med.*

SERCUI'DACA, *hatchet-vetch*, in botany, the name of a genus of plants, whoſe characters are:

It has a papilionaceous flower, out of whoſe empalement riſes the pointal, which afterwards becomes an upright, plain, articulated pod, containing in each joint a rhomboid ſeed, having a notch on the inner ſide.

SE'DER *Olam* (*Dict.*)—The great Seder Olam commences at the creation of the world, and comes down as low as the war of the pſeudo-meſſiah Barchochabas, under Adrian, fifty-two years after the deſtruction of the temple of Jeruſalem, and, of conſequence, to the 122d year of Chriſt.—It is almoſt all taken from the ſcripture, excepting the end. It is the work of R. Joſa, ſon of Hhelpeta of Tſippora, who lived in the ſecond century, about the year one hundred and thirty, and was maſter of the famous R. Juda Hakkadoſch, the compiler of the Miſchna.

The leſſer Seder *Olam* is an abridgment of the former, brought down as far as Mar Sutra, who lived four hundred and fifty years after the deſtruction of the temple of Jeruſalem, or five-hundred and twenty-two years after Chriſt.—F. Morin, continually bent upon diminiſhing the antiquity of the principal books of the Jews, endeavours to prove it to have been wrote about the year of Chriſt one thouſand one hundred and twenty four, as indeed is expreſſed at the beginning: but R. Dav. Gantz. has overthrown this opinion in his Tſemahh David, and ſhewn, that the date, in the beginning, is an interpolation.

The two chronologies were firſt printed at Mantua in one thouſand five-hundred and fourteen, quarto; again, at Baſil, by Frobenius, in one thouſand five-hundred and eighty, octavo: at Venice in one thouſand five-hundred and forty-five, quarto: at Paris, with a Latin verſion of Genebrard, in 12°.—They have been ſince reprinted at Amſterdam, in one thouſand ſeven-hundred and eleven.

SEDI'TION, among civilians, is uſed for an irregular commotion of the people, or an aſſembly of a number of citizens without lawful authority, tending to diſturb the peace and order of the ſociety.

SEDR, or **SEDRE**, the high-prieſt of the ſect of Ali, among the Perſians.

The Sedr is appointed by the emperor of Perſia, who uſually confers the dignity on his neareſt relation.

The juriſdiction of the Sedr extends over all effects deſtined for pious purpoſes, over all moſques, hoſpitals, colleges, ſepulchres, and monaſteries. He diſpoſes of all eccleſiaſtical employments, and nominates all the ſuperiors of religious houſes.—His deciſions, in matters of religion, are received as ſo many infallible oracles: he judges of all criminal matters, in his own houſe, without appeal, and is, without contradiction, the ſecond perſon in the empire.

The Sedr, however, has not any indelible character, but frequently quits his poſt, for another purely ſecular one.—His authority is balanced by that of the mudſitehid, or firſt theologue of the empire.

SEDUM, *houſleek*, in botany, the name of a genus of plants, whoſe characters are:

The flower conſiſts of ſeveral leaves, which are placed orbicularly, and expanded in form of a roſe; out of whoſe flower-cup riſes the pointal, which afterwards turns to a fruit, compoſed, as it were, of many ſeed-veſſels, reſembling huſks, which are collected into a ſort of head full of ſmall ſeeds.

Houſe-leek is very cooling, and in that intention is often uſed in outward applications.

SEED (*Dict.*)—The exterior form, and even the internal ſtructure, of the generality of vegetable Seeds have been ſuppoſed by ſome ſo much alike in the ſeveral kinds, and of ſo little curioſity and beauty in the whole, that they have been little regarded by the curious; but, when nearly examined with the help of microſcopes, they are found to be worthy of a greater attention; thoſe which appear moſt like to one another, when viewed by the naked eye, often proving as different, when thus examined, in their ſeveral forms and characters, as the different genera of any other bodies of the creation. If their external forms carry all this variety and beauty about them, their internal ſtructure, when laid open by different ſections, appears yet more admirable.

The Seed of the muſk ſcabious is amazing in its ſhape and ſtructure: it reſembles in figure an octagonal vaſe, with a ſcalloped brim; the whole is bell-faſhioned, having ribs or diviſions, which run down from the mouth of the vaſe, and, thence becoming narrower, form the bottom. Between theſe ribs, down to the beginning of the narrow part, it is clear, though not wholly tranſparent, and from thence to the bottom the ribs are hairy. This vaſe contains a ſeed, which is like a peſtle ſtanding in a mortar. The peſtle ſtands looſe in an octagonal caſe, but the narrowneſs of the mouth of this vaſe hinders the peſtle's being drawn out, becauſe its extremity within is rounded, and thicker than any other part of it. From its upper end there ariſe five ſpiculated ariſtæ or awns, whoſe little thorns are directed upwards, and are thereby prepared to cauſe the Seed to recede from any thing that might injure it on being touched. The baſon, from which theſe ariſtæ riſe, is of a fine green colour, and they are of an elegant ſhining brown.

The Seed of the angelica is one of the moſt fragrant in its ſmell in the world. When the outer huſk of this ſeed is pulled off, the nucleus appears of a browniſh colour, and of an elliptical ſhape. By the help of the microſcope we ſoon diſcover what it is that produces this charming ſmell; this is a fine amber-coloured gum, which appears laid in ridges, diſpoſed alternately with others of a browniſh colour, longitudinally, all over the ſeed; and on the flat ſide there is a white part, which is a ſort of theca, which receives a very minute ſtylus from the pedicle that ſupports it.

The medicinal Seed, commonly known in the ſhops under the name of grain of paradiſe, is one that promiſes very little from its external appearance, being only a brown Seed of an irregular ſurface, with many flats and angles, and having an apex like the mouth of a purſe, when drawn together with a ſtring; from this unpromiſing aſpect, however, there ariſes a very wonderful appearance on diſſection. In a longitudinal ſection we ſee firſt the edge of the brown cortex, next within that appears a black pitchy ſubſtance, and, within that, a very white matter, lodged in a radiated form: this reſembles a fine white ſalt, and is probably a mixture of a volatile ſalt and a farinaceous matter. Its radiated diſpoſition, and extremely pungent taſte, favour alſo this opinion. But there is in this Seed a yet far more curious particular than theſe; the center of every Seed is occupied by a ſmall piece of perfect camphor: that is, in all reſpects, the ſame with the common camphor ſold in the ſhops, and is always of the figure of a vinegar cruet, having a round large bottom, and a long and narrow neck. This is invariably the appearance in every Seed, and that not only in this, but in other Seeds of the ſame kind.

The Seed of the great maple, which we commonly, but improperly, call the ſycamore-tree, conſiſts of a pod and its wing: two of theſe grow upon a pedicle with the pods together, which makes them reſemble the body of an inſect with its expanded wings. The wings are finely vaſculated, and the pods are winged with a fine white down, reſembling ſilk: this contains a round compact pellet, covered with a brown membrane, that ſticks very cloſely to it. When this is pulled off, inſtead of diſcerning a kernel, as in other Seeds, there appears an entire green plant, folded up in a moſt ſurpriſing manner. The pedicle of this is about two eighths of an inch long, and its ſeminal leaves of about ſix eighths each: between theſe the germina of the next pair of leaves are plainly viſible to the naked eye, but with a microſcope they are ſeen with the greateſt beauty and perfection.

Theſe, and a number of ſuch other beauties in this part of the creation, are deſcribed at large by Dr. Parſons in his work, intitled a Microſcopic Theatre of Seeds, to which we refer for the reſt. *Phil. Tranſ.* N°. 474.

Many experiments have been made, in order to prove that the Seeds of plants derive their conſtituent matter from the woody central parts of the plant. Thus apple-trees, when they grow hollow, will bear good fruit, but with empty and imperfect Seeds. Barberry-trees, when the roots are bored through, are ſaid to bear fruit abſolutely without Seeds; and the gardeners ſay, that, if the woody part of the roots of parſley be cut out, the plant will continue to thrive in all appearance, but that it will never afterwards produce Seeds that will propagate the ſpecies. It is to be acknowledged that hollow oaks and elms produce Seed that is as good as that growing on the ſoundeſt trees of the ſame ſpecies; but the elm is all timber to the bark, and an oak, when it is putrid to the heart, may ſtill have firm wood enough to convey a proper nouriſhment from the root to the acorn. The roots may be found, when the body of the tree is very much decayed by water let in at the top of the pollard tree, or at the loppings of the branches; and we ſee that beans, wheat, and other grain, grow well, if the eyes and parts next adjoining be whole, though the beans be full of great holes in other parts, or the main body of the wheat be cut off with ſciſſars.

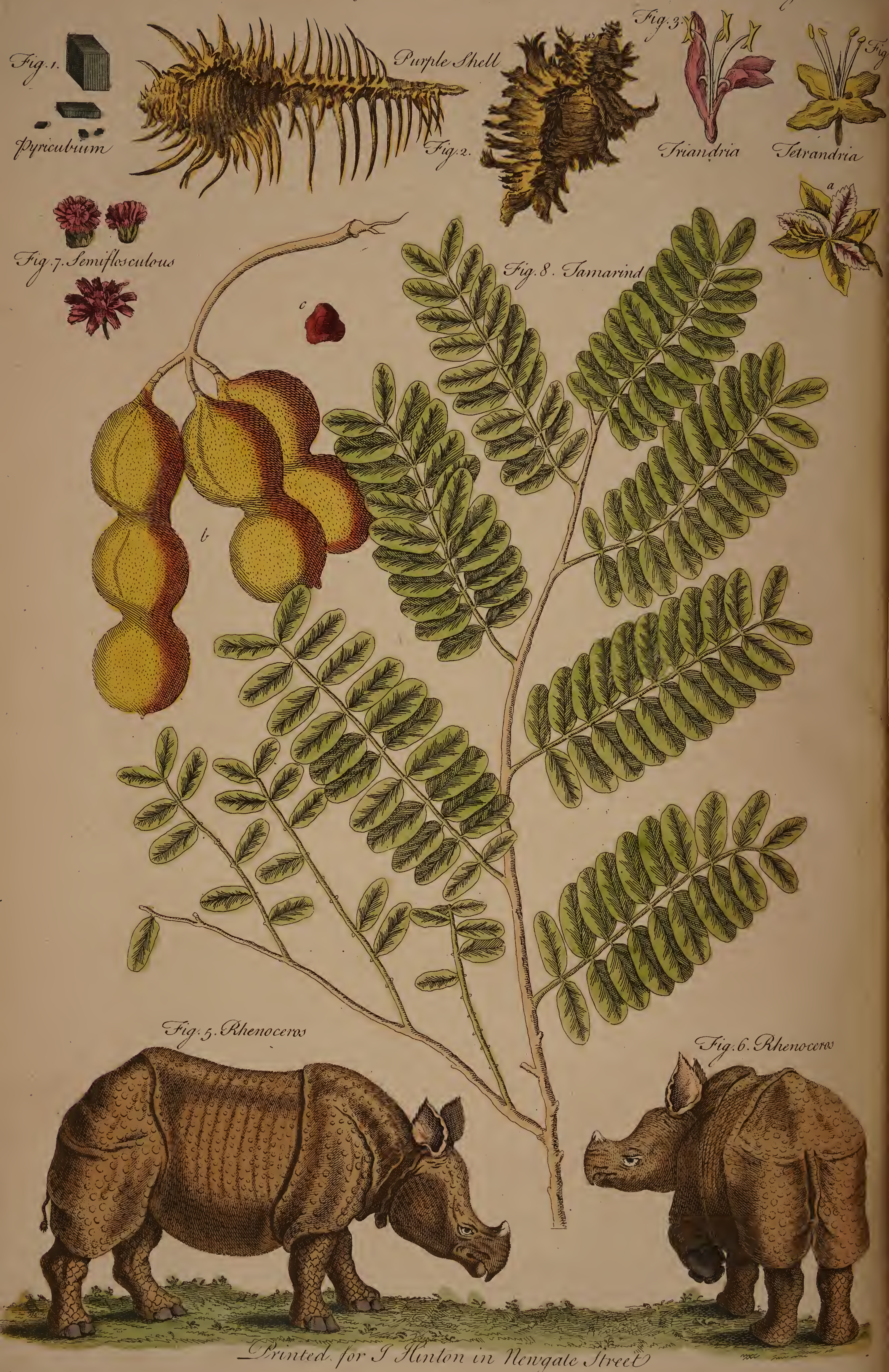
The people who recommend boring the barberry roots, to have fruit without ſtones, order therefore that the borings be very complete in the roots for that purpoſe. It is obſerved, in countenance of this doctrine, that ſome trees are leſs fruitful, or even altogether barren, by the exceſſive growth and hardneſs of the timber, and theſe are cured by croſs hackings or cuts, done with ſharp inſtruments through the bark, and into the wood: they alſo do the like injuries to the roots on the ſame occaſion, and often ſplit them lengthwiſe, putting a ſtone into the ſlit, that they may not grow together again. When this remedy is applied both to the ſtem and roots, it ſeldom fails of ſucceſs; but, when only to one, it ſometimes miſſes.

As the heart of the wood, or its more ſolid ſubſtance, are ſuppoſed to furniſh the matter of the Seeds, the bark is ſuppoſed to furniſh the matter of the pulp of the fruit. The experiment has been made, by debaſing and vitiating its juice, and the fruits have accordingly been debaſed. Thus if reſts be made for water on the body of a Kentiſh codling tree, and water poured frequently into theſe cavities, ſo as always to keep up a ſupply for the bark, the apples will grow to an immoderate ſize, and be inſipid; part of their pulp will be ſo relaxed as to look like the pulp of a lemon, and, on hanging but a moderate time on the tree, they will be as rotten, as if laid on heaps, when fully ripe. *Philoſ. Tranſ.* N°. 46.

Change of **SEED**, a term uſed by the farmers to expreſs the common and, as they ſuppoſe, neceſſary cuſtom, of changing among one another the Seed of their lands, as wheat, and the like; it being a received opinion, that the Seed produced on one land will grow better on another, than on that which produced it, though the ſame ſpecies of plant be ſown.

Seeds, in their natural climate, do not degenerate, unleſs culture has improved them; they then indeed are liable, upon omiſſion of that culture, to return to their natural ſtate again. Whatever benefit ariſes to the farmer from the changing the Seed of the ſame ſpecies, is from cauſes which are themſelves the effects of different climates, ſuch as heat and moiſture, which may vary very much in the ſame neighbourhood. There is a mountain in the Mogul's country, which on the ſouth ſide produces Indian plants, and on the north ſide European ones, from different expoſures. Some land retaining water longer is colder, and ſome letting it paſs off quicker is warmer; as it may alſo be from the nature and figure of its parts, which retain more of the ſun's heat than others. Sandy and gravelly grounds are always warmer than others, if they have ſome hollow and ſpungy ſtratum underneath, that will let the water paſs off.

The benefit ariſing from the change of Seed is owing to theſe changes, not to the change of food; and theſe cauſes ſhew their effects chiefly in the generation of the Seed. Flax Seed, brought from Holland, and ſown here, will produce as fine flax as it does there, but, in the next generation, it will degenerate, become coarſer; by this means it will continue to degenerate every year, till after two or three years it is no better than our own Seed produces, and yet the land ſhall be as good for this coarſe ſort, as when it produced the fine; ſo alſo it is, when the Seeds of our own wheat are changed between farmer and farmer. And thus ſilk-worms hatched and bred in France, of eggs brought from Italy, will make as fine ſilk as the Italian;



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but the eggs of thoſe laid in France will produce worms that make no better ſilk than thoſe produced in France, though their food is all the while the ſame.

Common barley, once ſown in the burning ſands in Wiltſhire, will for many years after, if ſown on indifferent warm ground, be ripe ſooner than any other barley by two or three weeks; but, if ſown on cold grounds farther north, it will be as late as any other barley, after two or three years. The weeds, which perplex the farmers in every field, grow as ſtrong and troubleſome one year as another, and that without any change of Seed at all. Theſe ſeem therefore to have been the natural produce of our ſoil, and corn and other uſeful plants to have been brought from other places, and improved by culture; theſe will therefore no longer retain their perfection and value, than ſuch culture is continued to them.

Laurembergius has carried this notion of degeneracy and change from the ſoil, ſo far as to affirm that wheat will, in ſome places, degenerate into rye; and in other places, rye will be exalted into wheat by the ſoil: but thoſe who are acquainted with botany know, that a horſe might as ſoon be changed into a bull by feeding in an improper paſture, as one plant degenerate into another by fault of the ſoil. *Tull's Huſbandry.*

SEE'DY, in the brandy trade, a term uſed by the dealers to expreſs a fault that is found in ſeveral parcels of French brandy, which renders them unſaleable. The French ſuppoſe that theſe brandies obtain the flavour, which they expreſs by this name, from the weeds which grow among the vines, from whence the wine, of which this brandy was made, was preſſed.

However it be, the thing is evident, and the taſte not of any one kind; but ſome pieces of brandy taſte ſtrongly of aniſeed, ſome of caraway-ſeed, and ſome of other of the ſtrong flavoured ſeeds of plants, principally of the umbelliferous kind; ſo that it ſhall be rather taken for aniſeed, caraway, or ſome other water, than for brandy.

The proprietor of ſuch brandies is always at great trouble to get them off, and uſually is reduced to the neceſſity of mixing them in ſmall quantities with pieces of other brandies, ſo as to drown and conceal the taſte; and, where he has not opportunities of doing this, is obliged to ſell them on very diſadvantageous terms.

The buſineſs of rectification of ſpirits is very little underſtood abroad, though very much practiſed with us; and a man in France or Holland, who could take off this taſte from theſe brandies, might get great advantages by it. There is no doubt but that the ſame means, which we uſe to rectify malt ſpirits, that is, to clear it of its nauſeous and ſtinking oil, which always riſes with it in the firſt diſtillation, would alſo ſerve to purify theſe brandies, and, by leaving theſe extraneous oils behind, render them as well taſted as any others; ſince there is no queſtion, but that the oil of malt, which is a principle of the ſame ingredients with the ſpirit, is more firmly united to it than flavouring oils in the brandy, which are not the produce of the grape, but of ſome foreign matter only accidentally mixed with it.

It is a miſtake to imagine, that all the brandies made in France are ſo fine as thoſe which we meet with on the keys of London; on the contrary, there are many hundred pieces made every year, which are as badly flavoured as our coarſeſt malt ſpirit: but the caſe is this, they ſend the beſt brandies and the beſt wines to England, where they can get the beſt prices for them. In Holland, on the contrary, the mart of goods of all ſorts, it is ſometimes difficult to pick one piece of good brandy out of fifty, the general run of them being either ſeedy, muſty, oily, or otherwiſe infected with ſome unnatural and diſagreeable flavour; and theſe are the ſorts which in France they deſpair of curing by re-diſtillation, or bringing to the ſtate of three fifths, or trois cinques, as they expreſs their ſtronger brandies. *Shaw's Eſſay on Diſtillery.* See TROIS CINQUES.

SE'GMENTS *of leaves*, are the parts of ſuch leaves of plants as are divided or cut into ſeveral threads.

SE'GUL, in Italian muſic, is often found before aria, allelujah, amen, &c, to ſhew that thoſe portions or parts are to be ſung immediately after the laſt note of that part over which it is writ. But, if theſe words ſe piace, or ad libitum, are joined therewith, it ſignifies that theſe portions may be ſung, or not, at pleaſure.

SEGUE'NZA, in the Italian muſic, ſung in the Roman church, generally in proſe. The Sequenza are often ſung after the gradual, immediately before the goſpel, and ſometimes in the veſpers before the magnificat. They were formerly more uſed than at preſent.

SEI'M, in agriculture, a term uſed by the farmers of Cornwall to expreſs a certain determinate quantity of ſea-ſand which they uſe as manure to their lands.

They dredge this up on the ſea coaſts, and carry it as far toward the lands, where it is to be uſed, as they can by water. At the landing-place the farmers bring a train of horſes to receive it, each horſe carrying a Seim, that is, a ſack of it, containing thirteen gallons. The land carriage of this ſand, in Cornwall alone, is ſuppoſed to coſt thirty-two thouſand pounds annually; and yet the farmers find abundant encouragement to continue the uſe of it, it is ſo rich a manure. *Philoſ. Tranſ.* N°. 103.

SEISA'CHTHEIA, a Σεισάχθεια, in antiquity, a public ſacrifice at Athens, in memory of Solon's ordinance; whereby the debts of poor people were either entirely remitted, or at leaſt the intereſt due upon them leſſened, and the creditors hindered from ſeizing upon the perſons of their debtors, as had been cuſtomary before that time. *Potter, Archæol. Græc.*

The word is Greek, and literally ſignifies the ſhaking off a burden.

SELF-*opens*, a term uſed by the miners in the north of England to expreſs certain natural cavities or chambers, which are frequently met with, ſome near the ſurface, ſome at very great depths, ſome ſmall, and others very large.

Theſe are of various figures, and often run into ſtrange ſinuſes. Dr. Liſter, in accounting for the origin of earthquakes, ſuppoſes the whole cruſt of the earth to be more or leſs hollowed in this manner; which he alſo argues for, from the ſtreams of waters which ariſe in large quantities from the ſides of mountains, and muſt have communication with theſe Self-opens and ſupplies from them.

The natural hollows the doctor thinks to be the means of continuing and propagating earthquakes; the firſt cauſe of which he aſcribes to the breath of the pyrites, which he alſo ſays is the pyrites itſelf tota ſubſtantia. This he obſerves takes fire of itſelf, on being expoſed to the air in our ſight, and may do ſo, from various other cauſes, under-ground. The ſulphureous ſmell of the air and waters, before and after earthquakes, in the places where they happen, ſeems a proof that they owe their origin to ſome ſuch ſulphureous matter as this ſtone; and the rolling, and deſultory noiſe of an earthquake, ſeems alſo to ſhew that it is not expanded any way at once, but is propagated through a chain of theſe ſubterranean hollows.

It is not neceſſary that we ſhould ſuppoſe a continued chain of them, from the place where the earthquake begins to be felt, to the ſpot where it ends; but, if there are many of them irregularly ſcattered about the earth, the force of the exploſion will be ſufficient to burſt through the ſolid parts between, and open a paſſage from one to the others, which may continue open no longer than the force continues, and after the ſhock is over cloſe together again, ſo as to leave no trace where it was

Our miners not only find the natural caverns, but they alſo find them often full of what they call fire damps, which are inflammable vapours, of the very nature of thoſe which occaſion earthquakes, and, when fired, make the ſame exploſions, and cauſe the ſame effects in a certain degree. Theſe ſometimes require a candle, or other actual fire, to come in contact, in order to kindle them; but ſometimes they are found kindled of themſelves, and flaming on the ſurface of the waters, in the bottoms of the pits, or at the fiſſures of the coal. *Philoſ. Tranſ.* N°. 157.

SEMIFI'STULAR *flowers*, in botany, are ſuch whoſe upper part reſembles a pipe cut off obliquely; as in buſh-wort, &c.

SEMIFLO'SCULOUS, in botany, a term uſed to expreſs the flowers of a certain claſs of plants, of which the dandelion, hawkweed, and the like, are kinds.

This ſort of flower conſiſts of a number of ſemifloſculi, which are either diſpoſed into one or more circles, and all comprehended in the ſame cup, which often becomes inverted, as the flower ripens. Theſe Semifloſcules are petals, hollow in their lower part, but in their upper half are flat, and continued in the ſhape of a tongue. Theſe are often ſeparated from each other by intermediate leaves, and are placed upon the embryo fruit, from which there ſtands out a ſlender capillament, divided at the end into two parts; often carried beyond the vagina, ſupported by five props. The embryo's are placed in the thalamus, or bottom of the cup, and finally become ſeeds, ſometimes winged with down, ſometimes naked, ſometimes coronated, and ſometimes foliated. See *Plate* XL. *fig.* 7. *Tourn. Inſt.*

SEMILUNA'RES *cochleæ*, in natural hiſtory, the name of a genus of ſea ſnails, ſo called, from their having ſemicircular mouths.

The characters of the genus are theſe: they are univalve ſhells of a compact body, with a flat, ſemicircular, and often dentated mouth. Some of the ſpecies have exerted apices, and ſome depreſſed.

SE'MINAL *leaves*, are two plain, ſoft, and undivided leaves, that firſt ſhoot forth from the greateſt part of all ſown ſeeds; which leaves are very different from thoſe which do ſucceed on the ſame plant, in ſize, figure, ſurface, and poſition.

SEMINAL *root*, in natural hiſtory, a name given by Grew to that part of the ſeeds of plants, which may otherwiſe be called the inner body of the ſeed: this is diſtributed through the parenchyma of the ſeed, but is wholly different from it, and diſtinguiſhed by Dr. Grew from the radicle, which becomes the plant root in its future growth. The parenchyma of the ſeed is, in ſome degree, that to the Seminal root, which the mould or earth is to the plant-root, or radicle; and the Seminal root is to the plant-root what the plant-root is to the trunk. *Grew's Anat. of Plants.*

SEMINI'FEROUS, *bearing or producing ſeed*, in botany, an epithet applied to thoſe plants which produce large quantities of ſeed.

SE'MINARIES, in popiſh countries, are certain colleges, appointed for the inſtruction and education of young perſons, deſtined for the ſacred miniſtry. The firſt inſtitution of ſuch places is aſcribed to St. Auguſtin. And the council of Trent decrees, that children, exceeding twelve years of age, ſhall be brought up, and inſtructed in common, to qualify them for the eccleſiaſtical ſtate, and that there ſhall be a Seminary of ſuch belonging to each cathedral, under the direction of the biſhop.

In the Seminaries of France, none are taken in but young perſons ready to ſtudy theology, and be ordained. And, for the maintenance of theſe Seminaries, certain benefices are allotted; or elſe the clergy of the dioceſe are obliged to maintain them. Theſe colleges are furniſhed with halls for the public exerciſes, and little chambers or cells, where each ſtudent retires, ſtudies, and prays apart. Such is the Seminary of St. Sulpitius at Paris.

In the reign of queen Eliſabeth, the Roman Catholics projected the founding Engliſh Seminaries abroad, that from thence they might be furniſhed with miſſionaries, to perpetuate and increaſe their communion. Accordingly, the college of Douay was founded in 1569, at the expence of Philip II. King of Spain; and Dr. William Allen, an Engliſhman, was made head of it. In the year 1579, a college was founded at Rome, for the ſame purpoſe, by Gregory XIII. who ſettled 4000 crowns per annum for the ſubſiſtence of the ſociety. The famous Robert Parſons, an Engliſh jeſuit, was rector of this college. King Philip founded another of theſe nurſeries at Valladolid in the year 1589, and one at Seville in 1593. The ſame prince founded St. Omers in Artois, in 1596. In the next century, more Seminaries were eſtabliſhed, at Madrid, Louvain, Liege, and Ghent.

The two colleges of Douay and Rome received ſuch great encouragements, that ſome hundreds of prieſts were ſent off from thence into England.

By the ſtatute of queen Eliſabeth it is made a præmunire to contribute to the maintenance of a popiſh Seminary. And by one of king James I. no perſons are to go, or be ſent, to popiſh Seminaries, to be inſtructed or educated, under divers penalties and diſabilities mentioned in the ſtatute.

The Houſes of the ſociety de propaganda fide, eſtabliſhed for the preparing eccleſiaſtics for miſſionaries among infidels and heretics, are alſo called Seminaries. The principal of theſe is that at Rome, called the apoſtolical college, or Seminary, or the Seminary de propaganda fide.

SE'MINARY, in gardening, is a ſeed-plot, adapted or ſet apart for the ſowing of ſeeds. Theſe are of different natures and magnitudes, according to the ſeveral plants intended to be raiſed therein. If it be intended to raiſe timber of fruit trees, it muſt be proportionably large to the quantity of trees deſigned; and the ſoil ſhould be carefully adapted to the various ſort of trees. Without ſuch a place as this, every gentleman is obliged to buy, at every turn, whatever trees he may want to repair the loſſes he may ſuſtain in his orchard, wilderneſs, or larger plantations; ſo that the neceſſity of ſuch a ſpot of ground will eaſily be perceived by every one. But as I have already given directions for preparing the ſoil, and ſowing the ſeeds in ſuch a Seminary, under the article of NURSERY, I ſhall not repeat it in this place, but refer the reader to that article.

It is alſo as neceſſary, for the ſupport of a curious flower-garden, to have a ſpot of ground ſet apart for the ſowing of all ſorts of ſeeds of choice flowers, in order to obtain new varieties; which is the only method to have a fine collection of valuable flowers; as alſo for the ſowing of all ſorts of biennial plants, to ſucceed thoſe which decay in the flower-garden; by which means the borders may be annually repleniſhed, which, without ſuch a Seminary, could not be well done.

This Seminary ſhould be ſituated at ſome diſtance from the houſe, and be intirely incloſed either with an hedge, wall, or pale, and kept under lock and key, that all vermin may be kept out; and that it may not be expoſed to all comers and goers, who, many times, do miſchief before they are aware of it. As to the ſituation, ſoil, and manner of preparing the ground, it has been already mentioned under the article of NURSERY; and, the particular account of raiſing each ſort of plant being directed under their proper heads, it would be needleſs to repeat it here. *Miller's Gard. Dict.*

SEMI'NIUM, a term uſed by the writers on foſſils to expreſs a ſort of firſt principle, from which the ſeveral figured ſtones, or as they are more uſually called the extraneous foſſils, are ſuppoſed to have their origin.

SEMITE'RTIAN, a kind of complex fever, which deſerves our careful obſervation.

It begins with a horror, and goes off with a ſweat, yet not ſo as to leave the patient entirely free from a fever. But, ſince it is complicated of an intermittent tertian and a continual quotidian, on one day it is more exaſperated, and moleſts the patient with a horror, and frequently with ſomething of a rigor, attended with bilious vomitings or ſtools, a burning heat, and exhalations of humid vapours. On the other day the patient is rather ſenſible of a cold than a horror, and is not much afflicted with heat or thirſt; the pulſe is more moderate, and the fever more gentle on all accounts; beſides, on one day may be obſerved two kinds of fevers, on the other but one. A Semitertian fever is indeed but rare, but, where it is once ſettled, very dangerous. An exquiſite Semitertian is, when the ſupplies of peccant matter for the intermittent tertian and continual quotidian are nearly equal; otherwiſe there cannot be a pure Semitertian, and conſequently the diſeaſe, as it is thought, will the more eaſily give way to remedies. *Lommii, Med. Obſ.*

Among the epidemic fevers of the intermittent and malignant kind, we, in practice, frequently meet with that ſpecies which conſiſts of an intermittent tertian and a quotidian of the continual kind, for which reaſon it is by the Greeks called ἡμιτριταῖος; and by the Latins ſemitertiana.

This ſpecies of ſever generally ſeizes the patient, in the forenoon, with a violent cold and horror, and a contracted pulſe. This ſtate is afterwards ſucceeded by an heat, which laſts for ſome hours, is accompanied with a frequent pulſe, and remits without being totally removed upon the eruption of the Sweat. Towards the evening the heat is rather increaſed, after a gentle refrigeration; and next day the diſorder is milder, and accompanied with thirſt, till about the evening, after a ſlight horripilation, it again becomes more violent. But, on the third day, the horror again ſeizes the patient, and is ſucceeded by a more intenſe heat, whilſt the ſtate of the diſorder is the ſame it was on the firſt day. So that there is always preſent a kind of growing fever, the exacerbation of which happens towards the evening; and on the third day, in the morning, this exacerbation is moſt conſpicuous, and accompanied with a rigor. Beſides, the ſtrength is impaired, the appetite rendered languid, the ſleep defective, and the urine thin and crude; whereas, after the paroxyſm of a tertian, it is thick and high-coloured. In coughing a ſmall quantity of crude matter is ſpit up. This ſpecies of fever is, alſo, frequently accompanied with a pain of the back and abdomen, which latter is, alſo, tumid. Some, upon the approach of the tertian paroxyſm, are afflicted with a nauſea and cardialgia; others vomit; others fall into deliquiums; and others become abſolutely delirious.

This fever is almoſt unknown in ſome parts of Europe, the inhabitants of which generally take it for a malignant intermittent fever; but the former greatly differs from the latter, ſince it is neither contagious, accompanied with exanthematous efflореſcences, nor attended with ſo conſiderable a loſs of ſtrength. Beſides, it has every third day a conſpicuous exacerbation accompanied with horror.

Others, in like manner, unjuſtly confound a Semitertian with a continual tertian; for the latter, otherwiſe than in the former, has its exacerbation only on the third day, but not in the evening; nor is it wholly continual; but, though it at firſt ſeizes with a continual heat, yet, on the third day, it generally loſes its violence, and paſſes into an intermittent tertian.

Nor is a Semitertian to be confounded with a double tertian; for, though the latter ſeizes every day, yet the paroxyſms correſpond to each other, and the fever itſelf perfectly intermits; whereas, in a Semitertian, there is abſolutely no intermiſſion, but a remiſſion. The paroxyſm, alſo, happens about the evening, and is always double on the third day.

A Semitertian is, therefore, compoſed of two fevers, and muſt, therefore, have a double fomes, and a double cauſe; that is, the ſource of the continual fever in the meſentery, in conſequence of the intercepted circulation of the blood through its ſtructure, and its conſequent inflammatory ſtagnation in the contiguous nervous coats. But the violent paroxyſm, happening on the alternate days, has, as well as a tertian, its ſeat and cauſe in the inteſtines, and eſpecially in the duodenum; for to the winding cavity of this inteſtine the lymphatic, bilious, and corrupted humours, in conſequence of the diſorder of the meſentery, are conveyed from the glands, the liver and pancreas; as alſo crude juices from the ſtomach, which conſtitute a morbid fomes; which, mixing with the blood, and being conveyed to the nervous membranes of the ſpine, induces a preternatural febrile motion.

Among the things which have a tendency to generate a Semitertian, we may reckon all thoſe ſubſtances and circumſtances which render the juices thick and impure, and eſpecially fill the primæ viæ and veſſels of the meſentery with ſordes. Hence Semitertians are moſt generally incident to thoſe, who, neglecting a ſalutary regimen, eat liberally of ſweet, acid, fermentable aliments, and farinaceous ſubſtances fried with butter, ſugar, and eggs; and to thoſe who lead an idle and too ſedentary life; who drink too little; who are too great lovers of ſweet wines; or who indulge the paſſions of the mind, eſpecially ſorrow. Semitertians are, alſo, readily incident to perſons after a recovery from acute diſorders; to thoſe who are coſtive; to thoſe who frequently uſe draſtic purgatives; and to ſuch as have the menſtrual or hæmorrhoidal diſcharge ſuppreſſed. Theſe fevers are, alſo, leſs frequent at other ſeaſons than in the autumn, the fruitful ſource of terrible fevers, on account of the variety and inequality of the weather, which is highly unfriendly to ſalutary perſpiration,

tion. Semitertian fevers, alſo, frequently happen to thoſe, who, when overheated, greedily drink cold liquors, or who, when ſweating, ſit down in moiſt places.

Semitertians are obſerved to be more frequent in ſome countries than in others. Thus Galen, Spigelius, and Baglivi, inform us, that they rage more in Italy than in other climates. And certainly, in that part of the world, the heat, during the day, generates many acrid recrementitious ſordes, whilſt the cold air of the night hinders the excluſion of theſe; and the cold drink, of which they are ſo very fond as to prepare it by putting ice into it, occaſions, that the juices in the meſentery, where the reſiſtance is ſmall, and the circulation languid, as it were, ſtand ſtill, and conceive an inflammatory ſtagnation. And thus a continual fever is generated, which is changed into a tertian, by the corrupted juices falling from the meſentery to the inteſtines. The like happens in Hungary, where a ſimilar ſtate of the air, and a liberal uſe of ſweet and ſpirituous wines, frequently excite Semitertians.

Since, therefore, a Semitertian, beſides the common cauſe of intermittents in the primæ viæ, has, for a foundation, an inflammation, and a continual diſpoſition never to admit of a great remiſſion of the ſymptoms, nor of a due time for recovering the ſtrength, it is of a very dubious nature, and far more dangerous than a ſimple intermittent.

For this reaſon, its progreſs is quick, ſince, for the moſt part, it terminates on the ninth or thirteenth day, either in health, ſome other diſeaſe, or death.

When it is long protracted, the inflammation either comes to a ſuppuration, and the diſorder is changed generally into an hectic or ſlow fever; or, when there is a violent obſtruction of the meſentery, it terminates in a dropſy; or, which happens more rarely, when the primæ viæ are filled with ſordes, it ends ſometimes in a ſimple, and ſometimes in a double intermittent.

But when the ſweat not only breaks out in the decline of the paroxyſm, but alſo on the ſeventh day, which is critical; or if, after this day, the inteſtines are put into a commotion, and a bilious, pituitous, or even a bloody flux, is produced, it is a good ſign, and prognoſticates the ſolution of the diſeaſe; or if there happen violent pains of the abdomen, which are increaſed at certain ſtated hours, the diſorder is reſolved by them, or afterwards terminated by a ſubſequent ſanious and purulent diarrhœa, or an evacuation of a large quantity of black blood by ſtool.

On the contrary, when none of theſe circumſtances happen, but rather a heat about the præcordia, a tenſion and pain in the whole region of the ſtomach, a vomiting, a hiccup, a reſtleſſneſs, a toſſing, and a trembling of the hands, are perceived, they are bad prognoſtics, and indicate that the inflammation has ſpread itſelf farther even to the ſtomach.

Thoſe who die of a Semitertian are taken off under the acceſs of a violent paroxyſm, which keeps the type of a tertian, the inflammation, in the mean time, being far diffuſed and converted into putrefaction. Thus Spigelius, in his Lib. de Semitertiana, cap. 14, informs us, that he always found this to be the cauſe of the death of ſuch patients, in the following manner: ‘ When, ſays he, I reflect upon what I have obſerved, in diſſecting thoſe who died of Semitertians, I can aſcribe their death to nothing elſe but putrid ſtagnations in the veſſels; for, in the carcaſſes of ſuch perſons, I found inflammations formed of bilious and pituitous blood, about the concave part of the liver, in the ſtomach, in the great and ſmall inteſtines, in the meſentery, omentum, and ſpleen, and often in one or more of theſe parts, and ſometimes in them all; and a ſupervening gangrene or ſphacelus, though perhaps ſmall, was found to be the cauſe of their ſpeedy death.’

The cure. The two principal intentions to be purſued in the cure of a Semitertian, are,

1. With all expedition either to diſcuſs or hinder the farther ſpreading of the inflammatory ſtagnation lodged in the coats of the meſentery and inteſtines, and expoſing the patient to imminent danger.

2. To correct and gently evacuate the febrile matter during the intermiſſion, having a due regard, at the ſame time, to the critical efforts of nature.

The former of theſe intentions is excellently well anſwered, by diaphoretic and gently nitrous powders exhibited frequently in ſmall doſes. Thus:

Take of the ceruſs of antimony, of prepared mother of pearl, and crabs eyes, each one drachm; of the ſolution of crabs eyes and depurated nitre, each half a drachm; reduce them to a powder, of which, every three hours, fifteen grains may be exhibited in a decoction prepared of two ounces of the roots of vipers-graſs, one ounce of the ſhavings of hartſhorn, one ounce of currans, and half an ounce of the roots of ſuccory, boiled for half an hour in four quarts of water.

The ſame intention is anſwered, by exhibiting every three hours a ſpoonful or two of the reſolvent and diaphoretic mixtures, prepared of the pectoral and analeptic waters of lily of the valley, galangals, carduus benedictus, vipers-graſs, and black cherries, with the diſtilled vinegar of crabs eyes, diaphoretic antimony, the mixtura ſimplex, and the ſyrup of carduus benedictus.

By means of theſe, the ſordes of the primæ viæ, which produce the diſorder, being corrected and diluted, are beſt evacuated by ſolutions of manna, with a due portion of cream of tartar, rhubarb, raiſins, and ſal polychreſtum; for theſe, without any commotion of the blood, irritation of the nervous parts, or loſs of ſtrength, cleanſe the inteſtines, and greatly contribute to remove the infarctions of the meſentery. This intention is, alſo, anſwered by balſamic pills, prepared of bitter extracts, reſinous and balſamic gums, and depurated aloes, together with the precipitating nitrous powder, moderately but frequently uſed. If the more ſubtile parts of the ſordes are, by an increaſed perſpiration, to be eliminated through the cutaneous pores, the eſſence of ſcordium mixed with an equal quantity of the anodyne mineral liquor, is of all other medicines the moſt ſafe and efficacious.

All cures are to be ſo managed, as never to diſturb or interfere with the critical efforts of nature, but rather to aſſiſt them when defective, and moderate them when exceſſive.

Hence, it is highly prejudicial to exhibit purgatives, eſpecially in the beginning of a Semitertian, ſince, by that means, the unprepared matter is agitated, the inflammation increaſed, and the diſeaſe diſpoſed to a ſpeedy, though a fatal event.

Saline deterſives, exhibited by themſelves, are not to be uſed in a Semitertian, eſpecially in large doſes, except antimoniated nitre, to which, and the ſal polychreſtum, Baglivi juſtly aſcribed ſo much; for theſe are poſſeſſed of an aperient, diuretic, and gently laxative quality, and may ſometimes be commodiouſly exhibited to the doſe of fifteen grains, in a ſufficient quantity of ſome proper decoction.

But if a Semitertian ſeizes a perſon who is coſtive, or if he is long coſtive during it, his body is only to be rendered ſoluble, by clyſters prepared of paregoric and emollient ſubſtances, the carminative ſeeds, and Venice ſoap, that thus the primæ viæ may be freed from the excrementitious ſordes; for, if this is neglected, nature ſeeks a way upwards, and excites a vomiting, eſpecially when the biliary ducts in the liver are turgid with an acrid bile.

In the decline of the fever, the phyſician is to follow the tendency of nature, which often terminates the diſorder by a flux, ſo that on this occaſion the above-mentioned laxatives and balſamic pills are commonly uſed.

In a Semitertian, the phyſician is to be very cautious in exhibiting emetics, leſt he ſhould create a vomiting, or hiccup, or diſpoſe the ſtomach to an inflammation: but if the peccant matter is to be evacuated by vomit, in conſequence of the tendency of nature that way, the intention is ſufficiently anſwered by drinking tepid water with ſalt, or a very gentle antimonial ſtimulus.

In a Semitertian, veneſection is not proper, except there is a violent plethora, and an intenſe heat in perſons as yet vigorous, and labouring under a ſuppreſſion of critical hæmorrhages; for, in this caſe, veneſection is abſolutely neceſſary, in order to prevent a mortal inflammation of the inteſtines; but it is to be uſed in the very beginning, ſince, the ſooner a proper quantity of blood is taken away, the ſooner the cure is accompliſhed.

The patient is, alſo, carefully to avoid all hot ſubſtances, alexipharmic eſſences, bezoardic tinctures, a hot regimen, and large quantities of hot liquors; for, by means of theſe, the heat is increaſed, the critical diſcharge of the fomes of the diſeaſe through the inteſtines is diſturbed, and the ſtrength impaired by profuſe ſweats.

Aſtringent, too fixed, earthy, teſtaceous powders, and Peruvian bark, are not to be uſed in a Semitertian; for Baglivi obſerves, that, by means of theſe, either mortal inflammations, or ſlow and hectic fevers, have been brought on.

Though the patient ſhould be afflicted with an exquiſite pain of the abdomen, and frequent ſtools, he is nevertheleſs to abſtain from ſedatives, and is only to be relieved by anointing his abdomen with ſpirituous and corroborative liniments, whilſt the tumult and commotion is to be checked by an internal exhibition of diaphoretics.

For ordinary drink, the moſt proper is the decoction beforementioned; as, alſo, a decoction of oats prepared in the following manner:

Take of clean waſhed oats, one pound; of the roots of ſuccory, ſarſaparilla, and vipers-graſs, each one ounce; of the flowers of red poppy, ſix pugils; of antimoniated nitre, half an ounce; leaves of ſcabious, half an handful; and of pure nitre two drachms; boil them in five quarts of common water, to a conſumption of a third part, and edulcorate with ſyrup of carduus benedictus, wild poppy, or citron juice.

In Semitertians, I have, alſo, found happy effects produced by decoctions of chamomile flowers, and the tops of yarrow, or by extracts prepared from theſe; for ſuch decoctions and extracts ſafely alleviate the pains, eſpecially of the hyſteric and complicated kind, and, at the ſame time, by their bitterneſs, prove excellent antiſcorbutic medicines, and reſtore the due tone of the parts.

As no fever more readily recurs than a Semitertian, ſo the patient is, after it, carefully to avoid the things already enumerated, as the procatarctic cauſes of the diſorder. All things are to be uſed temperately; the body is to be kept ſoluble by mild laxatives; the increaſe of crudities is to be prevented by ſtomachics; and, which is of all other circumſtances the moſt important, the perſpiration is carefully to be kept free and unobſtructed; for as in all fevers, ſo, alſo, in thoſe of the Semitertian kind, the relapſes are far worſe and more obſtinate than the original diſorder.

Theſe are the general precepts, founded on reaſon, and ſupported by the indications of nature, by the obſervation of which the cure may be judiciouſly attempted, and ſucceſsfully performed. But the particular method is to be ſuggeſted by the ſagacity of the phyſician, which is to direct him to the order, doſe, time, and uſe of proper medicines, which, being the ſame with thoſe employed in the cure of continual quotidian, tertian, and quartan intermittents, may be ſeen under theſe articles. *Frederic Hoffman.*

SE'MITONE (*Dict.*)— There are three degrees, or leſſer intervals, by which a ſound can move upwards and downwards ſucceſſively from one extreme of any concord to the other, and yet produce true melody; and, by means whereof, ſeveral voices and inſtruments are capable of the neceſſary variety in paſſing from concord to concord.— Theſe degrees are the greater and leſſer tone, and the Semi-tone. The ratio of the firſt is 8 : 9; that of the ſecond 9 : 10.

The ratio of the Semi-tone is 15 : 16, its compaſs is five commas; which interval is called a Semi-tone, not that it is geometrically the half of either of the tones, for it is more; but becauſe it comes ſomewhat near it. It is alſo called the natural Semi-tone, and the greater Semi-tone, becauſe greater than the part it leaves behind, or its complement to a tone, which is four commas.— The Italians alſo call it ſeconda minore, or a leſſer ſecond.

Every tone of the diatonic ſcale is divided into a greater and leſs, or a natural and artificial Semi-tone. Mr. Malcolm obſerves, it was very natural to think of a diviſion of each tone, where 15 : 16 ſhould be one part in each diviſion, in regard this, being an unavoidable and neceſſary part of the natural ſcale, would readily occur as a fit degree, and the more, as it is not far from an exact half-tone. In effect, the Semi-tones are ſo near equal, that, in practice, at leaſt, on moſt inſtruments, they are accounted equal, ſo that no diſtinction is made into greater or leſs.

Theſe Semi-tones are called fictitious notes, and, with reſpect to the natural ones, are expreſſed by characters called flats and ſharps.

Their uſe is to remedy the defects of inſtruments, which, having their ſounds fixed, cannot always be made to anſwer to the diatonic ſcale.

By means of theſe we have a new kind of ſcale, called the

SE'MI-TONIC *ſcale*, or the *ſcale of Semi-tones*: a ſcale or ſyſtem of muſic, conſiſting of twelve degrees, or thirteen notes, in the octave, being an improvement on the natural or diatonic ſcale, by inſerting, between each two notes thereof, another note, which divides the interval or tone into two unequal parts, called ſemi-tones.

The uſe of this ſcale is for inſtruments that have fixed ſounds, as the organ, harpſicord, &c. which are exceedingly defective on the foot of the natural or diatonic ſcale.— For, the degrees of the ſcale being unequal, from every note to its octave there is a different order of degrees; ſo that from any note we cannot find any interval in a ſeries of fixed ſounds: which yet is neceſſary, that all the notes of a piece of muſic, carried through ſeveral keys, may be found in their juſt tune, or that the ſame ſong may be begun indifferently at any note, as may be neceſſary for accommodating ſome inſtruments to others, or to the human voice, when they are to accompany each other in uniſon.

The diatonic ſcale, beginning at the loweſt note, being firſt ſettled on an inſtrument, and the notes thereof diſtinguiſhed by their names *a . b . c . d . e . f . g*; the inſerted notes, or Semi-tones, are called fictitious notes, and to take the name or letter below with a ♯ as *c* ♯ called *c* ſharp; ſignifying, that it is a ſemi-tone higher than the ſound of *c* in the natural ſeries; or this mark ♭ called a flat, with the name of the note above, ſignifying it to be a ſemi-tone lower. See FLAT and SHARP, in the *Dict.*

Now $\frac{15}{16}$ and $\frac{128}{135}$ being the two ſemi-tones the greater tone is divided into; and $\frac{15}{16}$ and $\frac{24}{25}$, the Semi-tones the leſs tone is divided into; the whole octave will ſtand as in the following ſcheme, where the ratio's of each term to the next are wrote fraction-wiſe between them below.

Scale of SEMI-TONES.

c . c ♯ *. d . d* ♯ *e . f . f* ♯ *. g . g .* ♯ *. a .* ♭ *. b . cc*

$\frac{15}{16}$ $\frac{128}{135}$ $\frac{15}{16}$ $\frac{24}{25}$ $\frac{15}{16}$ $\frac{128}{135}$ $\frac{15}{16}$ $\frac{15}{16}$ $\frac{24}{25}$ $\frac{15}{16}$ $\frac{128}{135}$ $\frac{15}{16}$.

For the names of the intervals in this ſcale it may be conſidered, that as the notes added to the natural ſcale are not deſigned to alter the ſpecies of melody, but leave it ſtill diatonic, and only correct ſome defects ariſing from ſomething foreign to the office of the ſcale of muſic, viz. the fixing and limiting the ſounds: we ſee the reaſon why the names of the natural ſcale are continued, only making a diſtinction of each into a greater and leſs.— Thus an interval of one Semi-tone is called a leſſer ſecond; of two Semi-tones, a greater ſecond; of three Semi-tones, a leſs third; of four, a greater third, &c.

A ſecond kind of ſemitonic-ſcale we have from another diviſion of the octave into Semi-tones; which is performed by taking an harmonical mean between the extremes of the greater and leſs tone of the natural ſcale, which divides it into two Semi-tones nearly equal.— Thus the greater tone 8 : 9 is divided into 16 : 17, and 17 : 18; where 17 is an arithmetical diviſion, the numbers repreſenting the lengths of chords; but, if they repreſent the vibrations, the lengths of the chords are reciprocal, viz. as $1 : {}^{16} : \frac{8}{9}$, which puts the greater Semi-tone $\frac{16}{17}$ next the lower part of the tone, and the leſſer $\frac{17}{18}$ next the upper, which is the property of the harmonical diviſion.— After the ſame manner the leſſer tone 9 : 10 is divided into the two Semi-tones 18 : 19 and 19 : 20, and the whole octave ſtands thus:

c . c . d . d e . f . f ♯ *. g . g .* ♯ *. a .* ♭ *. b . c*

$\frac{16}{17}$ $\frac{17}{18}$ $\frac{18}{19}$ $\frac{19}{20}$ $\frac{15}{16}$ $\frac{16}{17}$ $\frac{17}{18}$ $\frac{18}{19}$ $\frac{19}{20}$ $\frac{16}{17}$ $\frac{17}{18}$ $\frac{15}{16}$.

This ſcale, Mr. Salmon tells us, in the Philoſophical Tranſactions, he made an experiment of, before the royal ſociety, on chords, exactly in theſe proportions, which yielded a perfect concert with other inſtruments, touched by the beſt hands.— Mr. Malcolm adds, that, having calculated the ratio's thereof, for his own ſatisfaction, he found more of them falſe than in the preceding ſcale; but their errors were conſiderably leſs, which made amends.

SE'NATE (*Dict.*)— The Senate's authority in the Roman republic was very conſiderable; they decided what was to be done in matters of peace and war, without ſaying any thing to the people, to whom the ſentiments of the ſaid body were communicated in theſe terms: Senatus decrevit, populus juſſit. It was the Senate's right to give the firſt audience to foreign ambaſſadors, to diſpoſe of provinces, appoint triumphs, and receive letters from the generals of their armies concerning the ſucceſs of the republic's arms. Their power came ſomewhat to be leſſened under the emperors; for Auguſtus conſtituted to himſelf a privy-council, conſiſting of a certain number of Senators, with whom he conſulted concerning the moſt important affairs of ſtate. Tiberius endeavoured by little and little to aſſume the power into his own hands. Nero on the contrary ordered, that the Senate ſhould retain their ancient rights and privileges; but we may ſay with Tacitus, that all this was but a ſpecious pretence, wherewith he was minded to colour his uſurpations. All authors are agreed, that the Senate of Rome was of great dignity and authority, but had not a full power nor an abſolute dominion, they having none to command, and much leſs to execute their orders, as Dionyſius of Halicarnaſſeus has well obſerved; we alſo meet with divers paſſages in Livy to this purpoſe; Senatus decrevit, populus juſſit; that is, the Senate have thought it good, and the people commanded it: and, in ſhort, the leaſt tribune, that oppoſed the Senate, could obſtruct all their decrees; and the Senate gave out their orders to the conſuls and prætors, no otherwiſe than if it pleaſed them, ſi eis ita videtur.

All the great magiſtrates had a right to enter into the Senate, but not to give their opinions there, unleſs they were Senators: The ſenators children had alſo the ſame right, that they might betimes uſe themſelves to the affairs of the republic: the tribunes of the people at firſt ſtood at the door of the Senate, to know their deliberations, and to oppoſe them, in caſe they were contrary to the rights of the people; but they were afterwards admitted in: the conſuls, dictators, tribunes of the people, and the governor of Rome, in the conſul's abſence, had a right to call the Senate together.

The Senate uſually met three times a month, viz. on the calends, nones, and ides, according to Suetonius: and this ſtated aſſembly was called legitimus ſenatus; and all the ſenators were obliged to be preſent, under the penalty of a fine. They might be extraordinarily called together any day in each month; and this they called ſenatus indictus, or edictus. Theſe aſſemblies might be held from morning to evening, in three places in the city, appointed for this purpoſe, viz. in the temple of Concord, between that place and the capitol, at the gate Capena, and in the temple of Bellona, where they gave foreign ambaſſadors audience, before they were introduced into the city. There were alſo a great many more places appointed for this purpoſe, as, Curia Hoſtilia, Pompeia, and Julia, which the augurs firſt conſecrated, according to Aulus Gellius and Varro.

The aſſembly of the Senate began with a ſacrifice offered to the gods; but Auguſtus altered this cuſtom, and ordered every ſenator to offer a ſacrifice of wine and incenſe upon the altar of the god, in whoſe temple the Senate met, before he took his ſeat, or could conſult about any buſineſs, as Suetonius in his Life, c. 35, informs us. After which he was obliged to take an oath, by touching the altar, and calling the gods to witneſs, that he would give his opinion with ſincerity, and without flattery. This being done, the ſenators took their places, when the conſul, or he who ſat as preſident, propoſed both the public and private buſineſs, which they were to conſult about.

SE'NATOR (*Dict.*)— Romulus inſtituted the firſt hundred Senators at Rome, which made up the king's council: in order to be a Senator, a man muſt be a citizen of Rome, or of the municipal cities that had the ſame privileges or freedom: reſpect was had to their manners, birth, and eſtate:

for a Senator ought to have a revenue of 4000 pounds for the maintenance of his dignity; but Auguſtus required he ſhould have 300000 crowns. He was to be at leaſt thirty years old before he was made a Senator.

We are not without inſtances of children affranchiſed, and of perſons yet of a meaner condition, and even ſtrangers, who have arrived at the dignity of Senators; but this was brought about either by intrigue, or the emperor's authority. The choice of Senators belonged at firſt to the kings; the conſuls afterwards were inveſted with this power; and, laſtly, the cenſors, being obliged every five years to take an account of them, ſubſtituted others in the room of thoſe that were dead, or had been degraded: but, in the decaying time of the republic, the emperors arrogated this power to themſelves, and made as many Senators, and of what quality they pleaſed.

The number of Senators varied according to various times: Romulus at firſt created a hundred of them, which he called patres; and, after the alliance made with the Sabines, increaſed their number to a hundred more. Tarquinius Priſcus, according to Livy, or, as others will have it, king Servius, added alſo an hundred, which he named Patres minorum gentium, becauſe they were not of ſo noble an extract as the former. This number of 300 Senators continued to the time of C. Gracchus, tribune of the people; who, oppoſing the nobles, made the people add 300 Roman knights to the reſt, in order to counterbalance the number of the 300 Senators: thus the nnmber of 600 Senators laſted to the time of Julius Cæſar, who being willing to gratify a great many brave men, who had faithfully ſerved him in his wars againſt Pompey, increaſed the number to 1000 of all ſorts of people, without diſtinction. But Auguſtus, to purge this body that was in an ill habit, reduced it to the former number of 600. And ſo, of the 300 Senators, the 200 created by Romulus were called Patricii majorum gentium, and the other 100 Adlecti, or Conſcripti, a name which afterwards continued to be given to the whole ſenate.

Among theſe Senators, there were ſome who had a deciſive vote, and ſpoke their ſentiments in the matters that were propoſed; and others who did no more than follow thoſe ſentiments which to them appeared moſt reaſonable; and this made them be called Pediarii Senatores, who did not declare their own opinions, but ſided with thoſe whoſe opinions they approved of: Aulus Gellius rejects this interpretation, and ſeems to follow that of Q. Baſſus, who ſays in his Commentaries, that thoſe of the Senators who had never bore the office of curule magiſtrate, went a foot to the ſenate, and for that reaſon were called Pedarii Senatores.

The Senators wore a very large purple tunicle with broad edges called lati-clavii; they had a right to ſit or be carried in the curule chair, to aſſiſt at plays and ſhews in the Orcheſtra, and likewiſe at feaſts and the banquet conſecrated to Jupiter, in the capitol. The cenſors took an account of them every five years, calling them with a loud voice; and thoſe whom they paſſed over were degraded from the order of Senators, which were called præterire: but, if the perſon who was paſſed over was minded to oblige the cenſor to tell the reaſon of it, he was under an obligation to do it, ſays Lipſius, and then he was degraded with the greateſt ignominy and ſhame; this being called ejicere ſenatu. He, who was thus degraded, had the remedy of appealing to the people, who, in ſpite of the cenſor, did many times re-eſtabliſh him.

SE'NEKA, *rattle-ſnake-root.* See POLYGALA.

SE'NNA (*Dict.*)—The ſeeds ſhould be ſown early in the ſpring, upon a good hot-bed; and, when the plants are come up, and are ſtrong enough to tranſplant, they ſhould be each planted in a ſmall pot filled with light rich earth, and plunged into a freſh hot-bed, in order to bring the plants forward: for, as this is an annual plant, unleſs the plants are brought on in the ſpring, they will not flower in this country: therefore, they muſt be conſtantly kept in the hot-bed all the ſummer, obſerving to admit plenty of air in warm weather; by which method I have frequently had this plant in flower, but it is very rare that they perfect their ſeeds in England.

If the ſeeds of this plant were ſent to South Carolina, the plants might be propagated there, ſo as to furniſh plenty of the leaves, to ſupply the conſumption of Great-Britain.

In the Weſt-Indies, the inhabitants make uſe of the leaves of ſeveral ſpecies of caſſia, inſtead of this plant; and, alſo, of thoſe of the poinciana, or flower-fence, which is frequently called by them the true Senna.

SENSA'TION (*Dict.*)—To conceive the manner wherein Senſation is effected, obſerve, that all the organs conſiſt of little filaments, or nerves which have their origin in the middle of the brain, are diffuſed thence throughout all the members which have any ſenſe, and terminate in the exterior parts of the body; that when we are in health, and awake, one end of theſe nerves cannot be agitated or ſhaken, without ſhaking the other, by reaſon they are always a little ſtretched; as in the caſe of an extended chord, one part of which cannot be ſtirred without a like motion of all the reſt.

Obſerve, further, that theſe nerves may be agitated two ways, either at the end out of the brain, or that in the brain.—If they be agitated from without, by the action of objects, and their agitation be not communicated as far as the brain; as frequently happens in ſleep, when the nerves are in a ſtate of relaxation; the ſoul does not then receive any new Senſation.—But if the nerves happen to be agitated in the brain, by the flux of the animal ſpirits, or any other cauſe; the ſoul perceives ſomething, though the parts of thoſe nerves, that are out of the brain, diffuſed through the ſeveral parts of the body, remain at perfect reſt: as likewiſe is frequently the caſe in ſleep.

Laſtly, obſerve, that experience tells us, we may ſometimes feel pain in parts of the body that have been entirely cut off, by reaſon the fibres in the brain correſponding to them, being agitated in the ſame manner, as if they were really hurt; the ſoul feels a real pain in thoſe imaginary parts.

All theſe things ſeem to ſhew, that the ſoul reſides immediately in that part of the brain wherein the nerves of all the organs of ſenſe terminate: we mean, it is there it perceives all the changes that happen with regard to the objects that cauſe them, or that have been uſed to cauſe them; and that it only perceives what paſſes out of this part, by the mediation of the fibres terminating in it.

Theſe things premiſed, it will not be difficult to explain how Senſation is performed: the manner whereof may be conceived from what follows. When the point of a needle, for inſtance, is thruſt againſt the hand, that point ſtirs and ſeparates the fibres of the fleſh, which fibres are extended from that place to the brain, and when we are awake, are in ſuch a degree of tenſion, as that they cannot be ſtirred without ſhaking thoſe of the brain. If then the motion of the fibres of the hand be gentle, that of the fibres of the brain will be ſo too; and, if the firſt be violent enough to break any thing in the hand, the laſt will be ſtronger and more violent in proportion.—In like manner, if the hand be held to the fire, the little particles of the wood it throws off in great numbers, and with a great deal of violence, ſtriking againſt theſe fibres, and communicating a part of their agitation thereto; if the action be moderate, that of the extremities of the fibres of the brain, correſponding to thoſe of the hand, will be moderate likewiſe: if it be violent enough to ſeparate any of the parts of the hand, as it happens in burning; the motion of the fibres in the brain will be proportionably more violent. This is what befals the body, when objects ſtrike upon it.—We are now to conſider how the mind is affected.

The mind, we have obſerved, reſides principally, if we may be allowed to ſay ſo, in that part of the brain where all the fibres of the nerves terminate. It attends here, as its ſenſory, or office, to look to the preſervation of all the parts of the body; and, of conſequence, muſt be here advertiſed of all the changes that happen, and muſt be able to diſtinguiſh between thoſe agreeable to the conſtitution of the body, and thoſe hurtful thereto. Any other abſolute knowledge, without a relation to the body, were uſeleſs.—Thus, though all the changes in our fibres do, in reality, conſiſt in motions, which ordinarily only differ as to more and leſs; it is neceſſary the ſoul ſhould conſider them as changes eſſentially different; for, though in themſelves they differ but very little, yet, with regard to preſervation of the body, they are to be looked on as eſſentially different.

The motion, for inſtance, which cauſes pain, frequently differs exceeding little from that which occaſions a pleaſing titillation: it is not neceſſary there ſhould be an eſſential difference between theſe two motions; but it is neceſſary there be an eſſential difference between the pain and the tickling, which thoſe two motions occaſion in the ſoul; for the agitation of the fibres, which accompanies the titillation, informs the ſoul of the good ſtate of the body, that it is able to reſiſt the impreſſion of the objects, and that it need not apprehend its being hurt: but the motion which occaſions pain, being ſomewhat more violent, is capable of breaking ſome of the fibres of the body; wherefore it is neceſſary the ſoul be advertiſed hereof by ſome diſagreeable Senſation, that it may provide againſt it.

Thus, though all the motions which paſs in the body only differ in themſelves, as to more or leſs, yet, when conſidered with regard to the preſervation of life, they may be ſaid to be eſſentially different: for this reaſon it is, that the ſoul does not perceive the ſhakes, or motions themſelves, which objects excite in the fibres of the fleſh: it would be uſeleſs to perceive them; and ſhe would never be able, thence, to learn whether the objects were capable of doing hurt or good. But ſhe perceives herſelf affected with Senſations, which differ eſſentially, and which ſhewing preciſely the qualities of the objects, as they regard the body, make her perceive diſtinctly, whether or no thoſe objects are capable of hurting it.

In effect, from a ſtrict examination of the ſeveral ſenſes, it appears, that ſenſible objects act no otherwiſe upon the body, for the producing of Senſation, than by exciting a change in the extreme ſurface of the fibres of the nerves: the quality of which change depends on the figure, bulk, hardneſs, and motion of the object; ſo that, according to all appearance, the moſt different objects, which ſhould agree in theſe four circumſtances, would produce the ſame Senſation.

From the various texture of the object, the diverſity of the nerve affected, the different fabric of the organ of ſenſe, the different place in the medulla of the brain where the nerve ariſes, and the different degree of motion wherewith the action of the object is applied, ariſe various Senſations, and ideas, in the mind; none of which repreſent any thing in the action of the object, on in the paſſion of the organ. And yet the ſame action of the ſame object, on the ſame organ, always produces the ſame Senſation or idea: and the ſame ideas neceſſarily follow the ſame diſpoſition of the ſame ſenſible organ, in the ſame manner as if the idea perceived were the natural and neceſſary effect of the action on the organ.

SENSE (*Dict.*)—Some uſe the word Senſe in a greater latitude; and define it a faculty whereby the ſoul perceives ideas or images of objects, either conveyed to it from without, by the impreſſion of objects themſelves, or excited within by ſome effort of the ſoul of the ſenſory itſelf.

Under which notion, Senſe becomes diſtinguiſhable into two kinds, external and internal: correſponding to the two ſeveral manners wherein the images of the objects perceived are occaſioned, and preſented to the mind, viz. either immediately from without, or from within; that is, either by what we commonly call the five external Senſes, hearing, ſeeing, &c. or by the internal ones, imagination, memory, and attention; to which ſome add hunger and thirſt.

But theſe internal Senſes are not ordinarily conſidered in the notion of Senſes, nor implied under the word Senſe; but are thus only denominated by analogy.

The means, on the part of the mind, are always the ſame; it being one and the ſame faculty, whereby we ſee, hear, &c.—The means, on the part of the body, are different; as different as are the objects we are concerned to perceive: for, the being and well-being of the animal being the end, nature had in view in giving him any perception of external bodies, by this, the meaſure and manner of that perception is regulated: and we have ſo many ways of perceiving, and of perceiving ſo many things, as the relation we bear to external bodies renders neceſſary for the preſervation, &c. of our being.

Hence thoſe ſeveral organs of Senſe, called eye, ear, noſe, palate, and the univerſal one cutis; each of which is ſo diſpoſed as to give ſome repreſentation and report to the mind of the ſtate of external things, the nearneſs, convenience, hurtfulneſs, and other habitudes; and each of them a different one, according to the degree, and immediateneſs, &c. of the danger, or conveniency. And hence the ſeveral exerciſe of thoſe organs, hearing, ſeeing, ſmelling, taſting, and feeling.

A late excellent author gives us a more ingenious, extenſive, and philoſophical notion of Senſe.—On his principle, Senſe is defined a power of perception, or a power of receiving ideas; if what is abſolutely paſſive may be properly called a power.

On ſome occaſions, inſtead of power, he chuſes to call it a determination of the mind to receive ideas.—The ideas thus perceived, or raiſed in the mind, he calls ſenſations. Senſe he conſiders, either as natural or moral: and the natural, either as external or internal: though the diſtribution is chiefly founded on the common ways of conceiving; for, in reality, they appear to be all natural and neceſſary: ſome reaſons, however, for the diſtinction, will be ſhewn under the ſeveral articles thereof.

External SENSES, then, are powers of perceiving ideas, upon the preſence of external objects.—On ſuch occaſions, we find the mind is merely paſſive, and has not power directly to prevent the perception, or idea, or to vary it at its reception; as long as the body is continued in a ſtate fit to be acted upon by the external object.

When two perceptions are intirely different from each other, or agree in nothing but the general idea of ſenſation; the power of receiving thoſe different perceptions is called different Senſes. Thus ſeeing and hearing denote the different powers of receiving the ideas of colours and ſounds. And though colours, as well as ſounds, have vaſt differences amongſt themſelves; yet is there a greater agreement among the moſt oppoſite colours, than between any colour and a ſound: and hence all colours are deemed perceptions of the ſame Senſe.

All the ſeveral Senſes ſeem to have their diſtinct organs, except feeling, which is, in ſome degree, diffuſed over the whole body.

Internal SENSES (*Dict.*)—Of theſe there are two different ſpecies, diſtinguiſhed by the different objects of pleaſure, viz. pleaſurable or beautiful forms of natural things, and pleaſurable or beautiful actions, or characters of rational agents: whence the internal Senſes become diviſible into natural and moral; though what we call the internal natural Senſe, our author calls ſimply, and by way of eminence, the internal Senſe.

In reflecting on our external Senſes, we plainly ſee, that our perceptions of pleaſure, and pain, do not depend directly on our will. Objects do not pleaſe us according as we incline they ſhould: the preſence of ſome objects neceſſarily pleaſes us, and the preſence of others as neceſſarily diſpleaſes us; nor can we, by our will, any otherwiſe procure pleaſure, or avoid pain, than by procuring the former kind of objects, and avoiding the latter. By the very frame of our nature, the one is made the occaſion of delight, and the other of diſſatisfaction. In effect, our ſenſitive perceptions are pleaſant and painful, immediately, and without any knowledge of the caſe of this pleaſure and pain, or of the manner how they excite it, or are occaſions of it, or without ſeeing to what further advantage, or detriment, the uſe of ſuch objects might tend. Nor would the moſt accurate knowledge of theſe things vary either the pleaſure, or the pain, of the perception; however it might give a rational pleaſure diſtinct from the ſenſible; or might raiſe a diſtinct joy, from proſpect of further advantage in the object, or averſion, from apprehenſion of evil. There is ſcarce any object, which our minds are employed about, but is conſtituted the neceſſary occaſion of ſome pleaſure or pain. Thus we ſhall find ourſelves pleaſed with a regular form, a piece of architecture, or painting, a compoſition of notes, a theorem, an action, an affection, a character; and we are conſcious that this pleaſure naturally ariſes from the contemplation of the idea then preſent in the mind, with all its circumſtances, though ſome of thoſe ideas have nothing of what we call ſenſible perception in them; and, in thoſe which have, the pleaſure ariſes from ſome uniformity, order, arrangement, imitation; and not from the ſimple ideas of colour, or ſound, or mode of extenſion ſeparately conſidered.

It ſeems hence to follow, that, when inſtruction, education, or prejudice of any kind, raiſe any deſire or averſion towards an object, this deſire, or averſion, is founded on an opinion of ſome perfection, or deficiency, in thoſe qualities, for perception whereof we have the proper Senſes. Thus, if beauty be deſired by one who has not the Senſe of ſight; the deſire muſt be raiſed by ſome apprehended regularity of figure, ſweetneſs of voice, ſmoothneſs, ſoftneſs, or ſome other quality perceivable by the other Senſes, without relation to the ideas of colour.

The only pleaſure of Senſe, which our philoſophers ſeem to conſider, is that which accompanies the ſimple ideas of ſenſation; but there are vaſtly greater pleaſures in thoſe complex ideas of objects, which obtain the names of beautiful and harmonious.—The power, then, whereby we receive ideas of beauty and harmony, has all the characters of a Senſe. It is no matter, whether we call theſe ideas of beauty and harmony perceptions of the external Senſes of ſeeing and hearing, or not: we ſhould rather chuſe to call theſe ideas an internal Senſe, were it only for the convenience of diſtinguiſhing them from other ſenſations of ſeeing and hearing, which men may have without perception of beauty and harmony.

Moral SENSE (*Dict.*)—This moral Senſe of beauty, in actions and affections, may appear ſtrange at firſt view: ſome of our moraliſts themſelves are offended at it in my lord Shaftſbury, as being accuſtomed to deduce every approbation, or averſion, from rational views of intereſt. Our gentlemen of good taſte can tell us of a great many Senſes, taſtes and reliſhes for beauty, harmony, imitation in painting and poetry; and may we not find, too, in mankind, a reliſh for a beauty in characters, in manners? The truth is, human nature does not ſeem to have been left quite indifferent, in the affair of virtue, to form to itſelf obſervations concerning the advantage or diſadvantage of actions, and accordingly to regulate its conduct. The weakneſs of our reaſon, and the avocations ariſing from the infirmity and neceſſities of our nature, are ſo great, that very few of mankind could have framed thoſe long deductions of reaſon, which may ſhew ſome actions to be, in the whole, advantageous, and their contraries pernicious. The author of nature has much better furniſhed us for a virtuous conduct, than our moraliſts ſeem to imagine, by almoſt as quick and powerful inſtructions, as we have for the preſervation of our bodies; he has made virtue a lovely form, to excite our purſuit of it, and has given us ſtrong affections, to be the ſprings of each virtuous action.

SE'NSITIVE *Plant* (*Dict.*)—The ſtructure of the Senſitive plant is this: from the large ſtems, or main branches of the whole, there part off ſeveral other leſſer ones, and from theſe there go off others ſtill leſs, which, by way of diſtinction, may be called the ribs of the leaves, as they ſerve to ſupport a number of leaves arranged on each ſide, and ſtanding on ſhort pedicles in pairs over-againſt one another. Several other plants have this ſort of compound leaves, as the caſſia, colutea, and the like; and all theſe ſhut their leaves together at night, and open them again in the morning, in the ſame manner as the Senſitive plant does. This periodical opening and ſhutting of the leaves is therefore common to many plants, not peculiar to the Senſitive plant; but the wonder in this is, that, beſides having this motion periodical and regular, it is to be brought on at other times, and by accidents, there requiring no more than the touching the plant to make it cloſe its leaves at any time of the day, which it ſoon afterwards naturally opens again. This is peculiar to this plant, and reſembles the action of an animal which had been injured or frightened. A cloſe obſervation alſo of the manner, in which this is performed, will give many hints towards the finding its cauſe.

It is a very difficult thing to touch the leaf of a vigorous Senſitive plant ſo lightly, as not to make it cloſe. Its ſenſation is extremely delicate; and its large rib or nerve, which runs along its middle, is as it were a hinge, on which the two halves of the leaf move, when they turn upon being touched, till they ſtand erect, and by that means meet one another. The ſlighteſt touch imaginable gives this motion to the ſide of the leaf which is touched, which is communicated immediately to the other ſide or half, and they move together; and, if the touch hath been a very little rougher, the oppoſite leaf on the ſame rib receives the impreſſion, and cloſes up in the ſame manner with that which was actually touched.

Nor is this all; for, when the two ſides of each of theſe leaves move upwards, the pedicle of each half moves upwards at the ſame time, and by this means they, in ſome meaſure, approach towards each other, and make the angles of their pedicles with the main rib, or ſtalk of the compoſite leaf, leſs than before; and the total motion of each leaf is compoſed of theſe two motions.

If the touch be ſtill rougher, the whole arrangement of leaves on the ſame rib feel its influence on each ſide, and all cloſe in the ſame manner with the ſingle pair in the preceding inſtance; and, if the touch be yet ſtronger than this, the rib itſelf feels it, and attempts to cloſe in its way, moving itſelf upwards towards the branch from which it is produced, juſt as the ſingle pedicles of the leaves did towards it; and, if the touch be yet more hard and rough, the very branches have the ſenſation propagated to them, and apply themſelves to the main ſtem or trunk of the ſhrub, as the ſimple leaves did before to their rib, and that rib to the branch; ſo that the whole plant in this ſtate forms itſelf, from a very complexly-branched figure, into a ſort of ſtraight cylindric one. The motion which has, of all others, the greateſt effect upon this plant, is a ſhaking one.

Theſe three motions of the plant are performed by means of three diſtinct and ſenſible articulations; the firſt, that of the ſingle leaf to its pedicle; the ſecond, that of the pedicle to its branch; the third, that of the branch to the trunk. The primary motion of all which is the cloſing of the two halves of the leaf upon this rib, which ought alſo to be performed in a ſimilar manner, and by a ſimilar articulation: this, however, is much leſs viſible than the others.

Theſe motions are wholly independent on one another, as may be proved by experiment. It ſhould appear, that, if the ſtalks are moved and collapſe towards the branches, or theſe towards the trunk, that the leaves, whoſe motion is uſually primary to theſe, ſhould be affected alſo; yet experiment proves, that it is poſſible to touch the branches in ſuch a manner, as to affect them only, and make them apply themſelves to the trunk, while the leaves feel nothing of the touch: but this cannot be, unleſs the branches are ſo diſpoſed, as that they can fall to the trunk without ſuffering their leaves to touch any other part of the plant in their paſſage; becauſe, if they do, they immediately become affected. Winds and heavy rains cauſe the Senſitive plants to ſhut up their leaves, while eaſy ſhowers do not at all affect them: it is plain from hence, that the agitation of the plant by the wind, and the ſtrokes given by the large and haſty drops of rain, are what cauſe the contraction.

By whatever accident the plant has been made to cloſe its leaves, it always regularly opens them again afterwards. This, however, requires different times, according to ſeveral circumſtances, as the time of the day, the ſeaſon of the year, and the more or leſs vigorous and healthy ſtate of the plant: ſometimes this is done in ten minutes, ſometimes it requires half an hour. And the manner is not leſs different than the time; for ſometimes the leaves unfold themſelves firſt, and ſometimes the branches; whereas ſometimes all is done at once, and the whole plant ſeems in motion at a time.

In endeavouring to account for the motions of this plant, Meſſ. Du Fay and Du Hamel have conjectured, that they are performed by means of a ſort of very nice and fine hinges, which communicate one with another by means of very minute and ſlender cords, which occaſion them to act as we ſee when the plant is ſufficiently diſturbed, and theſe cords ſhaken; and what gives a ſtrong probability to this conjecture is, that the decayed and dying leaves of this plant perform this motion as regularly and vigorouſly, as thoſe which are freſh and full of juice. It ſeems plain, that, while the juices are evaporating, and the parenchymatous ſubſtance of the leaves drying up, theſe more ſolid parts, the lines and cordages, retain their figure; and, conſequently, if it is by means of theſe that the motion is always performed, it will be as well performed in theſe as in the freſher leaves; which could not be the caſe, were it owing to the juices.

The natural opening and ſhutting of the leaves of this plant, at night and morning, are not ſo fixed but that they are variable alſo, according to circumſtances of place, temperature, &c. In the month of Auguſt, a Senſitive plant was carried in a pot out of its uſual place into a dark cave; the motion that it received in the carriage ſhut up its leaves, and they did not open for twenty-four hours afterwards. At this time they became moderately open, but afterwards ſubject to no changes at night or morning, but remained three days and nights with their leaves in the ſame moderately open ſtate. At the end of this time they were brought out again into the air, and there recovered their natural periodical motions, ſhutting every night, and opening every morning, as naturally and as ſtrongly as if it had not been in this forced ſtate; and, while in the cave, it was obſerved to be very little leſs affected with the touch, than when abroad in the open air.

Repeated experiments have proved, that it is not the light of the day that opens theſe plants, nor the darkneſs of the night that cloſes them; neither is it the alternate warmth of the day, and cold of the night, that have this effect, ſince it ſhuts in nights that are much warmer than the days often are, in which it opens; and the increaſing the heat of the place in which it is kept, and marking the increaſe or decreaſe on the thermometer, have not been found to have the leaſt effect, as to its ſooner or later opening or ſhutting its leaves.

The moſt probable conjecture ſeems, that it is not great heat, or great cold, ſuch as it can bear, that brings on this effect, but the ſudden change from one to the other; and this is confirmed by this experiment: that, if one of theſe plants be raiſed under a glaſs bell or caſe, and the bell or covering be taken off, it immediately cloſes, even though it be in the middle of the day; and this is alſo obſerved, that, the more open or expoſed the plant ſtands, the more ſtrong and lively are its ſhutting and opening; and that they are moſt obſervable in ſummer, and much leſs ſo, when it is kept in a cloſe ſtove in winter.

The great heats of ſummer, when there is open ſunſhine at noon, affect the plant in ſome degree like cold, cauſing it to ſhut up its leaves a little, but never in any great degree. The plant, however, is leaſt of all affected about nine o'clock in the morning, and that is, conſequently, the propereſt time to make experiments on it. A branch of the Senſitive plant, cut off and laid by, retains yet its property of ſhutting and opening in the morning for ſome days; and it holds it longer, if kept with one end in water, than if left to dry more ſuddenly.

The leaves only of the Senſitive plant ſhut up in the night, not the branches; and, if it be touched at this time, the branches are affected in the ſame manner as in the day, ſhutting up, or approaching to the ſtalk or trunk, in the ſame manner, and often with more force. It is of no conſequence what the ſubſtance is with which the plant is touched, it anſwers alike to all; but there may be obſerved a little ſpot, diſtinguiſhable by its paler colour in the articulations of its leaves, where the greateſt and niceſt ſenſibility is evidently placed.

SENTENCE, in grammar (*Dict.*)—In every Sentence there are two parts neceſſarily required; a noun for the ſubject, and a definite verb; whatever is found more than theſe two, affects one of them, either immediately, or by the intervention of ſome other, whereby the firſt is affected.

Again, every Sentence is either ſimple or conjunct: a ſimple Sentence is that conſiſting of one ſingle ſubject and one finite verb.—A conjunct Sentence contains ſeveral ſubjects and finite verbs, either expreſly or implicitly.

A ſimple Sentence needs no point or diſtinction; only a period to cloſe it: as, ‘A good man loves virtue for itſelf’.—In ſuch a Sentence, the ſeveral adjuncts affect either the ſubject or the verb in a different manner. Thus the word ‘good’ expreſſes the quality of the ſubject, ‘virtue’ the object of the action, and, ‘for itſelf,’ the end thereof.—Now none of theſe adjuncts can be ſeparated from the reſt of the Sentence: for, if one be, why ſhould not all the reſt? And, if all be, the Sentence will be minced into almoſt as many parts as there are words.

But, if ſeveral adjuncts be attributed in the ſame manner either to the ſubject or the verb, the Sentence becomes conjunct, and is to be divided into parts.

In every conjunct Sentence, as many ſubjects, or as many finite verbs as there are, either expreſly, or implied, ſo many diſtinctions may there be. Thus, ‘My hopes, fears, joys, pains, all center in you:’ and thus Cicero, ‘Catilina abiit, exceſſit, evaſit, erupit.’—The reaſon of which pointing is obvious; for, as many ſubjects or finite verbs as there are in a Sentence, ſo many members does it really contain. Whenever, therefore, there occur more nouns than verbs, or contrariwiſe, they are to be conceived as equal. Since, as every ſubject requires its verb, ſo every verb requires its ſubject, wherewith it may agree: excepting, perhaps, in ſome figurative expreſſions.

Indeed, there are ſome other kinds of Sentences which may be ranked amongſt the conjunct kind, particularly the abſolute ablative, as it is called: Thus, ‘Phyſicians, the diſeaſe once diſcovered, think the cure half wrought:’ where the words, ‘diſeaſe once diſcovered’, are equivalent to, ‘when the cauſe of the diſeaſe is diſcovered.’— So alſo in nouns added by appoſition; as, ‘The Scots, a hardy people, endured it all’: ſo alſo in vocative caſes and interjections; as, ‘This, my friend, you muſt allow me:’ And, ‘What, for heaven's ſake, would he be at!’

The caſe is much the ſame, when ſeveral adjuncts affect either the ſubject of the Sentence, in the verb, in the ſame manner; or at leaſt ſomething, whereby one of them is affected: as, ‘A good, wiſe, learned man, is an ornament to the commonwealth:’ where the ſeveral adjectives, denoting ſo many qualities of the ſubject, are to be ſeparated from one another.—

Again, when I ſay, ‘ Your voice, countenance, geſture terrified him’ : the ſeveral nominative caſes denote ſo many modes of the verb, which are likewiſe to be diſtinguiſhed from each other. The caſe is the ſame in adverbs ; as, ‘ He behaved himſelf modeſtly, prudently, virtuouſly’.—In the firſt example, the adjuncts immediately affect the ſubject ; in the third, the verb ; in the following one, another adjunct : as, ‘ I ſaw a man loaden with age, ſickneſs, wounds.’

Now, as many ſuch adjuncts as there are, ſo many ſeveral members does the Sentence contain ; which are to be diſtinguiſhed from each other, as much as ſeveral ſubjects, or finite verbs : and that this is the caſe in all conjunct Sentences, appears hence, that all theſe adjuncts, whether they be verbs or nouns, &c. will admit of a conjunction copulative, whereby they may be joined together.—But, where-ever there is a copulative, or room for it, there a new member of a Sentence begins.

SE'PTICS, among phyſicians, an appellation given to all ſuch ſubſtances as promote putrefaction.

From the many curious experiments made by Dr. Pringle to aſcertain the Septic and antiſeptic virtues of natural bodies, it appears that there are very few ſubſtances of a truly Septic nature. Thoſe commonly reputed ſuch by authors, as the alcaline and volatile ſalts, he found to be no wiſe Septic. However, he diſcovered ſome, where it ſeemed leaſt likely to find any ſuch quality ; theſe were chalk, common ſalt, and the teſtaceous powders. He mixed twenty grains of crab's eyes, prepared with ſix drachms of ox's gall, and an equal quantity of water. Into another phial he put an equal quantity of gall and water but no crab's-eyes. Both theſe mixtures being placed in the furnace, the putrefaction began much ſooner, where the powder was, than in the other phial. On making a like experiment with chalk, its Septic virtue was found to be much greater than that of the crab's-eyes : nay, what the doctor had never met with before, in a mixture of two drachms of fleſh with two ounces of water and thirty grains of prepared chalk, the fleſh was reſolved into a perfect mucus in a few days.

To try whether the teſtaceous powders would alſo diſſolve vegetable ſubſtances, the doctor mixed them with barley and water, and compared this mixture with another of barley and water alone. After along maceration by a fire, the plain water was found to ſwell the barley, and turn mucilaginous and ſour ; but that with the powder kept the grain to its natural ſize, and though it ſoftened it, yet made no mucilage and remained ſweet.

Nothing could be more unexpected, than to find ſea-ſalt a haſtener of putrefaction, but the fact is thus : one drachm of ſalt preſerves two drachms of freſh beef in two ounces of water, above thirty hours, uncorrupted, in a heat equal to that of the human body ; or, which is the ſame thing, this quantity of ſalt keeps fleſh ſweet twenty hours longer than pure water. But then half a drachm of ſalt does not preſerve it above two hours longer. Twenty-five grains have little or no antiſeptic virtue, and ten, fifteen, or even twenty grains manifeſtly both haſten and heighten the corruption. The quantity, which had the moſt putrefying quality, was found to be about ten grains to the above proportion of fleſh and water.

Many inferences might be drawn from this experiment. One is, that ſince ſalt is never taken in aliment beyond the proportion of the corrupting quantities, it would appear that it is ſubſervient to digeſtion, chiefly by its Septic virtue, that is, by ſoftening and reſolving meats : an action very different from what is commonly believed.

It is to be obſerved that the above experiments were made with the ſalt kept for domeſtic uſes. *Pringle's Obſerv. on Diſ. of the Army.*

SEPTIFO'LIOUS *Plants*, they are ſuch has have but ſeven leaves.

SERJA'NIA, a name given to a genus of plants by father Plumier, who diſcovered them in America, in honour to the reverend father Philip Sergeant, who was of the order of the Minims, and a perſon well verſed in the knowledge of botany and phyſic.

The characters of the genus are :

It hath a roſe-ſhaped flower, conſiſting of four or more leaves, which are placed in a circular order : from whoſe flower-cup ariſes the pointal, which afterwards becomes a fruit compoſed of three cells having three wings, and each cell containing one round ſeed.

SE'RIES (*Dict.*)—The doctrine of Series is of extenſive uſe in mathematics, and has been carried far, though not ſo far as could be wiſhed. It would far exceed the limits of our deſign to enter into a detail of the diſcoveries relating to this ſubject.

A Series being propoſed, one of the principal queſtions concerning it, is, to find the law of its continuation. For this no univerſal rule can be given ; but it often happens, that the terms of the Series, taken two and two, three and three, or in greater numbers have an obvious and ſimple relation, by which the Series may be determined and produced indefinitely. Thus, if unity be divided by $1-x$, the quotient will be a geometric progreſſion, any term of which will be to the next antecedent term as x to 1. And by this property the Series $1+x+x^2+x^3+$ &c. may be diſtinguiſhed and produced ad infinitum. In like manner, in other caſes of diviſion, other Series's will ariſe, the terms of which will have a conſtant relation to each other, and this relation recurring always throughout the Series, they have been called recurring Series by Mr. de Moivre, who firſt conſidered them, and applied them to the ſolution of ſeveral intricate problems.

In many caſes, the relation of the terms of a Series is not conſtant, as it is in thoſe ariſing from diviſion. Yet this relation often varies according to a certain law obvious upon inſpection. Thus in the Series $1+\frac{2}{3}x+\frac{8}{15}x^2+\frac{16}{35}x^3+\frac{128}{315}x^4+$ &c. the terms may be continued indefinitely by the continued multiplication of theſe fractions $\frac{2}{3}$, $\frac{4}{5}$, $\frac{6}{7}$, $\frac{8}{9}$, &c. And the following Series. $1+\frac{1}{6}x+\frac{3}{40}x^2+\frac{5}{112}x^3+\frac{35}{1152}x^4+$ &c. may be continued by the multiplication of the fractions $\frac{1\times1}{2\times3}$, $\frac{3\times3}{4\times5}$, $\frac{5\times5}{6\times7}$, $\frac{7\times7}{8\times9}$, &c.

Series's of this kind may be defined by differential equations. The equation defining a Series is that which aſſigns the relation of the terms generally by their diſtances from the beginning. To do this Mr. Stirling conceives the terms of the Series to be placed as ſo many ordinates on a right line given by poſition, and he, for the ſake of ſimplicity, takes unity as the common interval of theſe ordinates. The initial terms of the Series he denotes by the initial letters of the alphabet, A, B, C, D, &c. A being the firſt, B the ſecond, C the third, &c. And he denotes any term in general by the letter T, and the reſt following it in order, T′, T″, T‴, T⁗, &c. He denotes the diſtance of the term T from any given term, or from any given intermediate point between two terms, by the indeterminate quantity z : ſo that the diſtances of the terms T′, T″, T‴, &c. from the ſaid term or point, will be, $z+1$, $z+2$, $z+3$, &c. for the increment of the abſciſs is the common interval of the ordinate, or terms of the Series applied to the abſciſs.

Theſe things being premiſed, let this Series be propoſed, 1, $\frac{1}{2}x$, $\frac{3}{8}x^2$, $\frac{5}{16}x^3$, $\frac{35}{128}x^4$, $\frac{63}{256}x^5$, &c. in which the relations of the terms are $B=\frac{1}{2}Ax$, $C=\frac{3}{4}Bx$, $D=\frac{5}{6}Cx$, $E=\frac{7}{8}Dx$, &c. The relation in general will be defined by the equation, $T'=\frac{z+\frac{1}{2}}{z+1}Tx$, where z denotes the diſtance of T from the firſt term of the Series. For, by ſubſtituting 0, 1, 2, 3, 4, &c. ſucceſſively in the place of z, the relations of the terms of the propoſed Series will ariſe. In like manner, if z be the diſtance of T from the ſecond term of the Series, the equation will be $T'=\frac{z+\frac{2}{3}}{z+2}Tx$, as will appear by ſubſtituting the numbers — 1, 0, 1, 2, 3, 4, &c. ſucceſſively for z. Or, if the indeterminate z denotes the place of the term T in the Series, its ſucceſſive values will be 1, 2, 3, 4, &c. and the equation will be $T'=\frac{z-\frac{1}{2}}{z}Tx$.

It appears therefore that innumerable differential equations may define one and the ſame Series, according to the different points from whence the origin of the abſciſſa z is taken. And, on the contrary, the ſame equation defines innumerable different Series's by taking different ſucceſſive values of z. For in the equation $T'=\frac{z-\frac{1}{2}}{z}Tx$, which defines the Series abovementioned, when 1, 2, 3, 4, &c. are the ſucceſſive values of the abſciſſæ ; if $\frac{1}{2}$, $2\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$, &c. be ſucceſſively ſubſtituted for z, the relations of the terms ariſing will be $B=\frac{2}{3}Ax$, $C=\frac{4}{5}Bx$, $D=\frac{6}{7}Cx$, &c. from whence the Series A, $\frac{2}{3}Ax$, $\frac{8}{15}Ax^2$, $\frac{1}{35}Ax^3$, $\frac{128}{315}Bx^4$, &c. will ariſe, which is different from the former. But the equation will always determine the Series from the given values of the abſciſſa and of the firſt term, when the equation includes but two terms of the Series ; as in the laſt example, where the firſt term being given, all will be given. But, when the equation includes three terms, two muſt be given ; and three muſt be given, when it includes four, and ſo forth.

If the Series x, $\frac{1}{6}x^3$, $\frac{1}{40}x^5$, $\frac{5}{112}x^7$ $\frac{5}{1152}x^9$, &c. be propoſed, where the relations of the terms are, $B=\frac{1\times1}{2\times3}Ax^2$, $C=\frac{3\times3}{4\times5}Bx^2$, $D=\frac{5\times5}{6\times7}Cx^2$, &c. the equation defining this Series will be $T'=\frac{\overline{2z-1}\times\overline{2z-1}}{2z\times2z+1}Tx^2$, or $T'=\frac{4zz-4z+1}{4zz+2z}Tx^2$, where the ſucceſſive values of z are 1, 2, 3, 4, &c. *Stirling's Methodus differentialis, in the Introduction.*

This may ſuffice to convey a notion of theſe differential equations, defining the nature of Series's. But, as to the application of theſe equations in finding the ſums of Series's, it would require a treatiſe to explain it. We muſt therefore refer the curious to that excellent one juſt quoted, as alſo to Mr. de Moivre's Miſcellanea Analytica, and ſeveral curious papers by Mr. Euler in the Acta Petropolitana.

A Series often converges ſo ſlowly as to be of no uſe in practice. Thus, if it were required to find the ſum of the Series $\frac{1}{1.2}+\frac{1}{3.4}+\frac{1}{5.6}+\frac{1}{7.8}+\frac{1}{9.10}+$ &c. which lord Brounker found for the quadrature of the hyperbola true to 9 figures, by the mere addition of the terms of the Series, Mr. Stirling computes that it would be neceſſary to add a thouſand millions of terms for that purpoſe; for which the life of man would be too ſhort. But by that gentleman's method the ſum of the Series may be found by a very moderate computation.

Recurring SERIES, is uſed for a Series which is ſo conſtituted, that, having taken at pleaſure any number of its terms, each following term ſhall be related to the ſame number of preceding terms according to a conſtant law of relation.

Thus in the following Series,

$$\begin{array}{cccccc} A & B & C & D & E & F \\ 1 + & 2x + & 3xx + & 10x^3 + & 34x^4 + & 97x^5 + \&c. \end{array}$$

in which the terms being reſpectively repreſented by the capitals A, B, C, D, &c. we ſhall have

$$\begin{aligned} D &= 3Cx - 2Bxx + 5Ax^3 \\ E &= 3Dx - 2Cxx + 5Bx^3 \\ F &= 3Ex - 2Dxx + 5Cx^3, \ \&c. \end{aligned}$$

Where it is evident, that the law of relation between D and E is the ſame as between E and F, each being formed in the ſame manner from the three terms which precede it in the Series.

The quantities $3x - 2xx + 5x^3$ taken together and connected with their proper ſigns is what Mr. de Moivre calls the index or the ſcale of relation. Sometimes the bare coefficients $3 - 2 + 5$ are called the ſcale of relation. And this ſcale of relation ſubtracted from unity is called the differential ſcale. Thus in the foregoing Series the ſcale of relation being $3x - 2xx + 5x^3$, the differential ſcale will be $1 - 3x + 2xx - 5x^3$.

A recurring Series, with its ſcale of relation, being given, the ſum of that Series continued in infinitum will alſo be given. For inſtance, ſuppoſe a Series $a + bx + cxx + dx^3 + ex^4 + \&c.$ where the relation of the coefficient of any term to the coefficients of any two preceding terms may be expreſſed by $f - g$; that is, $e = fd - ge$; and $d = fc - gb$, &c. Then will the ſum of the Series continued in infinitum be, $\dfrac{a + bx - fax}{1 - fx + gxx}$

To facilitate the intelligence of this rule by a particular example, aſſume any Series whereof the two firſt coefficients are given, ſuch as 2 and 5, and ſuppoſe f and g to be reſpectively 2 and 1; then we ſhall have the following Series, $2 + 5x + 8xx + 11x^3 + 14x^4 + 18x^5 + \&c.$

And the ſum $= \dfrac{2 + 5x - 4x}{1 - 2x + xx} = \dfrac{2 + x}{\overline{1 - x}^2}$

For the proof divide 1 by $\overline{1 - x}^2$

$$\begin{array}{ll} & 1 - 2x + xx)\,1\,(1 + 2x + 3xx + 4x^3 + \&c. \text{ which} \\ \text{multiplied by} & 2 + x \\ \hline & 2 + 4x + 6xx + 8x^3 + \&c. \\ \text{gives} & + x + 2xx + 3x^3 + \&c. \\ \hline \text{the product} = & 2 + 5x + 8xx + 11x^3 + \&c. = \text{the} \end{array}$$

given Series.

Analogous rules might be derived for more complex caſes; and Mr. de Moivre's general rule is,

Firſt, take as many terms of the Series as there are parts in the ſcale of relation. Secondly, ſubtract the ſcale of relation from unity, the remainder is the differential ſcale. Thirdly, multiply the terms taken in the Series by the differential ſcale, beginning at unity, and ſo proceeding orderly, remembering to leave out what would naturally be extended beyond the laſt of the terms taken. Then will the product be the numerator, and the differential ſcale will be the denominator of a fraction expreſſing the ſum required.

But we muſt here obſerve that, when the ſum of a recurring Series extended ad infinitum is found by Mr. de Moivre's rule, it ought to be ſuppoſed, that the Series converges indefinitely, that is, that the terms may become leſs than any aſſigned quantity. For, if the Series diverges, that is, if its terms continually increaſe, it is not true, that the rule gives the ſum. For the ſum in ſuch caſes is infinite, or greater than any given quantity, whereas the ſum exhibited by the rule will often be finite. The rule therefore in this caſe only gives a fraction, the reduction of which into a Series gives the propoſed Series.

Thus $\dfrac{1}{\overline{1 - x}^2}$, reduced to an infinite Series gives the recurring Series $1 + 2x + 3xx + \&c.$ whoſe ſcale of relation is $2 - 1$ and its ſum by the rule will be $\dfrac{a + bx - fax}{1 - fx + gxx} = \dfrac{1 + 2x - 2x}{1 - 2x + xx} = \dfrac{1}{\overline{1 - x}^2}$ = the quantity from which the Series aroſe. But this quantity cannot in all caſes be deemed equal to the infinite Series $1 + 2x + 3xx$, &c. For, ſtop were you will, there will always be a ſupplement required to make the product of the quotient by the diviſor equal to the dividend. When the Series, indeed, converges infinitely, the ſupplement diminiſhing continually, it becomes leſs than any aſſigned quantity, and is therefore, without error, reputed nothing; but, in diverging Series, this ſupplement becomes indefinitely great, and the Series deviates indefinitely from the truth.

A recurring Series being given, the ſum of any number of the terms of that Series may be found. This is prob. III. p. 73. Miſcel. Analyſ. and prop. V. p. 196. of the Doctrine of Chances. One ſolution of the ſimpleſt caſe will be ſufficient to give an idea of the method there uſed.

Let there be a geometric progreſſion $a + ax + ax^2 + ax^3 + \&c$: it is required to find the ſum of a number n of its terms. Then will the laſt term be ax^{n-1}. Suppoſe the progreſſion continued ad infinitum, and we ſhall have two infinite progreſſions, the firſt beginning with a, and the ſecond with ax^n. Now the difference of the ſum of theſe two muſt be the ſum of the number n of terms. By the rule the ſum of the firſt infinite progreſſion will be $\dfrac{a}{1 - x}$; and the ſum of ſecond will be $\dfrac{ax^n}{1 - x}$. But $\dfrac{a}{1 - x} - \dfrac{ax^n}{1 - x} = \dfrac{a - ax^n}{1 - x}$, which will therefore be the ſum of a number n, of terms.

This quantity $\dfrac{a - ax^n}{1 - x}$ is equal to $\dfrac{ax^n - a}{x - 1}$, which laſt expreſſion, calling $ax^{n-1} = l$, will be equivalent to this, $\dfrac{lx - a}{x - 1}$, which is the common rule for finding the ſum of any geometric progreſſion of which a, the firſt term; x, the ratio; and l the laſt term are given.

The Series reſulting from the diviſion of unity by $\overline{1 - x}^p$, or $\dfrac{1}{\overline{1 - x}^p} = \overline{1 - x}^{-p}$ is $1 + px + p \times \dfrac{p + 1}{2} xx + p \times \dfrac{p + 1}{2} \times \dfrac{p + 2}{3} x^3 + \&c.$ And the ſum of any number of terms expreſſed by n of this Series will be $\dfrac{1 - x^n}{\overline{1 - x}^p} - \dfrac{nx^n}{\overline{1 - x}^{p-1}} - \dfrac{\frac{n}{1} \times \frac{n + 1}{2}}{\overline{1 - x}^{p-2}} x^n - \dfrac{\frac{n}{1} \times \frac{n + 1}{2} \times \frac{n + 2}{3}}{\overline{1 - x}^{p-3}} x^n -$ &c. which is to be continued till the number of terms $= p$. This theorem is of uſe in finding the ſums of progreſſions of figurate numbers, and others.

Suppoſe, for inſtance, it were required to find the ſum of any number n of terms of the geometric progreſſion $1 + x + xx + x^3 + \&c.$ generated by $\dfrac{1}{1 - x}$. Here $p = 1$. And the ſum will conſequently be $= \dfrac{1 - x^n}{\overline{1 - x}^p} = \dfrac{1 - x^n}{1 - x}$.

Again, if the ſum of a number n of terms of the Series $1 + 2x + 3xx + 4x^3 + \&c.$ were required. The Series is generated from $\dfrac{1}{\overline{1 - x}^2}$. Then $p = 2$. And the ſum $= \dfrac{1 - x^n}{\overline{1 - x}^2} - \dfrac{nx^n}{1 - x}$. Suppoſe $x = 1$, then will the ſum be $\dfrac{nn + n}{2} = n \times \dfrac{n + 1}{2}$ which is the ſum of the arithmetical progreſſion $1 + 2 + 3 + 4 + \&c.$ continued to the number n of terms. But it is to be obſerved that it requires a particular artifice to derive the ſum from the general rule: for at firſt ſight the ſum appears under this form $\dfrac{1 - 1}{\overline{1 - 1}^2} - \dfrac{n}{1 - 1}$ which determines nothing.

In like manner, the ſum of a number n of terms of the Series of triangular numbers will be found to be $n \times \dfrac{n + 1}{2} \times \dfrac{n + 2}{3}$, as in Miſcel. Analyſ. p. 168.

By the like methods the ſum of any number of ſquares, cubes, &c. of the natural Series of numbers may be found. Which may alſo be done by Sir Iſaac Newton's differential method.

3° In a recurring Series any term may be obtained whoſe place is ſſigned. For, after having taken ſo many terms of the Series, as there are terms in the ſcale of relation, the Series may be protracted till it reach the place aſſigned. But, if that place be very diſtant from the beginning of the Series, the continuation of the terms will prove laborious: other methods have therefore been contrived.

Theſe queſtions have been reſolved in many caſes, beſides thoſe of recurring Series. But, as there is no univerſal method for the quadrature of curves, neither is there one for the ſummation of Series; there being a great analogy between theſe things, and ſimilar difficulties ariſing in both.

SERMO'NES, the title Horace gives to his Satires.

The critics are divided about the reaſon of the name. The opinion of father Boſſu ſeems well grounded; a mere obſervation of feet and meaſure, ſuch as we find in Plautus, Terence, and in Horace's Satires, he thinks, is not ſufficient to conſtitute verſe; to determine the work to be poetical, or diſtinguiſh it from proſe; unleſs it have ſome farther air or character of poetry, ſomewhat of the fable, or ſublime. Hence it is that Horace calls his Satires proſe Sermones. *Dict. de Trevoux.*

SE'RMONS, orations or diſcourſes delivered by the clergy of the Chriſtian church, in their religious aſſemblies.

In the ancient church, immediately after the reading of the pſalms, and leſſons out of the ſcriptures, before the catechumens were diſmiſſed, followed the Sermon, which the biſhop, or ſome other, appointed by him, made to the people. This, being done in the preſence of the catechumens, was therefore reckoned a part of the miſſa catechumenorum, or ante-communion ſervice. Such diſcourſes were commonly termed homilies, ομιλιαι, which ſignifies indifferently any diſcourſe of inſtruction to the people. Among the Latins they were frequently called tractatus, and the preachers, tractatories.

Preaching, anciently, was one of the chief offices of a biſhop; inſomuch that, in the African churches, a preſbyter was never known to preach before a biſhop in his cathedral church, till St. Auſtin's time. In the eaſtern church, preſbyters were indeed allowed to preach before the biſhop; but this was not to diſcharge him of the duty, for ſtill he preached a Sermon at the ſame time after them. In the leſſer churches of the city and country, the office of preaching was devolved upon the preſbyters; but deacons never were allowed to perform it. There are numberleſs paſſages in the writings of the fathers, which ſpeak of preaching as a duty indiſpenſably incumbent on a biſhop. Many canons of councils either ſuppoſe, or enjoin it: and, in the imperial laws, there are ſeveral edicts of the ſecular power to the ſame purpoſe.

It has been a queſtion, whether laymen were ever allowed by authority to make Sermons to the people. It is certain, they did it in a private way, as catechiſts, in their catechetic ſchools at Alexandria, and other places; but this was a different thing from public preaching in the church. Sometimes the monks, who were only laymen, took upon them to preach; but this was cenſured, and oppoſed, as an uſurpation of an office that did not belong to them. Yet, in ſome caſes, a ſpecial commiſſion was given to a layman to preach; as in the caſe of Origen, who was licenſed by Alexander, biſhop of Jeruſalem, to preach and expound the ſcriptures in the church, before he was in orders. As to women, whatever gifts they could pretend to, they were never allowed to preach publicly in the church; agreeably to the apoſtolic rule, Let your women keep ſilence in the churches, &c. But they might teach thoſe of their own ſex, as private catechiſts, and prepare them for baptiſm. And this was the office of the deaconeſſes. The Montaniſts were a noted ſect for giving the liberty of preaching to women, under the pretence of inſpiration by the ſpirit; for they had propheteſſes, women-biſhops, and women-preſbyters.

Next to the perſons, the manner, in which the office of preaching was executed, comes to be conſidered. And firſt it is obſervable, that they had ſometimes two or three Sermons preached in the ſame aſſembly, firſt by the preſbyters, and then by the biſhops. When two or more biſhops happened to be preſent in the aſſembly, it was uſual for ſeveral of them to preach, one after another, reſerving the laſt place for the moſt honourable perſon. In ſome places, they had Sermons every day, eſpecially in Lent, and the feſtival days at Eaſter. In many places, they had Sermons twice a day, for the better edification of the people. But this is chiefly to be underſtood of cities and large churches: for in the country pariſhes there was not ſuch frequent preaching.

The next thing to be obſerved is, their different ſorts of Sermons, and different way of preaching. Theſe are diſtinguiſhed into four kinds: 1. Expoſitions of ſcripture. 2. Panegyrical diſcourſes upon the ſaints and martyrs. 3. Sermons upon particular times, occaſions, and feſtivals. 4. Sermons upon particular doctrines, or moral ſubjects. There are examples of all theſe kinds in St. Chryſoſtome's and St. Auſtin's homilies, the two great ſtandards of preaching, in the Greek and Latin churches. But, though moſt of theſe were ſtudied and elaborate diſcourſes, penned and compoſed before-hand, yet ſome were alſo extempore, ſpoken without any previous compoſition, and taken down in ſhort-hand from the mouth of the preacher. Origen was the firſt that began the way of extempore preaching in the church.

Upon this account it was uſual for the preacher to uſher in his diſcourſe with a ſhort prayer, for divine aſſiſtance. In this ſenſe we are to underſtand St. Chryſoſtome, when he ſays, We muſt firſt pray, and then preach. Sometimes, before they began to preach, they uſed the common ſalutation, Pax vobis, Peace be with you; to which the people anſwered, And with thy ſpirit. And ſometimes they prefaced the Sermon with a ſhort form of benediction, eſpecially in times of calamity and diſtreſs, or of happy deliverances out of them. Sometimes they preached without any text, and ſometimes upon more texts than one. Neither did they entertain their auditory with light and ludicrous matters, or fabulous and romantic ſtories, ſuch as thoſe with which preaching ſo much abounded in the age before the reformation.

And, as they were careful in the choice of their ſubject, ſo were they in the manner of dreſſing it up, and delivering it, that they might anſwer the true ends of preaching. St. Auſtin has laid down excellent rules, for the practice of Chriſtian eloquence; and, if we will take his character of the ancient preachers, it was, in ſhort, this: that their diſcourſes were always upon weighty and heavenly matters, and their ſtyle anſwerable to the ſubject, being plain, elegant, majeſtic, and nervous; fitly adapted to inſtruct and delight, to convince and charm their hearers. It was no part of the ancient oratory to raiſe the affections of the auditory, either by geſticulations, or the uſe of external ſhews and repreſentations of things in their Sermons, that is now very common in the Romiſh church. As to the length of their Sermons, ſcarce any of them would laſt an hour, and many not half the time. And among thoſe of St. Auſtin there are many, which a man may pronounce diſtinctly, and deliver decently, in eight minutes. They always concluded their Sermons with a doxology to the Holy Trinity. And it is farther obſervable, that the preacher uſually delivered his Sermon ſitting, and the people heard it ſtanding; though there was no certain rule about this, but the cuſtom varied in different churches.

It was a peculiar cuſtom in the African church, when the preacher chanced to cite ſome remarkable text, in the middle of his Sermon, for the people to join with him in repeating the cloſe of it. St. Auſtin takes notice of this in one of his Sermons, where, having begun thoſe words of St. Paul, The end of the commandment is — the people all cried out, Charity, out of a pure heart. But it was a much more general cuſtom for the people to teſtify their eſteem for the preacher, and approbation of his Sermon, by public applauſes, and acclamations in the church. Thus, we are told, the people applauded St. Chryſoſtome's Sermons, ſome by toſſing their garments, others moving their plumes, others laying their hands upon their ſwords; and others waving their handkerchiefs, and crying out, Thou art worthy of the prieſthood, &c. Many of the auditors practiſed the art of notaries, and took down the Sermons of the moſt eminent preachers, word for word, as they delivered them. By this means ſome of their extempore diſcourſes were handed down to poſterity, which elſe would have died with the ſpeaking.

The Roman catholics call the Sermon, the prone. After the goſpel, the preacher goes to the bottom of the ſteps of the altar, on the epiſtle ſide, where he kneels down, and offers prayers to God for the action he is going about. Then he aſcends the pulpit; where he firſt bows to the croſs, and then to the chief of the congregation. He likewiſe croſſes himſelf; and, whenever he pronounces the name of Jeſus and Mary, he takes off his cap, and bows. In Italy, he does the ſame thing, whenever the reigning pope is named in the Sermon. Before the biſhop, or when the holy ſacrament is ſolemnly expoſed on the altar, it is uſual to preach bare-headed.

The manner of preaching in Italy is very indecent, the behaviour of the preachers being like that of ſtage-dancers: they are extravagant in their geſtures, they ſtrike with their hands and feet, roll their eyes, and walk from one end of the pulpit (which is very long and wide) to the other, with immoderate and ridiculous vivacity. Their fineſt Sermons (ſays a celebrated traveller) are thoſe that raiſe the moſt laughter. ' The Capuchins (adds he) never preach, but on terrible ſubjects; they ſeize their own beards, clap their hands, and ſcream enough to fright one. The other day, I heard a Carmelite, who was preaching to the repentant nuns of the holy croſs, on the ſubject of Mary Magdalen. In order to raiſe a more exalted idea of the ſacrifice his penitent had made of the pleaſures of the world, he ſpent a whole quarter of an hour in painting her out as the moſt charming creature under heaven: not one feature, in the moſt perfect body, was omitted; and he talked more like a moſt accompliſhed painter, than a preacher.' In Italy, there are ſeldom any Sermons, but in the time of Advent and Lent. The friars preach in their convents upon topics, which we may call eternal; for they ſeldom loſe ſight of their founders, or of ſome particular practices, which they are fond of, ſuch as the roſary, and ſcapulary, and St. Francis's girdle. In ſome cities of Italy, are itinerant preachers, who carry about with them little moveable pulpits.

In Spain they often preach in the public ſquares and high ſtreets, and ſeldom fail of a numerous audience. The preachers take great pains to affect their hearers, and to this end they frequently ſtrike their breaſt or face, and the whole congregation does the ſame thing. They who draw moſt tears are thought the beſt preachers.

The Greek Chriſtians ſeldom have any Sermons. Preaching, as Tournefort aſſures, is ſo far aboliſhed, that there is ſcarce a pulpit to be ſeen in all their churches: however, when a father does attempt to mount the roſtrum, he delivers himſelf in the moſt awkward manner imaginable; and has two crowns for his diſcourſe, which conſiſts only of a tedious train of empty words, without the leaſt order or coherence, and which the preacher himſelf (ſays our author) underſtands no more than the people.

SER'PENT, *ſerpens*, in zoology, the name of a genus of animals, which Mr. Ray defines to be creatures breathing by means of lungs, having only one ventricle in the heart, having no feet, and having a long body, covered with ſcales.

To which he adds, that in cold ſeaſons they can bear hunger a long time. The greater part of the Serpent claſs are poiſonous, and dangerous in their bite, leaving a miſchievous liquor in the wound, made by their tooth, which, mixing by this means immediately with the blood, is of fatal conſequence; though the whole creature may be eaten with ſafety, or even the poiſonous liquor, which does this miſchief in the wounded, taſted without hurt.

Notwithſtanding that Serpents reſpire by means of lungs, they do not take in and diſcharge their breath by ſuch ſhort intervals as other animals, but what they have once inſpired will ſerve them a long time; for as they are of a cold nature, and therefore their neceſſary warmth very ſmall, they do not require ſuch an eternally renewed ſupply of that pabulum of vital heat, as thoſe which have more of it; and as with us they lie half the year torpid, and half dead, their vital warmth at that time, like fire ſmothered under aſhes, barely exiſts, and needs perhaps no more air than what the creature took in at one inſpiration, before its laying itſelf down for the ſeaſon, which ſerves it till the life-renewing ſpring returns.

Serpents, according to Mr. Ray, may be divided into the poiſonous and the harmleſs; the firſt having long dentes exerti, with poiſonous liquors contained at their bottom, which on biting they diſcharge into the wound: the others wanting theſe teeth, and this poiſon.

They may alſo be divided, in regard to their generation, into the oviparous and viviparous; but this is a leſs firmly founded diſtinction than may be ſuppoſed, ſince all Serpents are truly and properly produced of eggs; and the only difference is, that ſome depoſit their eggs in dung-hills, and the like places, to be hatched by accidental heat; while others retain thoſe eggs to be hatched in their own bodies, and ſo bring forth living young ones. Of the firſt kind is the common ſnake, of the latter the viper. *Ray's Syn. Quad. et Serp. p.* 284. *See Plate* XLIII. *fig.* 1.

Serpens *bubalinus*.—Mr. Cleyer has given a very remarkable account, in the German Ephemerides, of the prodigious ſize and voracious appetite of this Serpent, and its manner of feeding. This gentleman aſſures us that they grow to the length of five feet, and are ſurpriſingly daring in attacking large creatures for prey. Their neck, he obſerves, is ſo ſmall, in proportion to the creatures they ſeize, that it is a wonder that they can ſwallow them whole, which yet experience ſhews they certainly do, having no power of tearing them to pieces. This gentleman ſaw a complete ſtag taken out of the belly of one of theſe ſnakes, with all its limbs remaining on: and at another time a wild goat which had been ſwallowed in the ſame manner, and from another a complete porcupine, a very troubleſome morſel; and there was once an inſtance, in the Molucca iſlands, of a woman big with child being thus ſucked down whole by one of theſe creatures. *Ray's Syn. An.*

The method of their managing their prey is this: when thoroughly lank, lean, and hungry, the Snake lies in wait for any thing it can ſeize; he darts out upon the prey, and, ſeizing it with his mouth, winds his body round that of the creature; and this he is able to do with ſuch force, that he will often, in twiſting himſelf firmly round the creature, break the bones within its ſkin. This he continues, and at the ſame time is biting, with his terrible mouth, all the tender parts of the creature, till he has deſtroyed it; or, if it be an animal too ſtrong to be killed by theſe ſimple folds, it will drag it to ſome neighbouring tree, and, tying it faſt againſt that, draw its body ſo forcibly round it, as to cruſh all its bones to pieces by the help of that ſolid reſiſting body. The part it uſually ſeizes with its teeth, at the ſame time, is the creature's noſe, which he bites ſo forcibly as not only to ſtop the breath, but to occaſion a diſcharge of blood, which helps to forward its deſtruction.

But the moſt ſingular attack, ever known to have been made by this creature, is that recorded by the ſame author, of its ſeizing a buffalo; which it deſtroyed in the manner above deſcribed, though it was a long time about it, and was obliged to have recourſe to the method of tying it up to a tree, againſt which it broke its bones ſeverally, with a noiſe that was heard to a great diſtance. When the creature had thus deſtroyed its prey, it continued breaking of the bones, till there was not one left whole in the body, and the whole reſembled a ſhapeleſs maſs of matter.

The jaws and throat of this, and of the other Serpent-kind, though ſmall and narrow, are prodigiouſly extenſible, and made ſo by nature, for the ſwallowing theſe morſels. The Snake, when the prey lay in this ſtate before it, licked it all over, and covered it thick with its ſaliva, and that ſo regularly, that the whole carcaſe looked as if daubed over with glue. This done, it opened its jaws to a monſtrous extent, and ſucked in the head of the prey, and, continuing inceſſantly ſucking, at length drew down the whole body.

This is a work of time, and very often two or three days are employed in it. And, when the animal is thus got down, the ſnake is ſwelled and bloated up all over with it, and is no longer in a ſtate of offending, or even of defending itſelf, or ſo much as running away; and the people of the places where this ſpecies is common, well know this, and find it an eaſy thing to deſtroy them in this ſtate, and are very happy when they catch one, as their fleſh is a very delicate food. *Ephem. Germ. Ann.* 12. *Obſ.* 7.

Serpent, in muſic, a wind-inſtrument, ſerving as a baſs to the cornet, or a ſmall ſhawm, to ſuſtain a chorus of ſingers in a large veſſel. It had its name Serpent from its figure, as conſiſting of ſeveral folds or wreaths, ſerving to take off its length, which would otherwiſe be ſix or ſeven feet; it is uſually covered with leather, and conſiſts of three parts, a mouth-piece, neck, and tail. It has ſix holes, by means whereof they give it the compaſs of two octaves.

Serpent-*ſtones*, a name given by ſome to the cornua ammonis; a beautiful foſſil ſhell, which reſembles a Serpent coiled up. Theſe are frequent in many parts of the world, beſides the plenty we have of them in England, and elſewhere. The accurate obſerver, Mr. Harenberg, found prodigious numbers of them on the banks, and among the ſand of a river in Germany. He traced this river through its ſeveral windings for many miles, and among a great variety of belemnitæ, cornua ammonis, and cochlitæ, of various kinds. He found alſo great quantities of wood, of recent petrifaction, carrying in it at that time the plain marks of the axe, by which it had been cut from the trees then growing on the ſhore. The water of this river he found, in a dry ſeaſon, and when the ſupplies of its natural ſprings were not diluted with rains, to be conſiderably heavier than common water; and many experiments ſhewed him that it contained ferrugineous, as well as ſtony particles, in great quantity, whence the petrifactions in it appeared the leſs wonderful, though many of them of recent date.

Of the cornua ammonis, or Serpent-ſtones, he there obſerved more than thirty different ſpecies, and doubts not but there are many more yet unobſerved. They lie immerſed in a bluiſh foſſil ſtone, of a ſoft texture, and fatty appearance. They lie in this in prodigious numbers, and of a great variety of ſizes, from the larger known ſorts, down to ſuch as could not be ſeen without very accurate inſpection, or the aſſiſtance of a microſcope. Such as lie in the ſofteſt of theſe ſtones are ſoft, like their matrix, and eaſily crumble to pieces; others are harder. In a piece of this ſtone, of the bigneſs of a finger, it is common to find thirty, or more, of theſe foſſils; and often they are ſeen only in form of white ſpecks, too minute to ſhew their figure, till examined by the microſcope. But what is moſt obſervable of the cornua ammonis of this place is, that they are often found growing not only to, but into one another, in ſuch a manner, that they cannot be ſuppoſed ever to have been inhabited by any living fiſh, eſpecially the ſpecimen which is pierced by the other. This author is of opinion that they grow, and are formed where they are; and attempts to prove it by affirming, that they have an actual increaſe in ſize there in a little time, and that not only if left in their beds, but if taken out, and put into a glaſs of the water. This is an opinion wholly different from the received one at preſent in the world, and perhaps will be found erroneous on farther trials. *Act. Erudit.* 1727.

Serpents *tongues*. The iſland ~~of Malta~~ abounds with gloſſopetræ, or the petrified teeth of ſharks, which, from their reſemblance to a tongue, are by the vulgar ſuppoſed to be the tongues of Serpents turned into ſtone by ſome miracle of St. Paul, when he was there. This iſland abounds not only with theſe, but with bufonitæ, and vaſt numbers of other remains of ſea productions. Theſe things, notwithſtanding their perfect reſemblance of the ſame bodies now found recent in mouths of living fiſhes, &c. are by ſome ſuppoſed never to have been real parts of fiſhes, but to have been formed where they now lie by ſome luſus of nature, or plaſtic ſeeds. This, however, is an idle and abſurd opinion; and Aguſtino Scilla, who has written at large on the foſſils of this iſland, gives a very rational account of their being the real remains of animals, which, according to his ſyſtem, it is no way wonderful to find there. The univerſal deluge has doubtleſs been of power to bring all the foſſils we find into the places where we now ſee them buried, even in the midſt of quarries of ſtone, in the middle of inland countries; but in regard to the iſland of Malta, which ſo abounds with them at this time, he ſuppoſes that, long ſince the time of the creation, and even without the aſſiſtance of the general deluge, it may have been formed out of the ſea, and that it appears plainly to have been at firſt no other than a maſs of ſoft mud, with an immenſe number of ſea ſhells, teeth of fiſhes, and other remains of ſea animals, mingled among it; and that theſe, ſubſiding as low as they could among that thickening matter, have made the iſland what we now find it; that is, a heap of earth with theſe things, in vaſt quantities, buried in it, and that at different depths, but principally not far from the ſurface.

That this collection of matter was occaſioned by a flood of ſome kind, is highly probable; but it is not neceſſary to have recourſe to Noah's flood for it, though that might as well cauſe it as any other; but it might alſo be formed by an irruption of the ocean into the Mediterranean, or by an inundation of the Tuſcan ſea driven by vehement winds, or any other means, that way: and, when the origin of this iſland is thus allowed, it is not to be wondered at, that an immenſity of the refuſe parts of animals, inhabitants of thoſe waters, ſhould be left in the places where they had time to ſubſide. And though there are found among theſe teeth, &c. in the iſland of Malta, great quantities of ſhells, of ſuch ſpecies as are not natives of thoſe ſeas, this is no objection to the opinion; ſince it is well known that the winds when violent, as they probably were about the time of the formation of that iſland, will bring ſuch light bodies as ſhells a vaſt way in water.

It is a common obſervation, that the eaſt and ſouth-eaſt winds bring to the coaſt of Calabria great quantities of beautiful ſhells, none of which are found living in the ſeas thereabout. The bufonitæ, or toadſtones of Malta, are plainly the grinder teeth of the lupus and ſargus dentex, as alſo of the aurata, and ſeveral other fiſh, which have ſuch round teeth in the hinder part of their jaws. The ſhells found in this iſland, and other places, are ſo plainly thoſe of once living animals, that the remains of the body of the fiſh is plainly to be diſtinguiſhed in ſome of them: and in others the lamellæ are laid together, and coated over one another, in the very ſame manner as in the recent ſhell fiſh.

It is objected, that theſe ſhells are produced in the places where they lie, becauſe they are found in great cluſters together, all of the ſame kind; but this is no material objection, but is eaſily ſolved upon the common principles: for, if we ſuppoſe a number of diſſimilar bodies, ſeveral of every kind, to be ſuſpended in the ſame quantity of water, and that water be put in motion, we ſhall ſee them all confuſedly blended together, while the motion is violent, but they will, as that becomes more calm, ſeparate themſelves, and thoſe of the ſame nature will, in a great meaſure, get together, and ſubſide in parcels ſeparately from the reſt. Thus, if ſtraws, ſticks, egg-ſhells, pebbles, and common cockle-ſhells, were to be thus ſhook together, the conſequence would be, that in a large tub of water they would naturally each parcel ſubſide together in different parts of the bottom; and, though in the neighbourhood of one another, yet the ſtraws would not be mixed with the pebbles, nor the egg-ſhells with the cockles, any more than it is really found, that the different ſpecies of ſhells are mingled in the earth.

It is alſo to be added, that theſe ſhells have ſubſided, not in water, but in a thicker fluid, compoſed of mud and water, and this has kept them more aſunder than common water alone would have done; and we ſhall find, on examining the bowels of the earth, that, though the ſhells, in the ſame maſs of earth, or ſtone, are generally principally of one kind, yet they are neither always ſo, nor perfectly ſo, but that often they are confuſedly blended among other kinds, and more often have ſome few of other ſpecies blended among them; as a few cockle-ſhells might be among the pebbles, in the familiar inſtance mentioned above, and by ſome particular accidents, even in that caſe, the whole ſet of bodies, excepting the very lighteſt, might happen to be blended together.

The mountains of Sicily afford ſome few gloſſopetræ, or ſnakes-tongues, but they are few in number, and worſe prepared than thoſe of the iſland of Malta; which is probably owing to the high ground of thoſe mountains being leſs likely to receive the refuſe of the ſea, and its ſoil, which is ſandy, being leſs fitted to preſerve them when there, than the marl, of which the iſland of Malta conſiſts.

The echini marini, or ſea eggs, and their ſpecies, which are very frequent among the Serpents-tongues of Malta, all lie upon the ſurface of the ground, or near it; whereas the gloſſopetræ lie deeper, though at no great depth. This is a plain effect of all theſe things having been really animal bodies, and having floated in the mud, of which that iſland was formed; for in this it could not be otherwiſe, but that the gloſſopetræ, or Serpents-tongues, being heavy, would ſubſide in the water, while the light ſhells of theſe other animals would float on, or near the ſurface.

The opinion of theſe bodies growing from ſeminal principles is alſo greatly weakened by the ſituation of them in the earth. If they grew from ſeeds as plants, we ſhould doubtleſs ſee them, like plants, all bending one way, the points of all upwards, and their roots downwards; but on the contrary, both in the iſland of Malta and elſewhere, theſe things are found in the moſt different directions imaginable; ſome with their bottoms upwards, ſome downwards, ſome horizontal, and others in all the intermediate angles. Some have ſuppoſed the gloſſopetræ, in particular, to grow from roots in the earth, becauſe they uſually have roots different from the other parts, and becauſe they ſtick very firmly in the earth at theſe roots, but are very eaſily looſened in any other part. It is certain, indeed, that theſe parts, at the bottom of the gloſſopetræ, are their roots, and that their ſpungy texture was intended for their taking in nouriſhment; but this was their uſe when in the head of the fiſh, not when in the earth; and the reaſon of their adhering more firmly to the earth in this, than in any other part, is only that they are more ſpungy and porous here, and that, in other parts where they are ſmooth and even, the earth can have no hold of them; but, where they are thus rough, as they ſubſided with a moiſt earth like mud about them, they naturally become connected ſtrongly to it in drying, as part of it was received into their pores, and not broken from the reſt, till by forcing them out afterwards. *Philoſ. Tranſ.* N°. 219.

Some affirm that the gloſſopetræ are natural cryſtalliſations of ſalt, and that to this their regular figure is owing; but it is to be anſwered, that their figure is not ſo regular as theſe objectors ſeem to ſuppoſe, but that there are as many different ſhapes of them, as there are of teeth, in the different parts of the jaw of the ſame ſhark, or in the jaws of different ſpecies of ſharks now found living; and, if they were cryſtalliſations of ſalt, the whole cryſtalliſation would be of one and the ſame ſurface and texture; which is not the caſe, ſince the root, as before obſerved, is always very different from the body of the tooth, and the ſubſtance different in even the various parts of the body. Salts are ſalts throughout, and a ruby, a cryſtal, or a diamond, is the ſame in all its parts; but this is not the caſe in the gloſſopetræ, but they are compoſed of a cortical and a medullary part, like the teeth of living ſharks: and it is to be obſerved, that, when any of theſe gloſſopetræ are found broken, as they frequently are, the fracture is found raw and unaltered, which ſhews that it has happened before they came to the place where they are now found, and that they have no growth or vegetation there, to heal or cover it; for, if there were, it would be ſkinned over, as the wounds of plants and animals always are, when in a perfect ſtate and living.

Whenever the gloſſopetræ are taken carefully up out of the earth in Malta, the marl or earth, which ſerved for their bed, is found to contain all their minuteſt traces and lineaments, like wax from a ſeal. This is a proof that the marl was as ſoft as melted wax when they were put into it, and that they were of their full ſize and growth when placed there, not having grown, or had any increaſe, in that place.

The apophyſes, or proceſſes in the gloſſopetræ, are alſo a ſtrong proof of their being no other than real ſharks teeth, ſince they exactly anſwer to thoſe in the teeth of recent ſharks, by which every tooth is received or inſerted into its neighbour in the jaw. Nay, whereas ſharks teeth are mortiſed into one another in ſuch a manner, that a man may eaſily tell which belong to each ſide, which lie near the throat, and which near the front of the mouth; and whereas, in a ſhark's mouth, the teeth on the left ſide will not fit on the right, nor thoſe above ſerve below, but that on ſeeing a recent tooth, a perſon of judgment will be able to ſay what part of the mouth it belonged to; ſo in the foſſil ſhark's teeth, or gloſſopetræ, there is not any one which may not be referred to the particular part of the mouth of the living animal, and could have belonged to no other. *Aguſtino Scilla, de Petrifac.*

SE'RPYLLUM, *mother-of-thyme*, in botany, the name of a genus of plants, whoſe characters are:

It hath trailing branches, which are not ſo woody and hard as thoſe of thyme, but in every other reſpect is the ſame.

There are but two of theſe ſpecies, commonly cultivated in gardens, viz. the lemon-thyme, and that with ſtriped leaves; the firſt for its agreeable ſcent, and the other for the beauty of its variegated leaves. Theſe were formerly planted to edge borders; but as they are very apt to ſpread, and difficult to preſerve in compaſs, they are diſuſed at preſent for that purpoſe. All theſe propagate themſelves very faſt by their trailing branches, which ſtrike out roots from their joints into the earth, and thereby make new plants; ſo that from a root of each there may be ſoon a large ſtock increaſed. They may be tranſplanted either in ſpring or autumn, and love an open ſituation, and a dry undunged ſoil; in which they will thrive and flower exceedingly, and continue ſeveral years.

It may not be improper here to take notice of a common miſtake, which generally prevails concerning this plant; which is, that the ſheep which feed upon this plant, afford the ſweeteſt mutton; whereas it is very certain, that the ſheep will not eat it; nor, ſo far as I have been capable of obſerving, is there any animal that will, it being extremely bitter to the taſte.

SERRA'TULA, *ſaw-wort*, in botany, the name of a genus of plants, whoſe characters are:

It hath a floſculous flower, conſiſting of ſeveral florets, divided into many parts reſting on the embryo, and contained in a ſcaly empalement, like to the greater centaury; from which this differs in having ſmaller heads; and from the knap-weed in having the borders of the leaves cut into ſmall ſharp ſegments, reſembling the teeth of a ſaw.

SE'RUM *aluminoſum*, *alum-whey*, a form of medicine preſcribed in the late London Pharmacopœia, made of a pint of milk boiled to whey with a quarter of an ounce of alum. *Pemberton's Lond. Diſp.*

SE'SAMUM *oily-grain*, in botany, the name of a genus of plants, whoſe characters are:

The flowers are produced from the wings of the leaves, without any foot-ſtalk; the flower-cup conſiſts of one leaf, divided into five long ſlender ſegments: the flower is of one leaf, in ſhape like thoſe of the fox-glove: the pointal, which riſes in the middle of the flower, afterwards becomes an oblong four-cornered pod, divided into four diſtinct cells, which are replete with eſculent ſeeds.

In England, theſe plants are preſerved in botanic gardens as curioſities. Their ſeeds muſt be ſown in the ſpring upon an hot-bed; and, when the plants are come up, they muſt be tranſplanted in a freſh hot-bed, to bring them forward. After they have acquired a tolerable degree of ſtrength, they ſhould be planted into pots filled with rich light ſandy ſoil, and plunged into another hot-bed, managing them as hath been directed for amaranthus's; to which I ſhall refer the reader, to avoid repetition: for, if theſe plants are not brought forward thus in the former part of the ſummer, they will not produce good ſeeds in this country; though, after they have flowered, if the ſeaſon is favourable, they may be expoſed in a warm ſituation, with other annual plants. When theſe plants have perfected their ſeeds, they decay, and never continue longer than one ſeaſon.

SE′SELI-*ſeed*, in the materia medica, the name of the ſeed of a plant, called alſo by ſome libanotis, and growing three or four feet high, with leaves like fennel, but of a paler green. It is a native of warm climates. The ſeed ought to be choſen moderately large, of a longiſh ſhape, heavy, clean, and of a greeniſh colour, freſh, and of a grateful ſmell. It affords, by diſtillation, a very large quantity of an eſſential oil, and is hot and dry. It incides, opens, and diſcuſſes, and is cephalic, neurotic, pectoral, and nephritic. It is good againſt epilepſies, apoplexies, vertigoes, and all diſorders of the head and nerves. *Lemery's Dict. of Drugs.*

SETS, a term uſed by the farmers to expreſs the young plants of the white thorn, and other ſhrubs, which they uſe to raiſe their quick, or quick-ſet hedges.

The white thorn is the beſt, of all trees, for this purpoſe, and under proper regulations, its Sets ſeldom fail of anſwering the farmers utmoſt expectations.

The firſt thing to be conſidered by the perſon, who is about to plant a quick-ſet hedge, is what nature the land is of where it is to ſtand, as whether it is clay, ſand, or gravel. It is always proper to take the Sets from a worſe land, than that they are to be planted on, otherwiſe they will never grow well. The Sets are about the thickneſs of a man's thumb, and cut within four or five inches of the ground. If the quick is intended only for a hedge, without a bank or ditch, let the Sets be planted almoſt perpendicular in two rows, at about twelve inches diſtance from each other; and, if there is to be a ditch and a bank, that is to be firſt provided. The ground is to be marked out with a line, and a ditch dug three feet wide at the top, one foot wide at the bottom, and two feet deep. When the ditch is digging, on that ſide where the quick is to ſtand, let the turf be laid evenly on the ground, with the graſſy ſide downwards: upon this ſome fine mould is to be laid, to bed the quick Sets in, and they are to be laid upon it with their ends inclining upwards, and at about twelve inches aſunder. They muſt be carefully gathered, and ſuch as are ſtraight, ſmooth, and well rooted, are only to be choſen. At every thirty feet there ſhould be planted with the Sets a young oak, aſh, or ſome other ſuch tree, to grow up along with the hedge. When a complete row of the Sets is thus laid, cover them with a layer of fine mould, and lay over that another layer of the turf; and upon this a third layer of mould, ſo deep, that its ſurface may be a foot above the row of Sets: on this bed place another row of the like Sets at the ſame diſtances, but placed between the others; cover this as the other, and then make up the bank with the earth dug out of the bottom of the ditch, and on its top ſet the dry, or dead hedge: this will ſhade the under plantation, and will be a defence till the Sets are grown up into a live hedge. The ſtakes for the dead hedge are to be driven into the bank ſo low as to reach the firm ground, and are to be placed at two feet and a half diſtance from one another.

Oak-ſtakes are the beſt for this purpoſe, and ſallow and black thorn are eſteemed next to theſe. The ſmall buſhes cut from them muſt be laid below, but not too thick, that they may ſhade the young plantation without ſmothering it, and defend its young ſhoots from the biting of cattle: the long buſhes are to be laid at top to bind in the ſtakes by interweaving them. To add a farther ſtrength to the hedge, it may be eddered as the farmers call it: this is binding the tops of the ſtakes with ſome ſmall long poles, or ſticks on each ſide. When this is all done, the ſtakes ſhould be new drove a little, becauſe the making the hedge, and the eddering it, are apt to looſen them a little.

The young plants muſt be conſtantly weeded, and great care muſt be taken to preſerve them from the bitings of cattle, eſpecially of ſheep. If they have been cropped, or are not found to grow well, it is a good cuſtom among the farmers to cut them down to the ground, or within an inch of it, for after this they uſually ſend out new roots, and ſhoot very vigorouſly. *Mortimer's Husbandry.*

SETA′CEUS *Vermis*, in natural hiſtory, a name given by Dr. Liſter to that long and ſlender water-worm which ſo much reſembles a horſe-hair, that it has been ſuppoſed by the vulgar to be an animated hair of that creature.

SETTEE′, a veſſel, very common in the Mediterranean, with one deck, and a very long and ſharp prow. They carry, ſome two maſts, ſome three, without top-maſts. Their yards and ſails are like the miſen. The leaſt of them are of ſixty tons burthen. They ſerve to tranſport cannon, and proviſion for ſhips of war and the like.

SE′TTING, the term uſed by ſportſmen to expreſs a manner of attacking partridges, in order to the taking them, by means of a dog peculiarly trained to that purpoſe. The ſetting-dog generally uſed is a long land-ſpaniel, taught by nature to hunt partridges more than any other game, and, in his untaught ſtate, running over the fields in ſearch of them, with an alacrity that is truly wonderful; yet by art this creature is brought under ſuch excellent command, that he will, in the midſt of his higheſt career, attend to the leaſt hem from his maſter, and ſtand ſtill to look in his face, and take his orders by the ſlighteſt ſignals; and, when he is ſo near his game, that it is almoſt in his mouth, he will ſtand ſtock ſtill, or lie down on his belly, till his maſter arrive, and he receives his directions.

The Setting-dog, being taken to the haunt of the partridges, is to be caſt off, and ſent to range; but he muſt be made to keep near the ſportſman, and not to run wildly on, but to beat all the ground regularly. On being reproved for ranging too wildly and too far, he will keep cloſe the whole day, and at times look up in his maſter's face to know if he does right or wrong. If in the dog's ranging he ſtops of a ſudden, the ſportſman is to make up to him, and as there is certainly game before him, he muſt be ordered to advance; if he refuſe this, and look back and ſhake his tail, it is a ſignal that they are cloſe before him, and the ſportſman is then to make a circumference, and look with a careleſs eye before the dog's noſe to ſee where they are, and how they lie; then going up, and ſtaking down one end of the net, he is to command the dog to lie ſtill, and to draw the net gently over the birds; then making in with a noiſe, he is to ſpring them, and they will be entangled and taken, as they riſe. It is a rule with fair ſportſmen, when they take a covey in this manner, always to let the cock and hen go.

SE′VENTH, (*Dict.*) — In thorough baſſes the Seventh, whether double, ſimple, major, or minor, is marked by a figure of 7; but, if it be accidentally flat, or minor, thus, 7*b*, or *b*7. If ſharp, or major, thus, ♯ 7, or 7 ♯. Again, if, when it is naturally minor, it be marked with a flat, it muſt be diminiſhed.

SE′WEL-*coronde*, a name given by the natives of Ceylon to a ſpecies of cinnamon, which, when chewed, is of a mucilaginous nature, like the caſſia; this dries well, and is very firm and hard, and has the appearance of a very fine cinnamon, but it has very little taſte, and a diſagreeable ſmell. The natives take advantage of the handſome appearance of this kind of cinnamon, and are very apt to mix it with the good kind, to the great detriment of the buyer. *Philoſ. Tranſ.* N°. 409.

SEXA′NGLE, in geometry, a figure having ſix ſides, and conſequently ſix angles.

SEXUALI′STÆ, among botanical authors, thoſe who have eſtabliſhed the claſſes of plants upon the differences of the ſexes, and parts of fructification in plants, according to the modern method, as Linnæus, &c. See the article *Sexes of* FLOWERS.

SHAD, *alauſa*, in zoology, the name of a ſea-fiſh of the herring kind, called alſo the mother of herrings, and by ſome authors clupea and triſſa, and by the ancients trichis, or trichias.

It is very common in many ſeas, and in ſome of our large rivers which lie near the ſea. They run up theſe in great numbers in the months of March and April, and are then very fat; in May they become lean, and then go down to the ſea again. They uſually ſwim in large ſhoals together. *Willughby's Hiſt. Piſc.*

SHAGGE, in zoology, a name by which we commonly call a water fowl, common on the northern coaſts, and called by Mr. Ray corvus aquaticus minor, or the leſſer cormorant, being properly a bird of the cormorant kind.

SHA′KER *Pigeon*, a kind of pigeons, of which there are two ſorts, the broad-tailed, and the narrow-tailed. The firſt is the fineſt, and moſt valued. It has a beautiful long thin neck, which bends like the neck of a ſwan, leaning towards the back. It has a full breaſt, and a very ſhort back, and a tail conſiſting of a great number of feathers, ſeldom leſs than four and twenty, which it ſpreads in an elegant manner, like the tail of a turkey-cock, and bends it up ſo, that it meets the head. It is commonly all white, but ſometimes is red, yellow, or blue-pied. The longer the neck of this bird is, the more it is valued.

The ſecond, or narrow-tailed Shaker, has a ſhorter and thicker neck, and a longer back. It is eſteemed by many a different ſpecies, but ſeems only a mixed breed with ſome other pigeon. They are called Shakers, from a tremulous motion which they have in their necks, when courting. *Moore's Columbarium.*

SHA′MBLE, in mining, a term uſed to expreſs a ſort of nich, or landing-place, left at certain diſtances in the adits of mines. The method of digging the tin mines in Devonſhire, and ſome parts of Cornwall, is this: they ſink their way in ſuch a breadth, as is ſufficient for them to ſtand and work, and at every fathom they leave a ſquare place vacant, to which the ore is to be thrown up with ſhovels, as it is dug. This they do from caſt to caſt; that is, as far as a man can conveniently throw up the ore with his ſhovel. Thus the ore, as it is dug by the beelmen, is thrown up by the ſhovelers, who follow them from Shamble to Shamble, till it comes to the top of the mine. This, however, is but an inconvenient way, and the uſe of theſe Shambles is generally ſupplied by a winder at the opening of the mine, which manages two buckets, the one of which is ſent down empty, while the other is ſent up full; and one man employed below to load, and another above to empty. *Philoſ. Tranſ.* N°. 69.

SHAMBRIE′R, in the manege, is a long thong of leather, made faſt to the end of a cane, in order to animate a horſe, and puniſh him, if he refuſes to obey the rider.

SHA'MMY (*Dict.*) — Beſides the ſoftneſs and warmneſs of the leather, it has the faculty of bearing ſoap without damage, which renders it very uſeful on many accounts.

In France, &c. ſome wear the ſkin raw, without any preparation: it is alſo uſed for the purifying of mercury; which is done by paſſing it through the pores of this ſkin, which is very cloſe.

The true chamoiſe leather is counterfeited with common goat, kid, and even ſheep-ſkin; the practice of which makes a particular profeſſion, called by the French chamoiſure. The laſt, though the leaſt eſteemed, is yet ſo popular, and ſuch vaſt quantities prepared, eſpecially about Orleans, Marſeilles, and Tholouſe, that it may not be amiſs to give the method of preparation.

Manner of SHAMOISING, *or of preparing ſheep, goat, or kid-ſkins in oil, in imitation of* SHAMMY. — The ſkins being waſhed, drained, and ſmeared over with quick-lime on the fleſhy ſide, are folded in two, length-wiſe, the wool outwards, and laid on heaps; and ſo left to ferment eight days; or, if they had been left to dry after fleaing, fifteen days.

Then they are waſhed out, drained, and half dried; laid on a wooden leg, or horſe, the wool ſtripped off with a round ſtaff for the purpoſe, and laid in a weak pit, the lime whereof had been uſed before, and had loſt the greateſt part of its force.

After twenty-four hours they are taken out, and left to drain twenty-four more; then put in another ſtronger pit. This done, they are taken out, drained, and put in again, by turns; which begins to diſpoſe them to take oil: and this practice they continue for ſix weeks in ſummer, or three months in winter; at the end whereof they are waſhed out, laid on the wooden leg, and the ſurface of the ſkin on the wool-ſide peeled off, to render them the ſofter; then, made into parcels, ſteeped a night in the river, in winter more; ſtretched, ſix or ſeven over one another, on the wooden leg; and the knife paſſed ſtrongly on the fleſh-ſide, to take off any thing ſuperfluous, and render the ſkin ſmooth.

Then they are ſtretched, as before, in the river; and the ſame operation repeated on the wool-ſide; then thrown into a tub of water with bran in it, which is brewed among the ſkins till the greateſt part ſtick to them; and then ſeparated into diſtinct tubs, till they ſwell, and riſe of themſelves above the water.

By this means, the remains of the lines are cleared out: they are then wrung out, hung up to dry on ropes, and ſent to the mill, with the quantity of oil neceſſary to ſcour them: the beſt oil is that of ſtock-fiſh.

Here, they are firſt thrown in bundles into the river for twelve hours, then laid in the mill-trough and fulled without oil till they be well ſoftened; then oiled with the hand, one by one, and thus formed into parcels of four ſkins each, which are milled and dried on cords a ſecond time, then a third; then oiled again and dried.

This proceſs is repeated as often as neceſſity requires: when done, if there be any moiſture remaining, they are dried in a ſtove, and made up into parcels wrapped up in wool: after ſome time they are opened to the air, but wrapped up again as before, till ſuch time as the oil ſeems to have loſt all its force, which it ordinarily does in twenty-four hours.

The ſkins are then returned from the mill to the chamoiſer, to be ſcoured; which is done by putting them in a lixivium of wood-aſhes, working and beating them in it with poles, and leaving them to ſteep till the lye have had its effect; then they are wrung out, ſteeped in another lixivium, wrung again, and this repeated till all the greaſe and oil be purged out. When this is done, they are half dried, and paſſed over a ſharp-edged iron inſtrument, placed perpendicular in a block, which opens, ſoftens, and makes them gentle: laſtly, they are thoroughly dried, and paſſed over the ſame inſtrument again, which finiſhes the preparation, and leaves them in form of Shammy.

Kid and goat ſkins are ſhamoiſed in the ſame manner as thoſe of ſheep; excepting that the hair is taken off, without the uſe of any lime; and that, when brought from the mill, they undergo a particular preparation, called ramalling; the moſt delicate and difficult of all the others.

It conſiſts in this, that, as ſoon as brought from the mill, they are ſteeped in a lixivium; taken out, ſtretched on a round wooden leg, and the hair ſcraped off with a knife; this makes them ſmooth; and, in working, caſt a kind of fine nap; the difficulty lies in ſcraping them evenly.

SHANK, or SHANK-*painter*, in a ſhip, is a ſhort chain faſtened under the fore-maſt ſhrouds, by a bolt, to the ſhip's ſides, having at the other end a rope faſtened to it. On this Shank-painter the whole weight of the aft part of the anchor reſts, when it lies by the ſhip's ſide. The rope by which it is haled up, is made faſt about a timber-head.

SHARE, the name of that part of the plough which cuts the ground, and the wood to which it is fixed. The extremity of the iron forwards is called the point of the Share, and the end of the wood behind is called its tail.

The length of the whole Share, from point to tail, ſhould be three feet nine inches; at the top of the iron it has an upright piece called the fin, and, near the iron at the other end, there is an oblong ſquared hollow, called the ſocket; the uſe of which is to receive the bottom of the ſheat. Near the tail there is a thin plate of iron, well riveted to the wood; by means of this plate the tail of the Share is held firmly to the hinder ſheat of the plough by a ſmall iron pin, with a ſkrew at the end, and a nut ſkrewed on it, on the inner or right ſide of the ſheat.

The point of the Share is that part in which it does not run up into the fin: this point is generally made of three inches and a half in length, and ſhould be flat underneath, and round at the top, and the lower part of it muſt be of hard ſteel. The edge of the fin ſhould alſo be well ſteeled, and ſhould make an acute angle with the Share.

The ſocket is a ſort of mortiſe; it ſhould be a foot long, and about two inches deep: the fore-end of it muſt not be perpendicular, but oblique, conformable to the end of the ſheat which enters into it. The upper edge of the fore-part muſt be always made to bear againſt the ſheat; but, if this end of the ſocket ſhould not be quite ſo oblique as the ſheat, it may be helped, by paring off a ſmall part of the wood at the point. *Tull's Huſbandry.* See the article PLOUGH.

SHARK.—We know two different fiſh under the ſame name of Shark, with the addition of their colour, blue and white.

The blue Shark is that ſpecies of ſqualus called glaucus, and galeus glaucus, by authors, and diſtinguiſhed by Artedi by the name of the ſqualus with a triangular dent or furrow in the extremity of the back, and with no foramina about the eyes like the galeus.

The other is the lamia, or canis carcharias of authors, commonly called by us *ſimply* the Shark. This is diſtinguiſhed by Artedi by the name of ſqualus with a flat back, and with numerous teeth, ſerrated at the edges. See the article SQUALUS.

The white Shark, or lamia, is a very dreadful and voracious fiſh, the largeſt of all the Sharks. They have been ſeen of four thouſand weight, with throats capable of ſwallowing a luſty man whole; nay, men have been found in them whole, when opened. Some have, for this reaſon, imagined this, and not the whale, to have been the fiſh in whoſe belly the prophet Jonah lay.

Its teeth are very ſharp and terrible; they are diſpoſed in ſix rows, and are all triangular, and notched like a ſaw on their edges. Theſe are, in the whole, a hundred and forty-four in number, and are placed in various directions. Their number is not exactly determinate. Its back is ſhort and broad, in compariſon of the other fiſh of this kind, and its tail compoſed of two fins of a cubit in length each. Its ſkin is rough, and its eyes large and round. It is found both in the ocean and Mediterranean, and is of all fiſh the moſt voracious of human fleſh.

SHEA'RING. The beſt time for Shearing of ſheep is about the middle or the latter end of June, becauſe it is good for them to ſweat in the wool before it is cut. They muſt be very well waſhed before the Shearing, for this is a great addition to the price of the wool: after the waſhing, let them go three or four days in a clean dry ground. When they are cut, the ſhearer muſt be very careful not to wound their ſkins, becauſe this gives occaſion to the flies to teaze the poor creature in a terrible manner. Some ſhear their lambs, the firſt year eſpecially, behind; but, before the doing of this, they ought to be carefully tagged, as it is called, that is, their tails and thighs behind ſhould be well cleared of wool, that the dung may not hang there, which would elſe make them ſore, and ſubject them to the flies, which would blow them, and make them full of maggots.

In Glouceſterſhire they houſe their ſheep every night, and litter them with clean ſtraw. Their dung makes this a very good manure for the land, and the wool of the ſheep is rendered ſo much finer by it, that the farmers have a double advantage from the practice.

In Middleſex, and about London, they have Way-hill ſheep: theſe come from Hampſhire, Wiltſhire, &c. and lamb very early, before Chriſtmas. *Mortimer's Huſbandry.*

SHEAT *of a plough*, a word uſed by our farmers to expreſs a part of a plough paſſing through the beam, and faſtened to the ſhare. The Sheat, or, as it is ſometimes called, the fore-Sheat, there being another timber behind it, called the hinder Sheat, ſhould be ſeven inches wide, and is faſtened to the beam by the retch, a piece of iron with two legs, and by a wedge driven, with it, into the hole in the beam.

The angle made by the Sheat, with the beam of the plough, ſhould be forty-two, or forty-three degrees. *Tull's Huſbandry.* See the article PLOUGH.

SHEATS, in a ſhip, are ropes bent to the clews of the ſails, ſerving in the lower ſails to hale aft, or round off the clew of the ſail; but in top-ſails they ſerve to hale home, as the word is, or to hale the clew of the ſail cloſe to the yard-arm.

SHEA'THING, *of a ſhip*, (*Dict.*)— It is very well worth the trying what the new ſtone-pitch will do in this caſe; if it will defend from the worm, as perhaps it may, a ſhip might be paid with it cheaper than with the crown-pitch; and it will not crack nor ſcale off, as that will do, but keeps always ſoft and ſmooth. It has been found to continue on thirteen months, and to remain very black and ſoft all the time.

SHEEP, *ovis*, in zoology, a well known kind of cattle, that is kept at the leaſt expence of any to the farmer, and will thrive upon almoſt any ground, and for this reaſon many prefer them before the larger cattle.

The beſt ſort of Sheep for fine wool are thoſe bred in Herefordſhire and Worceſterſhire, but they are ſmall and black-faced, and bear but a ſmall quantity.

Warwick, Leiceſterſhire, Buckingham, and Northamptonſhire breed a large-boned Sheep, of the beſt ſhape, and deepeſt wool we have got. The marſhes of Lincolnſhire breed a very large kind of Sheep, but their wool is not good, unleſs the breed be mended by bringing in Sheep of other countries among them, which is a ſcheme of late very profitably followed there.

The northern counties in general breed ſheep with long, but hairy wool; and Wales breeds a ſmall hardy kind of Sheep which has the beſt-taſted fleſh, but the worſt wool of all.

The farmer ſhould always buy his Sheep from a worſe land than his own, and they ſhould be big-boned, and have a long greaſy wool, curling cloſe and well. Theſe Sheep always breed the fineſt wool, and are alſo the moſt approved of by the butcher for ſale in the market.

For the choice of Sheep to breed, the ram muſt be young, and his ſkin of the ſame colour with his wool, for the lambs will be of the ſame colour with his ſkin. He ſhould have a large long body, a broad forehead, round, and well riſing, large eyes, and ſtraight and ſhort noſtrils. The polled Sheep, that is, thoſe which have no horns, are found to be the beſt breeders. The ewe ſhould have a broad back, a large bending neck, ſmall, but ſhort; clean and nimble legs, and a thick deep wool covering her all over. To know whether they be ſound or not, the farmer ſhould examine the wool, that none of it be wanting, and ſee that the gums be red, the teeth white and even, and the briſket ſkin red, the wool firm, the breath ſweet, and the feet not hot. Two years old is the beſt time for beginning to breed, and their firſt lambs ſhould not be kept too long, to weaken them by ſuckling, but be ſold as ſoon as conveniently may be. They will breed advantageouſly, till they are ſeven years old.

The farmers have a method of knowing the age of a Sheep, as a horſe's is known, by the mouth. When a Sheep is one ſhear, as they expreſs it, it has two broad teeth before; when it is two ſhear, it will have four; when three, ſix; when four, eight; after this, their mouths begin to break. The difference of land makes a very great difference in the Sheep. The fat paſtures breed ſtraight tall Sheep, and the barren hills and downs breed ſquare ſhort ones; woods and mountains breed tall and ſlender Sheep, but the beſt of all are thoſe bred upon new plowed land, and dry grounds. On the contrary, all wet and moiſt lands are bad for Sheep, eſpecially ſuch as are ſubject to be overflowed, and to have ſand and dirt left on them. The ſalt marſhes are, however, an exception to this general rule, for their ſaltneſs makes amends for their moiſture; any thing of ſalt, by reaſon of it drying quality, being of great advantage to Sheep.

As to the time of putting the rams to the ewes, the farmer muſt conſider at what time of the ſpring his graſs will be fit to maintain them and their lambs, and whether he has turneps to do it till the graſs comes; for very often both the ewes and lambs are deſtroyed by the want of food; or, if this does not happen, if the lambs are only ſtunted in their growth by it, it is an accident that they never recover. The ewe goes twenty weeks with lamb, and according to this it is eaſy to calculate the proper time. The beſt time for them to yean is in April, unleſs the owner has very forward graſs, or turneps, or the Sheep are field Sheep where you have not incloſures to keep them in, then it may be proper they ſhould yean in January, that the lambs may be ſtrong by May-day, and be able to follow the dam over the fallows, and water furrows; but then the lambs, that come ſo early, muſt have a great deal of care taken of them, and ſo indeed ſhould all other lambs at their firſt falling, elſe, while they are weak, the crows and magpies will peck their eyes out.

When Sheep are turned into fields of wheat or rye to feed, it muſt not be too rank firſt, for, if it be, it generally throws them into ſcowerings. Ewes that are big ſhould be kept but bare, for it is very dangerous to them to be fat at the time of their bringing forth their young. They may be well fed indeed, like cows, a fortnight before-hand, to put them in heart. *Mortimer's Huſbandry.*

The feeding Sheep with turneps is one great advantage to the farmers, from the crops they raiſe of them: they ſoon fatten upon them, but there is ſome difficulty in getting them to feed on them; the old ones always refuſe them at firſt, and will ſometimes faſt three or four days, till almoſt famiſhed; but the young lambs fall to at once.

The common way, in ſome places, of turning a flock of Sheep at large into a field of turneps, is very diſadvantageous, for they will thus deſtroy as many in a fortnight, as would have kept them a whole winter. There are three other ways of feeding them on this food, all of which have their ſeveral advantages.

The firſt way is to divide the land by hurdles, and allow the Sheep to come upon ſuch a portion only at a time, as they can eat in one day, and ſo advance the hurdles farther into the ground daily, till all be eaten. This is infinitely better than the former random method, but they never eat them clean even this way, but leave the bottoms and outſides ſcooped in the ground; the people pull up theſe indeed with iron crooks, and lay them before the Sheep again, but they are commonly ſo fouled with the creature's dung and urine, and with the dirt from their feet, that they do not care for them; they eat but little of them, and what they do, does not nouriſh them like the freſh roots.

The ſecond way is by incloſing the Sheep in hurdles, as in the former; but in this they pull up all the turneps they ſuppoſe the Sheep can eat in one day, and daily remove the hurdles over the ground, whence they have pulled up the turneps: by this means there is no waſte, and leſs expence, for a perſon may in two hours pull up all thoſe turneps; the remaining ſhells of which would have employed three or four labourers a day to get up with their crooks out of the ground, trodden hard by the feet of the Sheep; and the worſt is, that as, in the method of pulling up firſt, the turneps are eat up clean; in this way, by the hook, they are waſted, the Sheep do not eat any great part of them, and when the ground comes to be tilled afterwards for a crop of corn, the fragments of the turneps are ſeen in ſuch quantities on the ſurface, that half the crop at leaſt ſeems to have been waſted.

The third manner is to pull up the turneps, and remove them in a cart or waggon to ſome other place, ſpreading them on a freſh place every day; by this method the Sheep will eat them up clean, both roots and leaves. The great advantage of this method is, when there is a land not far off which wants dung more than that where the turneps grow, which perhaps is alſo too wet for the Sheep in winter, and then the turneps will, by the too great moiſture and dirt of the ſoil, ſometimes ſpoil the Sheep, and give them the rot. Yet ſuch ground will often bring forth more and larger turneps than dry land, and when they are carried off, and eaten by the Sheep on plowed land in dry weather, and on green ſward in wet weather, the Sheep will ſucceed much the better; and the moiſt ſoil, where the turneps grow, not being trodden by the Sheep, will be much fitter for a crop of corn, than if they had been fed with the turneps on it. The expence of hurdles, and the trouble of moving them, is ſaved in this caſe, and this will counterbalance at leaſt the expence of pulling the turneps, and carrying them to the places where they are to be eaten. They muſt always be carried off for oxen. *Tull's Horſehoeing Huſbandry.*

The uſe of ſalt preſerves Sheep from the rot. The animals muſt be made to take a ſmall handful of it two or three times in a few days, without permitting them to drink any thing for ſome hours afterwards. *Boyle's Works.*

SHEEP's *dung*.— This is one of the beſt manures we know. It ſucceeds better upon cold clayey lands, than any other dung whatever; but, as it is not ſo conveniently to be collected as the dung of larger animals, it is commonly conveyed to the land it is intended for, by folding the Sheep upon it. The urine, as well as the dung, is thus given to the land, and is of very great advantage; but the farmer always ſhould plow in this ſort of manure as ſoon as he can, for the ſun ſoon robs it of a great part of its virtue.

In Northamptonſhire they begin to fold the Sheep upon the lands that they would dung by them, after the month of July, and, the drier the lands are, the later they fold them. In Flanders they make many thouſand loads of manure annually from their Sheep: they cover the bottom of the folds conſiderably deep with ſome light and ſpungy earth, and, when this has received the dung and urine of the animals for ſeven or eight days, they remove it, and lay freſh in its place: the earth, thus impregnated, becomes an excellent improvement to land, and they raiſe large crops by means of it, in places where very little could be expected without it.

In England we have a contrivance like this, which is the covering the bottoms of the folds deep with ſand, and changing it once in a week, or thereabouts: this is a kind of manure finely calculated for clayey lands, both the ſand, and this peculiar kind of dung, being appropriated things for it.

SHEEP-*noſe-worms*, in natural hiſtory, a ſpecies of fly-worm, found in the noſes of ſheep, goats, and ſtags, and produced there from the egg of a large two-winged fly.

The frontal ſinuſes above the noſe in Sheep, and other animals, are the places where theſe worms live, and attain their full growth. Theſe ſinuſes are always full of a ſoft white matter, which furniſhes theſe worms with a proper nouriſhment, and are ſufficiently large for their habitation; and when they have here acquired their deſtined growth, and come to the ſtate in which they are fit to undergo their changes for the fly-ſtate, they leave their old habitation, and, falling to the earth, bury themſelves there; and, when theſe are hatched into flies, the female, when ſhe has been impregnated by the male, knows that the noſe of a Sheep, or other animal, is the only place for her to depoſit her eggs, in order to their coming to good. *Reaumur's Hiſt. Inſ.*

SHEERS, aboard a ſhip, a name the ſeamen give to two maſt's yards, or poles, ſet up and ſeized acroſs each other aloft, near the top. This pair of Sheers, as they call it, is placed below on the chain-wales of the ſhrouds, and laſhed faſt to the ſhip's ſide, to keep them ſteady aloft. Their uſe is to ſet in, or take out a maſt; for which end there is faſtened, at the place where they croſs one another, a ſtrong double block with a ſtrap. They ſerve alſo to hoiſe in or out, of boats that have maſts, ſuch goods as are wanted to be taken in or out.

SHEER-*water*, in zoology, an Engliſh name for a bird common on our coaſts, and not known by any of the common authors, nor honoured with a Latin name. It is nearly of the ſize of a duck. Its head, which is large, neck and back, are of a browniſh black; its throat, breaſt, and belly, white; its legs are red. Its three fore toes are connected by a membrane, but its hinder one is looſe. Its wings are very long, and, when folded, reach to the end of the tail. Its beak is ſtrong and ſharp, and is hooked at the end. It flies very ſwiftly along the ſurface of the water, whence it has its name. *Ray's Ornithology.*

SHEIK, in the Oriental cuſtoms, the perſon who has the care of the moſques in Egypt; his duty is the ſame as that of the imams at Conſtantinople. There are more or fewer of theſe to every moſque, according to its ſize or revenues. One of theſe is head over the reſt, and anſwers to a pariſh prieſt with us, and has under him, in large moſques, the readers, and people who cry out to go to prayers; but in ſmall moſques the Sheik is obliged to do all this himſelf. In ſuch it is their buſineſs to open the moſque, to cry to prayers, and to begin their ſhort devotions at the head of the congregation, who ſtand rank and file in great order, and make all their motions together. Every Friday the Sheik makes an harangue to his congregation. *Pocock's Egypt.*

SHEIK-*bellet*, the name of an officer in the Oriental nations.

In Egypt the Sheik-bellet is the head of a city, and is appointed by the paſha. The buſineſs of this officer is to take care that no innovations be made, which may be prejudicial to the port, and that they ſend no orders which may hurt the liberties of the people. But all his authority depends on his credit and intereſt, not his office: for the government of Egypt is of ſuch a kind, that often the people of the leaſt power by their poſts have the greateſt influence; and a caia of the Janizaries, or Arabs, and ſometimes one of their meaneſt officers, an oda-baſha, finds means, by his parts and abilities, to govern all things. *Pocock's Egypt.*

SHE'KEL (*Dict.*)—In the Bible, the Shekel is ſometimes rendered ſolidus, and ſometimes ſtater.

The Jewiſh doctors are in great doubt about the weight of the Shekel: and it is only by conjecture, and by the weight of the modern Shekel, that the ancient one is judged equal to four Attic drachmas.

Father Souciet has deſcribed ſeveral of theſe Shekels, in his diſſertation on the Hebrew Medals. By the way he obſerves, that the third and fourth parts of a Shekel, deſcribed by Waſerus de Ant. Num. Heb. are counterfeits of that author.

The Hebrew Shekel, according to F. Merſenne, weighs 268 grains, and is compoſed of 20 oboli, each obolus weighing 16 grains of wheat. This, he ſays, is the juſt weight, as he found by weighing one in the French king's cabinet. He adds, that ſuch as come ſhort of this weight have been filed or clipped. Biſhop Cumberland tells us, he has weighed ſeveral, and always found them near the weight of a Roman ſemuncia, or half-ounce.

Some are of opinion, that the Hebrews had two kinds of Shekels: the common or prophane Shekel, called didrachma; and the Shekel of the ſanctuary, which laſt they will have to be double the former.—By this expedient they think we may get clear of ſome difficulties occurring in ſcripture, where things are mentioned as of incredible weight; particularly that paſſage where it is ſaid, that every time Abſalom cut off his hair, the weight whereof uſed to incommode him, he cut off the weight of 200 Shekels.

But Villalpandus will not hear of ſuch a diſtinction; nor do biſhop Cumberland, M. Morin, &c. take the opinion to have any foundation. The prophane Shekel, or Shekel of four drachmas, they agree, was the ſame with the ſacred Shekel; and it was only called by this laſt name, in regard the ſtandard thereof was kept, in the ſanctuary, by the prieſts. It is maintained by ſeveral, that the Jews had alſo a gold Shekel, ſiclus aureus, of the ſame weight with the ſilver one, and valued at 1 l. 16 s. 6 d. ſterling.

The Shekel is ſuppoſed to have been firſt ſtruck in the deſart, on the footing of 100 to the Attic mina, weighing 160 grains of wheat, and current for 10 geratis or oboli. But afterwards they were ſtruck of double that weight.

Some will have the Shekel to be the oldeſt piece of money in the world, as being in uſe in Abraham's time; but this was not coined, or ſtamped; nor had any other value beſides its intrinſic worth.

Xenophon mentions Shekels, as current in Arabia: Du Cange ſpeaks of others ſtruck and current in England.

SHELF (*Dict.*)—What the miners mean by this term is, that part of the earth which they find lying even, and in an orderly manner, and evidently having retained its primitive form and ſituation unmoved by the waters of the general deluge, while the circumjacent and upper ſtrata have plainly been removed, and toſſed about.'

It is evident to reaſon, that there muſt have been a very violent concuſſion of the ſuperficial part of the earth, in the time of its being covered by the waters of the deluge; and experience as much evinces this as reaſon. Before this concuſſion it appears probable that the uppermoſt ſurface of mineral veins, or loads, did in moſt places lie even with the then ſurface of the earth. The remains of this ſurface, found at different depths in digging, the miners expreſs by the word Shelf.

In this concuſſion of the waters covering the whole earth, its natural ſurface, together with the uppermoſt ſurface of thoſe mineral veins, were then in many places looſened, and torn off; and the earth, and with it the mineral nodules, called ſhoad-ſtones, were carried down with the deſcending waters from hills into the adjacent valleys, and ſometimes into the ſtreams of rivers; by which they were waſhed to yet greater diſtances from their original place.

On this depends the method of training mines. *Philoſ. Tranſ.* N°. 69.

SHELLS (*Dict.*)—The world has for a long time wanted a regular method of claſſing of Shells, which a late author of the French nation has attempted upon a new and very laudable plan. In this, he throws aſide the vulgar diſtinction of Shells into the ſea, freſh-water, and land kinds, and very judiciouſly arranges all under the ſame claſs, which have the ſame general characters.

The Shells are all naturally to be arranged under three principal claſſes; theſe will contain all the ſpecies, and are afterwards to be divided into a number of families, or genera, and under theſe the ſeveral ſpecies regularly recounted; and, at the end of each deſcription, the varieties may be added. The firſt general claſs of Shells contains thoſe which are found all of one piece, or have only one Shell, not a pair. Theſe have been called by the Greeks monothyræ, and by the Latin authors univalviæ, univalves.

The ſecond general claſs contains thoſe Shells which are of two pieces, called bivalves, ſuch as oyſters, cockles, and the like. The third claſs contains thoſe which are compoſed of more than two pieces. Theſe are called multivalves; and of this kind are the pholas and balanus.

This method takes in the freſh-water Shells, as well as thoſe of the ſea; and, as thoſe hitherto known are all of one or other of the firſt claſſes, their ſeveral ſpecies will be compriſed among, or after the ſea Shells of each of thoſe claſſes.

The land Shells are of two kinds, the recent and the foſſil; the firſt kind, as far as hitherto known, are all univalves, and the latter are of all the three claſſes.

As each of theſe general claſſes contains a very great number of ſpecies, it may ſeem difficult to enter on this ſtudy, from the multiplicity of the bodies; but method renders all this eaſy, and it is no way difficult, in the following manner, to find of what claſs, what family, and what genus, any given Shell is, from a bare inſpection.

Bivalve **SHELLS**.—The former are all the genera of the Shells compoſed of one piece, and thence called univalves: and, as any given Shell may, by the characters given of each, be eaſily referred to that to which it belongs, ſo, in regard to the bivalves, the taſk is not more arduous, when entered on upon the ſame principles; and it is the eaſier in this reſpect, that the families of this claſs are much leſs numerous than thoſe of the other, theſe being only ſix.

The firſt genus or family of the bivalves is that of the oiſter, oſtreæ. The variety of this one genus is almoſt infinite, and is extremely agreeable. Some are echinated ſo as to repreſent the echini; others have excreſcences of parts in undulatory, or jagged forms, repreſenting the ears of animals, or the comb of a cock; and others form themſelves into very remarkable figures, by adhering and growing to trees, ſtones, corals, and other ſubſtances, either naturally growing in the ſea, or ſuch as have accidentally fallen into it. Sometimes, alſo, the upper Shell in an oiſter is ſmaller and flatter than the under one. Theſe, however, are all trifling varieties, and the Shells are ſtill of the oiſter kind.

When the bivalve Shells, under examination, differ from the oiſter kind, in being more elevated in the middle, and equally convex, or nearly ſo, in both Shells, then it belongs to the family, under the name of chamæ. Theſe differ alſo from oiſters, in that they are more ſmooth on the ſurface, and they often do not cloſe ſo evenly and regularly at the mouth, whence ſome have called them conchylia ore patulo et hianti.

The third family is that of the muſcles. Theſe are all of the general ſhape of the common muſcle, and are thence eaſily known. It is to be obſerved, however, that ſome of them are equal at both ends; theſe are called tellinæ: and ſome others are extremely long at one end, and broad and ſhort at the other; theſe are called pinnæ marinæ.

The fourth genus, or family, is the cordiform kind, called in French cœurs. The eſſential character of this family is, that the Shells are of a roundiſh elevated figure, and that they have no ears, as the pectens have, and they always repreſent the figure of a heart, in whatever view they are taken; though this is ſometimes of a triangular figure. Moſt of the ſpecies of this family, as well as of the following one of the pectens, are ſtriated.

The fifth family of the bivalves is that of the pectens or ſcallop Shells. Among theſe, ſome have two ears at the head of the Shell; others have only one ear; and others have none at all. Some ſpecies are deeply furrowed, and others are full of ſmall protuberances. The general character of the pectens is to have the upper Shell plain, and the under one ſomewhat hollow; and the ears are alſo a very obvious character in thoſe that have them.

The ſixth, and laſt family of the bivalves, is the ſolen or raſor-fiſh, called by the French manche de couteau. Theſe are very eaſily known by their figure which reſembles that of a knife-haft, and therefore need no other mark of diſtinction.

Multivalve SHELLS. Theſe are not leſs eaſily diſtinguiſhed, than the other two general claſſes, into their ſeparate families. Of theſe, alſo, there are ſix families. The firſt is that of the echini marini, called, in Engliſh, ſea-eggs, and by the French ourſins, boutons, and heriſſons des mer. Theſe carry a very obvious diſtinction, in their being covered with ſpines or prickles; and if we meet with them in a ſtate, when theſe are fallen off, they are ſtill eaſily known by the marks of their inſertion. This, and their general figure which is alike in all, and in all unlike to all other ſpecies, is ſuch a diſtinction, as cannot ſuffer them to be miſtaken.

The ſecond family of theſe is that of the vermiculi marini particularly charactered in the ſpecies called the ſea-organ. Theſe are uſually of a beautiful red colour, and are of a very elegant ſtructure. Theſe generally are found in very large cluſters, and are eaſily diſtinguiſhed from all other genera.

The third family of the multivalves conſiſts of the balani marini, called by the French glands de mer. Theſe are all ſo like one another, that they are eaſily known from all the other genera, by their all reſembling the common balanus, a Shell too well known to need deſcription.

The fourth family is that of the pollicipedes, or, as the French call them, the pouſſepieds. Theſe are ſo eaſily known by their perfect reſemblance to one another, that there needs no other character than referring to their figure in *Plate* XLIII. *fig*. 2.

The fifth family of the multivalves is that of the conchæ anatiferæ. Theſe were once ſuppoſed to produce a bird of the gooſe kind; and theſe are all ſo like to one another, that the referring to the figure of the common ſpecies, in *Plate* XLIII. *fig*. 3. will ſhew the characters of all the ſpecies.

Finally, the ſixth genus of the multivalves is that of the pholas. Theſe Shells are eaſily diſtinguiſhed by their figure, which is uſually oblong, and their colour, which is ſimply white in all the ſpecies. Theſe Shells are often found incloſed in ſtone in the ſea, and ſome of them are compoſed of five valves.

Foſſil SHELLS.— The number and variety of ſea Shells which are found far from ſeas buried at great depths in the earth, and often immerſed in the hardeſt ſtones, is an object of great wonder.

Of theſe ſome are found remaining almoſt entirely in their native ſtate, but others are variouſly altered by being impregnated with particles of ſtone, and of other foſſils; in the place of others there is found mere ſtone or ſpar, or ſome other native mineral body, expreſſing all their lineaments in the greateſt nicety, as being formed wholly from them, the Shell having been firſt depoſited in ſome ſolid matrix, and thence diſſolved by very ſlow degrees, and this matter left in its place, on the cavities of ſtone and other ſolid ſubſtances, out of which Shells have been diſſolved and waſhed away, being afterwards filled up leſs ſlowly with theſe different ſubſtances, whether ſpar or whatever elſe: theſe ſubſtances, ſo filling the cavities, can neceſſarily be of no other form than that of the Shell, to the abſence of which the cavity was owing, though all the nicer lineaments may not be ſo exactly expreſſed. Beſides theſe, we have, alſo, in many places, maſſes of ſtone formed within various Shells; and theſe, having been received into the cavities of the Shells while they were perfectly fluid, and having therefore nicely filled all their cavities, muſt retain the perfect figures of the internal part of the Shell, when the Shell itſelf ſhould be worn away, or periſhed from their outſide. The various ſpecies we find of theſe are, in many genera, as numerous as the known recent ones; and as we have in our own iſland not only the Shells of our own ſhores, but thoſe of many other very diſtant ones; ſo we have alſo many ſpecies, and thoſe in great numbers, which are, in their recent ſtate, the inhabitants of other yet unknown or unſearched ſeas and ſhores. The cockles, muſcles, oiſters, and the other common bivalves of our own ſeas are very abundant: but we have alſo an amazing number of the nautilus kind, particularly of the nautilus Græcorum, which, though a Shell not found living in our own, or any neighbouring ſeas, yet is found buried in all our clay-pits about London, and elſewhere; and the moſt frequent of all foſſil Shells in ſome of our counties are the conchæ anomiæ, which yet we know not of in any part of the world in their recent ſtate. Of this ſort, alſo, are the cornua ammonis and the gryphitæ, with ſeveral of the echnatæ and others.

The exact ſimilitude of the known Shells recent and foſſil, in their ſeveral kinds, will by no means ſuffer us to believe, that theſe, though not yet known to us in their living ſtate, are, as ſome have idly thought, a ſort of luſus naturæ. It is certain, that, of the many known ſhores, very few, not even thoſe of our own iſland, have been yet carefully ſearched for the Shell-fiſh that inhabit them; and, as we ſee in the nautilus Græcorum an inſtance of Shells being brought from very diſtant parts of the world to be buried here, we cannot wonder that yet unknown ſhores, or the unknown bottom of deep ſeas, ſhould have furniſhed us with many unknown Shell-fiſh, which may have been brought with the reſt; whether that were at the time of the general deluge, or the effect of any other cataſtrophe of a like kind, or by whatever other means; to be left in the yet unhardened matter of our ſtony and clayey ſtrata. *Hill's Hiſt. of Foſſ.*

The vaſt beds of foſſil Shells, buried in many parts of the world, are not uſeleſs matter, but will ſerve to one of the greateſt purpoſes of huſbandry, the manuring of barren lands. The people of many parts of France, and in ſome places in our own country, dig up the maſſes of broken Shells, connected into a ſort of ſtrata by marly, or other earths, for this purpoſe; and, ſpreading them upon the lands as dung, they ſoon moulder away, and are found extremely beneficial to the earth. Mr. Reaumur, deſirous of knowing in what manner theſe fragments of Shells fertiliſed land, at firſt conjectured that they did the ſame as the various ſpecies of marls, diſſolving wholly away in time, and entering into, and fattening the earth; and carried it ſo far, as to believe that the common marls were a ſort of earth, which owed its origin merely to ſuch fragments of Shells more perfectly diſſolved; and conſequently, that the rain and air, in ſome ſort, converted theſe Shells into marl upon the earth. But he was ſoon convinced of the error of this opinion, by the experience of the peaſants, from whom he found that there was marl in the ſame pits whence they dug theſe Shells, and that they uſed it alſo as manure, but to lands of a very different kind; thoſe which received benefit from the marl being always injured by the Shells, and, on the contrary, thoſe which were meliorated by the Shells receiving no benefit from the marl. It might naturally enough be ſuppoſed that the ſalts, contained in theſe foſſil Shells, helped to fertiliſe the earth, in the ſame manner with the ſalts of the common ſea-plants, which are uſed as manure in many places. It is not impoſſible, but that the ſalts may indeed have their uſe in the whole, but the great good theſe ſhelly fragments do to the lands they are uſed on, is to be explained in a much eaſier manner, when the nature of the lands, on which they are employed, is conſidered.

Theſe are uſually cold clayey lands, on which nothing can grow but heath, and a few uſeleſs weeds, the common plants not ſhooting in any ſtrength or perfection upon them; and they are always very wet upon the ſurface after any little rain, their texture being ſo cloſe and compact, that the water cannot penetrate into them, as it does into the ſpungy texture of the common fertile lands. This ſort of manure, which is very light, and is no other than a maſs of broken, and, as it were, half calcined Shells, mixing with this earth, breaks its particles, and occaſions a multitude of voids and little cavities in it, which reduce it to ſomething like the common ſtate of other earth, and the rain penetrates it as it does other mould.

The effects of this ſort of manure are very laſting; a land well ſtrewn with theſe Shells is manured for twenty years, and the rain no longer wets its ſurface only, but penetrates its ſubſtance, and moiſtens the roots of plants ſown in it. Theſe find alſo an eaſier paſſage, and penetrate to a proper depth; while the plowman finds no leſs the benefit; his plough now eaſily turning up an earth, which before it was ſcarce able to cut. Some have imagined, indeed, that all theſe effects are owing to the ſalts in the Shells operating in the manner of thoſe of dung, and by that means breaking the connections of the more minute molecules; but ocular examination will ſhew the Shells act, in this caſe, merely as particles of hard matter of that ſize and hardneſs, and do no more than fragments of ſtone of the ſame ſize would do; and the peaſants are well acquainted with this, as they find it neceſſary to dung thoſe lands, which they have before manured with Shells, in the ſame manner as they do any others.

There are in many foreign countries, as well as in our own, lands of ſuch a nature, that they never will become fertile, unleſs a large quantity of ſand is diſperſed over them. Theſe lands are all of the ſame nature with thoſe on which the farmers find their manure of Shells to take effect. The ſand, and this manure of Shells, evidently act upon the ſame principle, in meliorating land, which is only by dividing its parts, when naturally too compact; but the Shells are qualified to do it greatly the better of the two, becauſe they are in themſelves ſo conſiderably lighter. Somewhat analogous to this ſort of manure is that of the throwing pebbles and rough fragments of ſtone on ſome earths, which are naturally tough and compact in a great degree. It is the general practice in huſbandry to take off all the ſtones, as far as it can be done, from the lands; but theſe ſoils are apt to crack, and burſt open in dry ſeaſons, and, the more ſtones are mixed in them, the leſs they are obſerved to crack, and what cracks they have, are always the ſmaller and the ſhorter. The earth is, by theſe ſtones, divided into ſo many ſeparate parcels, that no very large and continued cracks can be formed; and always is the more fruitful, the more ſtones it has upon it, provided that they be not too large.

The manure of Shells, upon theſe lands, does not produce nearly ſo great an effect for the two firſt years, as it does in the ſucceeding ones; the reaſon of which is, that it is not then ſufficiently mixed, but in ſucceeding time it breaks itſelf into a number of very ſmall particles, and theſe all become intimately blended with the molecules of earth, and produce their effect more perfectly.

It is well known, that the Shells of the common garden ſnails always become calcined, as it were, in ſome degree, by lying in the earth; this becomes very friable, and may be mouldered to powder between the fingers: and the caſe is juſt the ſame in regard to theſe ſea-ſhells; they, by their long abode in the earth, are thus calcined, and, happily for the farmer, are reduced to a ſort of coarſe powder, the particles of which are juſt of ſuch a ſize, as may properly ſerve for the dividing and breaking the little clods of earth, and forming in the whole certain voids and ſpaces, juſt as large as they could be wiſhed, in order to give roots, and moiſture to ſwell them, an eaſy paſſage. And as theſe pieces of Shells are not expected to act as bodies containing active principles, but merely as inert particles of matter, ſo long as they retain their form, that action will not be impeded; and notwithſtanding all the rude ſhocks they receive from the plough, and other inſtruments of huſbandry, they retain this their form without any great alteration for a long time, and therefore the operation of ſtrewing them on any piece of land needs not to be repeated in twenty, or ſometimes in thirty years.

The manner in which the effects of this Shell-manure wear off at length, will be eaſily ſeen, if parcels of earth, manured with it at different diſtances of time, be examined, by waſhing away the earth with water; the fragments of Shells, left from the waſhing of earths of different years from the time of their being added to them, will be found growing ſmaller and ſmaller every year, till at length they make only a fine powder, mixing every way equally with the earth, and no longer opening its texture, or dividing its molecules; and it is then that theſe lands require a freſh quantity of it.

This breaking of the particles of the Shells is not to be determined by any regular rule, as to time, but differs from a number of accidents; and, accordingly, the farmer cannot ſay when he ought to renew the work, till he finds that the fertility it occaſioned decreaſes. The ſize of the fragments in their original beds makes a great difference, the largeſt uſually, and as might naturally be ſuppoſed, laſting the longeſt; but, beſides this, they are more or leſs durable, as they were more or leſs calcined in the earth, and even according to the nature of that earth, upon which they are laid.

Mr. Reaumur concludes this uſeful account of theſe ſubſtances, by obſerving, that it is much more eaſy to account for the manner of their acting upon land, than for the manner of their coming where they are found. It has been the favourite ſyſtem of our Dr. Woodward, that all theſe Shells were the remains of the univerſal deluge, which, having overflowed the whole earth, might eaſily leave them in all places; but Mr. Reaumur has much more rationally accounted for their coming to thoſe parts of France, where they are found at this time in ſuch vaſt abundance, by carefully tracing the courſe of the beds of them, ſo far as known there, and eaſily proving, that all that extent of country, under which they are found, may have been once overflowed by the ſea, without a deluge; it being the very track that a large body of waters, let in at one part of the kingdom, muſt have taken, in order to getting out at another. *Mem. de l'Acad. Par.* 1720.

Arabian SHELL, a name given by ſome to a ſpecies of porcelain Shell, not becauſe it is found on the coaſt of Arabia, but becauſe its lines and variegations are ſuppoſed to repreſent the figures of Arabic characters.

Aurora SHELL, in natural hiſtory, a very remarkable ſpecies of Shell-fiſh, found in cabinets of the curious. It is of the figure of a bird, having a head, wings, and tail, and is of a flame-colour. It owes much of its beauty, however, to art and accident. The Shell is an oiſter of a peculiar variation of figure from the common one; the head of the bird is the cardo or hinge; the wings are the body of the Shells; and the tail is a peculiar proceſs, like that of the marteau, only ſingle. It is naturally of a duſky brown on the outſide, and pearly within, but, when its rough coat is taken off, it appears of this beautiful flame-colour.

Center SHELL, in natural hiſtory, a name given to the balanus marinus, a kind of ſea Shell, of the multivalve kind, with an open mouth, frequently found fixed to the bottoms of ſhips, and other things covered with ſea-water.

China-letter SHELL, in natural hiſtory, a name given by many to that ſpecies of chama, uſually called, by authors, the chama Arabica. It is of a pale browniſh ground, and is variegated with a great number of black lines, which are as ſlender as the ſtrokes of a pen, and are of ſuch odd figures, that they repreſent ſome of the Arabic, or, as others fancy, Chineſe characters.

Guinea SHELL, the Engliſh name for a very beautiful variegated ſpecies of voluta, called by the French la ſpeculation.

Helmet SHELL, in natural hiſtory, the name of a kind of murex, of which there are ſeveral ſpecies. They all approach ſomewhat towards a triangular figure, and are free from any long ſpines.

Leopard SHELL, in natural hiſtory, the Engliſh name of the pardus, a kind of voluta; ſo called, from its ſpots reſembling thoſe of a leopard. There are three kinds of this, one ſpotted with black, another with yellow, and another with red.

Leveret SHELL, in natural hiſtory, a name given by many to a ſpecies of porcelain, reſembling a young hare in colour.

Lightning SHELL, in natural hiſtory, a name given by ſome authors to a ſpecies of murex with variegations on its body, reſembling the pictures we commonly ſee of flaſhes of lightning.

Map SHELL, in natural hiſtory, the name given by ſome to a peculiar ſpecies of porcelain Shell, the figures on which repreſent the lines of a map.

Saddle SHELL, in natural hiſtory, the name of a ſpecies of oiſter, which in ſome degree repreſents a ſaddle in its ſhape.

St. James's SHELL, in natural hiſtory, a name given by writers on Shells to a very beautiful ſpecies of variegated pecten.

St. Michael's SHELL, in natural hiſtory, a name given by authors to a ſpecies of pecten, or ſcallop Shell. It is of a bright yellow colour.

Scorpion SHELL, in natural hiſtory, the name of a ſpecies of murex, very much approaching to the nature of the ſpider Shell. This is a common Shell in cabinets. It is of a yellow colour, and very deeply ridged, and full of tubercles; there ariſe from the lip of the Shell five large ſpines, or, as they are uſually called, fingers, and two others, which are very much bent, the one from the head, the other from the tail: theſe are very elegantly radiated with white and a fine violet colour on the lips.

Screw SHELL. See the article TURBO.

Small-pox SHELL, in natural hiſtory, a name given to a remarkable kind of concha venerea, or porcelain Shell, the protuberances on the ſurface of which are ſuppoſed to repreſent the puſtules of the ſmall-pox. There are two ſpecies of this Shell, the one white, with flattiſh protuberances; the other greeniſh, with more elevated ones.

Snake-SHELL, in natural hiſtory, the name given by many to that beautiful ſpecies of porcelain Shell, the ſpots of which repreſent thoſe of a ſnake's ſkin.

Spider SHELL, the name of a kind of murex.

Strawberry SHELL, in natural hiſtory, the name given by collectors of Shells to a very beautiful ſpecies of cordiformis, ſpotted with ſmall round red ſpots.

Swallow SHELL, in natural hiſtory, the name given by authors to a ſpecies of oiſter, which in ſome degree repreſents the figure of a ſmall bird flying.

Tiger SHELL, in natural hiſtory, the name of a ſpecies of porcelain, or concha venerea, ſuppoſed to repreſent the ſpots on a tiger's ſkin.

Trumpet SHELL. See the article TRUMPET *Shell*.

Turban SHELL. See TURBAN *Shell*.

Turnep SHELL. This is a ſpecies of ſea Shell, by others called the radiſh Shell. It is exactly of the ſhape of a turnep, and is of the dolium, or concha globoſa kind. Thoſe who have called it the radiſh Shell allude to the great black round-rooted radiſh, not to our common radiſh.

SHELL-*apple*, in zoology, an Engliſh name for the loxia or croſsbill; given from his manner of ſplitting an apple, and feeding on the kernels, leaving the Shell of the pulp untouched. *Ray's Ornithology*.

SHELL-*drake*, in zoology, a common Engliſh name for the tadoma.

SHELL-*fiſh*. Theſe animals are in general oviparous, very few inſtances having been found of ſuch as are viviparous. Among the oviparous kinds, anatomiſts have found that ſome ſpecies are of different ſexes in the different individuals of the ſame ſpecies, but others are hermaphrodites, every one being in itſelf both male and female: in both caſes their increaſe is very numerous, and ſcarce inferior to that of plants, or of the moſt fruitful of the inſect claſs. The eggs are very ſmall, and are hung together in a ſort of cluſters by means of a glutinous humour, which is always placed about them, and is of the nature of the jelly of frogs ſpawn; by means of this they are not only kept together in the parcel, but the whole cluſter is faſtened to the rocks, Shells, or other ſolid ſubſtances, and thus they are preſerved from being driven on ſhore by the waves, and left where they cannot ſucceed. *Langius, Method. Teſtac.*

SHELL-*gall inſect*, an inſect of the gall-inſect claſs, ſomewhat reſembling thoſe which are called the boat-faſhioned ones, but differing in this, that, as the two ends of that ſpecies are not very different in form, in this kind one of the ends is ſharp and pointed in compariſon with the other. It has its name of Shell-inſect, from the reſemblance it bears to a muſcle Shell; as it is, in its whole form, not unlike one of the two Shells, in which the common ſea-muſcle is incloſed; but the pointed end of this inſect is much more extended in length, than the ſmaller end of this Shell.

SHE'LTIE, the name of a ſmall, but ſtrong kind of horſe, found in the Iſland of Zetland, commonly called Shetland. In the country, the price of one of theſe horſes is about a guinea. *Phil. Tranſ.* N°. 473.

SHE'RIF, in the Egyptian orders, the relations of Mahomet, the ſame tribe of perſons called emir by the Turks.

SHIELD (*Dict.*)—People have at all times thought this honourable piece of armour the propereſt place to engrave or figure on the ſigns of dignity of the poſſeſſor of it; and hence, when arms came to be painted for families in after times, the heralds always choſe to repreſent them upon the figure of a Shield, but with ſeveral exterior additions and ornaments, as the helmet, ſupporters, and the reſt. *Niſbet's Herald.*

The form of the Shield has not only been found different in various nations, but even the people of the ſame nation, at different times, have varied its form extremely; and among ſeveral people there have been Shields of ſeveral forms and ſizes in uſe, at the ſame period of time, and ſuited to different occaſions. *Baron's Heraldry.*

The moſt antient and univerſal form of Shields, in the earlier ages, ſeems to have been the triangular. This we ſee inſtances of in all the monuments and gems of antiquity: our own moſt early monuments ſhew it to have been the moſt antique ſhape alſo with us, and the heralds have found it the moſt convenient for their purpoſes, when they had any odd number of figures to repreſent; as if three, then two in the broad bottom part, and one in the narrow upper end, it held them very well; or, if five, they ſtood as conveniently at three below, and two above. The other form of a Shield, now univerſally uſed, is ſquare, rounded and pointed at the bottom: this is taken from the figure of the Samnitic Shield uſed by the Romans, and ſince copied very generally by the Engliſh, French, and Germans. The Spaniards and Portugueſe have the like general form of Shields, but they are round at the bottom without the point; and the Germans, beſides the Samnite Shield, have two others pretty much in uſe: theſe are, 1. The bulging Shield, diſtinguiſhed by its ſwelling or bulging out at the flanks; and, 2. The indented Shield, or Shield chancrée, which has a number of notches and indentings all round its ſides. The uſe of the antient Shield of this form was, that the notches ſerved to reſt the lance upon, that it might be firm while it gave the thruſt; but, this form being leſs proper for the receiving armorial figures, the two former have been much more uſed in the heraldry of that nation.

Beſides this different form of the Shields in heraldry, we find them alſo often diſtinguiſhed by their different poſitions, ſome of them ſtanding erect, and others ſlanting various ways, and in different degrees. This the heralds expreſs by the word pendant, hanging, they ſeeming to be hung up not by the center, but by the right or left corner. The French call theſe ecu pendant, and the common antique triangular ones ecu ancien. The Italians call this ſcuto pendente, and the reaſon given for exhibiting the Shield in theſe figures in heraldry is, that, in the antient tilts and tournaments, they who were to juſt at theſe military exerciſes, were obliged to hang up their Shields, with their armories or coats of arms on them, out at the windows and balconies of the houſes near the place; or upon trees, pavilions, or the barriers of the ground, if the exerciſe was to be performed in the field.

Thoſe who were to fight on foot, according to Columbier, had their Shields hung up by the right corner, and thoſe who were to fight on horſeback, had theirs hung up by the left. This poſition of the Shields, in heraldry, is called couché by ſome writers, though by the generality pendant. It was very frequent, in all parts of Europe, in arms given between the eleventh and fourteenth centuries. But it is to be obſerved, that the hanging by the left corner, as it was the token of the owners being to fight on horſe-back, ſo it was eſteemed the moſt honourable and noble ſituation, and all the pendant Shields of the ſons of the royal family of Scotland and England, and of our nobility at that time, are thus hanging from the left corner. The hanging from this corner was a token of the owner's being of noble birth, and having fought in the tournaments before; but no ſovereign ever had a Shield pendant any way, but always erect, as they never formally entered the liſts of the tournament.

The Italians generally have their Shield of arms of an oval form: this ſeems to be done in imitation of thoſe of the popes, and other dignified clergy; but their herald, Petro Sancto, ſeems to regret the uſe of this figure of the Shield, as an innovation brought in by the painters and engravers, as moſt convenient for holding the figures, but derogatory to the honour of the poſſeſſor, as not repreſenting either antiquity, or honours won in war, but rather the honours of ſome citizen, or perſon of learning. Some have carried it ſo far, as to ſay that thoſe, who either have no antient title to nobility, or have ſullied it by any unworthy action, cannot any longer wear their arms in Shields properly figured, but were obliged to have them painted in an oval, or round Shield. In Flanders, where this author lived, the round and oval Shields are in the diſrepute he ſpeaks of; but in Italy, beſides the popes and dignified prelates, many of the firſt families of the laity have them. The ſecular princes, in many other countries, alſo retain this form of the Shield, as the moſt antient, and truly expreſſive of the Roman clypeus. *Niſbet's and Compenille's, Herald.*

SHI'NGLING, in the iron-works in many parts of England, is the operation of hammering the ſow, or caſt-iron, into blooms. The tongs, uſed for holding the iron in this operation, are called Shingling-tongs, and the iron to be thus wrought is called a loop. *Ray's Engliſh Words.*

SHIP (*Dict.*) It is highly neceſſary, to the health of ſeamen, that Ships ſhould be cleared of foul air; for it has been found by frequent experience, that air ſhut up, and confined in a cloſe place, without a ſucceſſion and freſh ſupply of it, becomes unwholeſome, and unfit for the uſe of life. This is more ſenſibly ſo, if any ſtagnating water be pent up with it. But it grows ſtill worſe, if ſuch an air as this is made uſe of in reſpiration; that is, becomes moiſter and hotter, by paſſing and repaſſing through the lungs. Theſe bad effects in different degrees, according to the different manner in which air is incloſed, are obſerved in many caſes; particularly in deep wells and caverns of the earth; in priſons, or cloſe houſes, where people are ſhut up with heat and naſtineſs: but moſt of all in large Ships, in which, with the ſtench of water in the hold, many men being crouded up in cloſe-quarters, all the mentioned circumſtances concur in producing greater miſchiefs than would follow from any of them ſingle.

Mr. Sutton did therefore, a few years ago, propoſe, in order to clear the holds of Ships of the bad air they contain, that the fire-place and aſh-place of the copper or boiler ſhould be both cloſed up with ſubſtantial and tight iron doors; and that a copper, or leaden pipe, of ſufficient ſize, ſhould be laid from the hold into the aſh-place, for the draught of air to come in that way to feed the fire. And thus, from the natural elaſticity of the air, it ſeems plain, that there will be from the hold a conſtant diſcharge of the air therein contained: and conſequently, that the air ſo diſcharged muſt be as conſtantly ſupplied by freſh air below the hatches, or ſuch other communications as are open into the hold; whereby the ſame muſt be continually made free, and its air rendered more wholeſome, and fit for reſpiration. And if into this principal pipe, ſo laid into the hold, other pipes are let in communicating reſpectively either with the well, or lower decks, it muſt follow that part of the air, conſumed in feeding the fire, muſt be reſpectively drawn out of all ſuch places, to which the communication ſhall be ſo made. *Philoſ. Tranſ.* N°. 462.

Ship, in the ſalt-works, is a large ciſtern, out of which the ſalt-pans are ſupplied for boiling.

This ciſtern is cloſe built to the ſaltern, and is made either of wood, brick, or clay; and it ought always to be covered with a ſhed, that the ſea-water, contained in it, may be kept clean from ſoot and other impurities, and not mixed with freſh water in rains; and it muſt be always placed ſo high, that the water will eaſily run out of it into the pans to ſupply them for boiling.

SHIP-*building*, the art of deſigning, conſtructing, and forming Ships.

Shipwrights, in delineating the models of ſhips, make uſe of three planes, which they call the ſheer-plane, the floor-plane, and the body.

The ſheer-plane is the ſame with that of elevation, being a ſection of a Ship ſuppoſed to be cut by a plane paſſing through the middle line of the keel ſtem and ſtern-poſt.—The floor plane is the ſame with the horizontal, and is that on which the whole frame is erected.—The body is the ſame with the profile; being a ſection ſuppoſed to cut the Ship through the broadeſt place, and is perpendicular to the ſheer and floor planes.

The length of the keel, extreme breadth, depth in the hold, heighth between decks, and in the waiſt, and ſometimes the heighth of the wing tranſom, are agreed on by contract in the merchants ſervice, from which dimenſions the builder is to form a draught ſuitable to the trade the ſhip is deſigned for.

The firſt thing that is generally done, is to lay down the keel, ſtem, and poſt, upon the ſheer planes: then to determine the proper ſtation of the mid-ſhip timber, where a perpendicular is erected: it is generally about $\frac{2}{3}$ of the keel before the poſt. On this line the given depth of the hold is ſet off from the upper ſide of the keel; to obtain which point, the thickneſs of the timber and plank muſt be added to that agreed on by contract. This, being fixed, will enable us to determine the upper heighth of the extreme breadth at that place, which ſometimes is the very point itſelf. The lower heighth of the breadth muſt likewiſe be determined at this place. Then we may form the two main heighths of the breadth lines which nearly unite abaft and afore. Abaft theſe curves end at the wing tranſom, or above it; and, afore, they are carried up ſometimes as high as the hawſe holes. The heighth of the breadth line of the top timber muſt likewiſe be formed. This is generally done by a bow, which makes nearly an arch of a circle. It is limited in mid-ſhips by contract, afore and abaft only by the fancy and judgment of the artiſts, according to what ſheer he deſigns; we muſt alſo form a line for the riſing of the floor; for which purpoſe we muſt determine the dead riſing, which is that of the mid-ſhip timber. This limits it at that place, and, in the whole moulding, it is pretty near parallel to the lower heighth of the breadth lines. Theſe lines muſt abſolutely be drawn on the ſheer plane, and correſponding to the main and top timber heighth of breadth lines; there muſt be two half breadth lines formed on the floor plane.

The main half breadth at the mid-ſhip timber is agreed on by contract, only obſerving that the thickneſs of the timber and plank muſt be deducted out of it, becauſe it is the extreme breadth from outſide to outſide of the plank that is contracted for. Thoſe in the draughts are called moulded half breadths. Then the breadth at the wing tranſom, if a ſquare ſtern, is limited; it is generally about two thirds of the extreme breadth, but this is juſt as the artiſt ſhall think proper. He alſo fixes the breadth of the top timber, and then deſcribes the two half breadth lines. In the due formation of theſe curves on the ſheer and floor planes, the whole art of drawing chiefly conſiſts; which muſt be acquired by practice, ſo that it will be ſcarce poſſible for one, that is not very well acquainted with drawing, to form them, without having recourſe to ſome other draughts. After theſe are formed, the ſtations of the timbers are fixed; if the room and ſpace, and the breadth of the mid-ſhip timber, are agreed on by contract, this will determine the ſtation of all the timbers; obſerving that the timbers abaft the mid-ſhips muſt be ſet off from the foreſide of the midſhip timber; and the timbers before the midſhip from the aft ſide of it. At every third or fourth timber there muſt be perpendiculars drawn on the ſheer and floor planes, to the line that repreſents the lower edge of the keel, which is the common ſection of theſe two planes; though ſometimes the half breadth lines are deſcribed on the ſheer plane, when there is not ſpace to produce the perpendiculars till they be of ſufficient length to contain the heighth of the breadth and half breadth.

After the timbers are ſtationed, and the perpendiculars for the frames drawn on the ſheer and floor planes; we proceed to the body plane, and draw a line equal in length to the whole breadth moulded. This line may be called the baſe of the body plane. A perpendicular is erected at each end of it, and one in the middle, which may be produced at pleaſure.

The next thing to be done, is to form the midſhip frame: the limits of it are had from the ſheer and floor planes; the lower, upper, and top timber heights of the breadth are taken from the ſheer plane at the perpendicular, repreſenting the midſhip frame, and ſet off on the middle line of the body plane from the baſe. Through theſe points, lines are drawn parallel to the baſe, and the reſpective half breadths, correſponding to each, are ſet off on theſe lines from the middle line in the body plane. The lower and upper main half breadths are limited by the perpendiculars already drawn at each end of the baſe. The half breadth of the top timber is had from the floor plane on the perpendiculars repreſenting the midſhip frame. The heighth of the dead riſing is likewiſe taken from the ſheer plane, and ſet up from the baſe upon the middle line in the body plane, through which point a line parallel to the baſe muſt be drawn, and upon this line the half breadth of the floor is ſet off from the middle line; at which point a perpendicular is erected. The center of the floor ſweep is in this line, from which a circle muſt be deſcribed that ſhall juſt touch the riſing line. A proper radius for the under breadth ſweep is next to be found: the center of it is in the lower breadth line, from which it is deſcribed to paſs through the point which limits the half breadth. After which the radius, and center of a reconciling ſweep to join the floor and under breadth ſweeps, is found, and the circle deſcribed; and, to compleat the frame below the breadth, the half breadth of the keel is ſet off from the middle line on the baſe; from which point, a ſtraight line is drawn to touch the back of the floor ſweep.

By this way of forming the frame, it is plain the centers and radii of the ſweeps are arbitrary, but they muſt be determined before any of the other timbers can be formed; if by no other means, by repeated trials, till they are made to pleaſe the fancy and judgment of the artiſt. But there are various other ways of forming this frame; ſo that, though ſeveral ſhips may be of the ſame breadth, depth in the hold, and dead riſing, they may all differ in the form of their timbers. After this midſhip timber is formed, a pattern or mould is made to fit exactly to the curve, and the dead riſing line. By this, and a hollow mould, all the timbers are formed, ſo far as the riſing line and lower heighth of the breadth line are parallel to one another in the ſheer plane.

Having explained what the Ship-wrights call whole moulding, we ſhall proceed to ſhew the method of forming the body by ſweeps.

In Ships of war the general dimenſions are eſtabliſhed by the authority of thoſe appointed by the government for that purpoſe. The ſheer and floor planes are laid down in this, exactly in the ſame manner as in that of the whole moulding. We may have a ſufficient number of points from the dimenſions ſettled by authority to determine the heighths of the breadth and half breadth lines. A riſing of the floor line muſt likewiſe be formed on the ſheer draught. We may then go to the body plane, and form the midſhip bend or frame timber; the limits of which we have from the ſheer and floor planes, and it muſt be formed in the ſame manner as before directed in whole moulding, either by two, three, or more ſweeps, as the artiſts ſhall think moſt ſuitable to the ſervice the ſhip is deſigned for. The lower, upper, and top timber heighths of breadth, and riſings of the floor are ſet up on the middle line in the body plane, as in whole moulding, and lines drawn through theſe points parallel to the baſe upon which the half breadths are ſet off. A mould may then be made for the midſhip frame as before, and laid upon the ſeveral riſings in the ſame manner as in whole moulding, with this difference, that here an under breadth ſweep is deſcribed to paſs through the point which limits the half breadth of the timber; the center of which will be in the breadth line of that timber.

The proper centers for all the frames being found, and the arches deſcribed, the bend mould muſt be ſo placed on the riſing line of the floor, that the back of it may touch the back of the under breadth ſweep. But the general practice is to deſcribe all the floor ſweeps with compaſſes as well as the under-breadth ſweeps, and to reconcile theſe two by a mould which is an arch of a circle; its radius being the ſame with that of the reconciling ſweep, by which the midſhip frame was formed. It is uſual for all the floor ſweeps to be of one radius; and, in order to find their centers, a line is formed on the floor plane for the half breadth of the floor: this, as was before obſerved, is only an imaginary one; for it cannot be deſcribed on the ſurface of the ſhip: inſtead of it ſome make uſe of a diagonal in the body plane, to limit the half breadth of the floor upon every riſing line, and erect perpendiculars at the ſeveral interſections in the ſame manner as for the midſhip frame, as in the draught; where it is very plain the floor ſweep conſtitutes no part of the after timbers abaft the ſquare body.

After the ſweeps are all deſcribed, we muſt have recourſe to moulds, or ſome ſuch contrivance, to form the hollow of the timbers, much in the ſame manner, as in whole moulding; and, when we have thus formed all the timbers, they muſt be proved by ribband and water-lines, as before directed; and altered, if needful, to make theſe lines fair: hence it is obvious, that the form of the ribband lines muſt be determined, before we can with certainty have the true form of the timbers. But there will be a neceſſity of determining, at leaſt, the form of three timbers, viz. the midſhip, foremaſt, and aftermoſt, before we can form a ribband line. Theſe will give three points, through which the curve of each ribband muſt paſs. The points in the intermediate timbers may be found by forming timbers as before directed; but by repeated trials, altering them till they make fair ribbands; for it is by them that the whole ſtructure is regulated, when every frame is erected into its proper place.

The ingenious Mr. Mungo Murray has invented a new ſector, by which the difficulties attending laying down ſhips is greatly facilitated, the conſtruction of which the reader will find under the article Ship wright's Sector. It's uſes are as follows:

The general dimenſions being determined, and a ſcale adapted to the draught, take the half breadth with a pair of compaſſes, and placing one foot in the proper point for the half breadth of ⊕, which will be found in number V. open the ſector till the other foot reaches to the ſame point in the correſponding line on the other leg.

The ſector being thus ſet, it will be indifferent whether we begin with the body or ſheer plane: let it then be the ſheer.

Firſt, draw the line X Z (*Plate* XLI. *fig.* 4.) to repreſent the upper edge of the keel, and length of the gun-deck; but it may be produced to the aft ſide of the wing tranſom, and fore part of the ſtem.

Secondly, erect a perpendicular to the line X Z, upon which ſet up the heights of the wing tranſom to W; taken from N°. IV. on the ſector.

Thirdly, take the rake of the poſt from number VII. on the ſector, and ſet it forward from the perpendicular of the wing tranſom to the point 7, where a perpendicular muſt be erected, which will be the ſtation of that timber.

Fourthly, take the diſtance of the frames from number III. on the ſector, and ſet it off from 7 to 8; and erect a perpendicular at that point for timber 8. Draw alſo a line from 8 to the wing tranſom, to repreſent the fore-part of the poſt.

Fifthly, take the heighth and rake of both counters, alſo the rake of the ſtern timber, from number II. The heighth of the ſtern timber is on number I, and by theſe form the counters, and upright of the ſtern.

Sixthly, ſtation the timbers, by taking the diſtance between the perpendiculars at 7 and 8; which at eight times will reach to ⊕; and erect perpendiculars at 5, 3, and ⊕. Then, for ſtationing the timbers in the forebody, we muſt turn the ſector, and take the diſtance of the frames from number III, which, ſet eight times from ⊕, will reach to H. Erect perpendiculars at C, E, G, and H; and from G ſet off the diſtance of the gun-deck before G. It is in number I. on the ſector, which will reach to Z; at which point erect a perpendicular, and ſet off the height of the gun-deck, taken from the ſector; and from the gun-deck ſet up the height of the head of the ſtem, alſo its diſtance before G; both taken from number I. We may then form the ſtem. The center of the ſweep is in the perpendicular of timber F, and the radius of the ſweep is upon the ſector between numbers III. and IV, which, ſet up from the point F, will give the center: ſo the ſweep will juſt touch the upper edge of the keel in the point F. And, as the ſweep will not reach to the gun-deck, we muſt make uſe of a mould to break in fair with the back of the ſweep.

Seventhly, ſet up the heighths of the lower, upper, and top timber breadth lines upon the perpendiculars erected for the ſtations of the ſeveral timbers. The points, correſponding to each, are on their proper lines on the ſector.

Having thus finiſhed the ſheer plane, we may then go to the floor plane; and, producing all the perpendiculars for the timbers, we may upon them ſet off the main and top timber half breadths. The points correſponding to each are on their proper lines upon the ſector; which muſt be ſet off from the line W K, repreſenting the lower ſide of the keel, and may be produced both ways, as far as ſhall be needful. We muſt in the next place form all the ribband lines, which are the dotted ones in the draught; beginning with the fourth ribband. But it will be more expeditious, firſt, to draw all the diagonals in the body plane.

Let A B be the whole breadth, on the middle of which erect the perpendicular K O; ſo ſhall A K, or K B, be the half breadth. Upon the line K O, ſet up the ſeveral heighths of the breadth lines, taken from the ſheer plane, and draw lines parallel to the baſe, as has been already directed; and likewiſe ſet off the half breadths correſponding to each, taken from the floor plane. We may alſo ſet off the heighth and half breadth of the wing tranſom; all which may be done without the ſector; but we muſt have recourſe to it for the dead riſing. This is in number III, in the after body, and muſt be ſet off upon the line K O, from the lower heighth of breadth to *i*. Through *i* draw the line *r i s*, parallel to the baſe, and ſet off the one half breadth of the floor from *i* to *r*, and from *i* to *s*: it is upon number VII. on the ſector. Then, taking *r i*, ſet it up from *i* upon the line K O, to which point draw the dotted diagonal marked R 1ſt. This regulates all the other diagonals: for, if one line be drawn from the point of this interſection, with the middle line, to the half breadth of the wing tranſom; and another from the point *r*, its interſecting with the riſing line, to the point ⊕, at the lower heighth of breadth; each of theſe may be divided into four equal parts by the dotted diagonals 2^{d} R^{d}, 3^{d} R^{d}, 4^{d} R^{d}.

Note, the lines from the ends of the firſt diagonal to the lower heighth of breadth, and to the wing tranſom, were drawn only with a black lead pencil, and wiped out after the diagonals were drawn. The diagonals being thus drawn, we may form the midſhip frame, for which purpoſe we muſt find a point in each diagonal, through which the curve of the timber muſt paſs. Theſe points we have from the ſector; which muſt be ſet off from the interſections of the diagonals with the line K O. That in the firſt diagonal is in number I. The point in the ſecond diagonal is in number VI. The point in the third diagonal is in number V. And the point in the fourth diagonal is between numbers I and II. This laſt muſt be doubled, becauſe the ſector will not contain the whole length. The midſhip frame being formed, we muſt in the next place form the after and foremoſt timber; which the ſector does, by giving the diſtance on every diagonal between theſe timbers, and the midſhip frame now formed: ſo that we ſhall have a point in each diagonal, through which the curve of the timber muſt paſs. To find the point in the firſt diagonal for the after timber, extend 1ſt, from ⊕ R in number V, to the correſponding point on the other leg. Set off this diſtance from ⊕ on the firſt diagonal: do the ſame upon the ſecond, third, and fourth diagonals. The point on the ſecond diagonal is in number IV. That on the third in number VI. And that on the fourth in number VII. The curve muſt paſs through theſe points, and likewiſe through the point for the half breadth, which was before ſet off from the ſheer and floor planes; by which means we have determined the form of the after timber; and the foremoſt timber is to be formed by the ſame method. Theſe two timbers being formed, we may find points in the diagonals for all the intermediate timbers. Thus, to find the point for timber 3 in the firſt diagonal, extend from the point 3 in the inner part of the line number V. to its correſponding point on the other leg. Set off this in the firſt diagonal from the after timber, already formed; which will give the point through which timber 3 muſt paſs; and, to find the point in the ſecond diagonal, we muſt extend from 3 in the inner part of the line number IV, and ſet off this diſtance in the ſecond diagonal from the after timber. The ſame method muſt be uſed to find the points in the third and fourth diagonals. In like manner we may find a point in each diagonal for the timbers 5 and 7, which will be ſufficient for the after body: and the ſame proceſs muſt be uſed to find points in each diagonal for the timbers in the fore body.

Having now found the points, before we form the timbers, it may be proper, by them, to form the ribbands: for now we may take the diſtance of each point in the diagonal, from its interſection with the middle line K O, and transfer it to the floor plane upon the perpendiculars that repreſent the planes of the timbers, as before directed. In order to limit the ends of the ribband lines on the floor plane, we muſt ſet off half the thickneſs of the poſt, on one ſide of the middle line K O, and half the thickneſs of the ſtem on the other ſide of it, on the body plane; firſt deducting the depth of the rabbet out of it. We muſt likewiſe determine the inner part of the rabbet on the ſtem, and upon the poſt in the ſheer plane. In the ſtem, it is generally in the middle between the lines that repreſent the outſide of the rabbet. It may be alſo ſo on the poſt, from the wing to the lower tranſom; and from thence the line may be continued fair to interſect the line that repreſents the after ſide of the rabbet, at the upper edge of the keel; for there the rabbet is cut ſquare into the poſt.

Now, it is obvious that, when the plane of any diagonal ribband is in its proper place and poſition, the line W K will be in the ſheer plane, parallel to the upper ſide of the keel; and its heighth will be the ſame with that of the point where the diagonal interſects the middle line in the body plane. But by reaſon of its inclination, and of the half thickneſs of the ſtem and poſt, the heighth of the plane of the ribband upon the poſt and ſtem will be in the point where the diagonal interſects the line that repreſents the rabbet in the body plane. This then muſt be transferred from the body to the ſheer plane, and ſet up from the upper edge of the keel upon a perpendicular that will interſect the line that repreſents the inſide of the rabbet at that heighth. This perpendicular may be produced into the floor plane; and, if that part of the diagonal intercepted between the middle line, and the line that repreſents the inſide of the rabbet, in the body plane, be ſet off upon the perpendicular, it will give the proper point for the end of the ribband line, as may be ſeen in the plate; where all the ribbands are dotted lines, and they are marked 1ſt D R, 2d D R, &c.

Note, the ſcale in the plate is ſo ſmall, that we have taken the outſide of the rabbet to limit the end of the ribband.

The ribbands being thus formed, we may from them form all the timbers below the breadth.

The next thing to be done, is to form the top timbers. We have the heighth and half breadth of each from the ſheer and floor planes; and the timbers below the breadth are carried up by a ſweep, which forms the lower part of the top timber. The center of this ſweep is in the upper heighth of the breadth line of the timber, and may be taken from the ſector: it is on number III. after body. The midſhip top timber has generally a hollow, which is left intirely to the artiſt; for ſome, eſpecially ſmall Ships, have none. The general practice is to make a mould for this hollow, either by a ſweep, or ſome other contrivance, and produce it conſiderably above the heighth of the top timber in a ſtraight line, or very near one. The midſhip timber is formed by this mould, and ſo placed, that it breaks in fair with the back of the upper breadth ſweep. All the other timbers are likewiſe formed by the ſame mould; obſerving to place it ſo that the ſtraight part of it may be parallel to the ſtraight part of the midſhip timber; and moved up or down in that direction till it juſt touches the back of the upper breadth ſweep. Some begin at the after timber after the mould is made for the midſhip one, becauſe they think it eaſier keeping the ſtraight part of the mould parallel this, than to the midſhip timber; and by this means the top ſide is kept from winding. Others again make a mark upon the mould where the breadth line of the midſhip timber croſſes it, and with the ſame mould they form the after timber. This will occaſion the mark that was made on the mould, when in midſhips, to fall below the breadth line of the after timber; and ſo another mark is made at the heighth of the breadth of the after timber.

The next thing to be done, is to lay the ſtraight part of the mould obliquely acroſs the breadth lines of the top timbers in ſuch a manner that it may interſect the breadth line of the midſhip timber at one of theſe marks, and the breadth line of the after timber at the other mark. Then the ſeveral interſections of the breadth lines of the timbers are marked upon the mould. The mould, being thus marked, muſt be ſo placed in forming each timber, that the proper mark may be applied to its proper breadth; and the mould be turned about ſo as juſt to ſweep the upper breadth ſweep. Any of theſe methods may make a fair ſide; but it may be eaſily proved by forming another half breadth line.

Hitherto, we have conſidered the timbers, as having their planes perpendicular both to the ſheer and floor planes. Theſe are called ſquare timbers; and, when they are all formed, we may from them form as many ribband and water lines as ſhall be neceſſary to form the cant timbers. Their planes are inclined to the ſheer, but perpendicular to the floor planes. The reaſon of canting theſe timbers is that they may nearly be equally ſpaced at the breadth ribband: for, if the poſt has a conſiderable rake, and the timbers all ſquare, there will be a great ſpace at the breadth ribband, between timber 8 and the wing tranſom: beſides, the timber may be ſo canted, that it may be ſquare to ſome of the ribbands; whereas, if they were perpendicular to the ſheer plane, they would interſect the ribband lines ſo as to form very oblique angles; which would occaſion very great bevelling. Another advantage that attends canting the timbers, is that they will not require ſuch compaſs timber.

It is uſual to begin the cant timbers from the aftermoſt floor timber, and ſpace them near equally on the breadth line to the wing tranſom: and, in order to ſpace them upon the keel, the cant of the faſhion piece muſt be determined. Now, if we ſuppoſe the plane of the faſhion piece to interſect the ſheer and floor planes in the point F, it muſt interſect the floor plane in the line F P, becauſe the point P is ſuppoſed to be the end of the wing tranſom. So the angle *s* F P will be its inclination to the ſheer plane. It will interſect the ſheer plane in a perpendicular erected from the point F; and, if the ſpace between the point F and the foremoſt cant timber upon the keel, be divided into the ſame number of equal parts, that the ſpace between the ſame timber, and the wing tranſom upon the breadth line, is divided into; this will determine the cant of all the timbers only by drawing lines from all points in the line W K, to the correſponding points in the breadth line, in the ſame manner as the line F P determines the cant of the faſhion piece.

It would be needleſs to draw all theſe lines in the plate, the only intent of drawing them being to ſhew how to form the timbers by them: and as one method ſerves for all the cant timbers, which are ſuppoſed perpendicular to the floor plane, it will be ſufficient to ſhew the formation of the faſhion piece. Before any of the cant timbers can be formed, there muſt be a ſufficient number of water lines, or diagonal and horizontal ribband lines, formed from the ſquare timbers; and, when theſe are abſolutely determined, we may, with certainty form all the cant timbers, either by water, or ribband lines.

If we make uſe of the diagonal ribbands, which are diſtinguiſhed by the dotted curves in the floor plane, we muſt form an horizontal ribband correſponding to each. We have only laid down one of theſe horizontals in the plate, viz. that correſponding to the third diagonal: it is marked 3d H R. To form this ribband, fix one foot of the compaſſes in the point where the third diagonal interſects the midſhip frame in the body plane; and extend the other foot to touch the middle line K O; ſo that, if a line were drawn from one foot of the compaſſes to the other, it would be perpendicular to the line K O: this diſtance ſet off from the line W K, upon the perpendicular that repreſents ⊕ in the floor plane, will give the point thro' which the curve muſt paſs at that place. The ſame method muſt be uſed for finding the points on all the other timbers.

Now, though the diagonal and horizontal ribbands ſeem to be quite different curves in the plates, they will make but one line upon the timbers; for the one interſects them in a direction perpendicular to the ſheer plane, and the other is ſo inclined as to interſect the timbers in the very ſame points. The horizontal one is too ſhort upon the plate, but the true length of it might eaſily be had by transferring to the ſheer plane the ſeveral heighths at which the diagonal interſects the timbers in the body plane. By theſe we might form a heighth of breadth line to correſpond to this horizontal ribband, which is only a half breadth line; and the length of this heighth of breadth line may be taken by a penning batten, and all the timbers marked upon it. Now, when the batten is applied to a ſtraight line, and all the timbers transferred to this line from the batten, we may erect perpendiculars at each, and ſet off the ſame half breadths as before; by which means we may have the true length of the horizontal ribband: but, as this will be of no manner of ſervice, we ſhall omit forming it. We only mention it, becauſe ſeveral imagine theſe two curves to be as different on the ſurface of the Ship as they are upon the draught. The horizontal ribband correſponding to the firſt diagonal one is formed to timber 7, and marked 1ſt H R; but the horizontals for the ſecond and fourth diagonals were formed by a black-lead pencil, and only the point in which they interſect the line F P, is in the plate; which is ſufficient for our purpoſe.

There are likewiſe five water lines formed, four of which are repreſented by level lines in the body plane, and by lines parallel to the keel in the ſheer plane: three of them repreſent the planes of the tranſoms in the ſheer plane, viz. Dk. 1ſt, 2d: but the plane of the third tranſom is perpendicular to the poſt. The lower water line is drawn parallel to the keel from the ſtem to the poſt, and produced into the body plane, as in the plate, where it is marked M N: the plane of the third tranſom interſects the timbers at different heighths, which are transferred from the ſheer to the body plane, where it forms a curve.

The water lines being now drawn in the ſheer and body plane, our next buſineſs is to form them in the floor plane, where they will be curves. The points through which the curve of the lower water line is to paſs, are had by transferring the ſeveral portions of the level line, intercepted between the line K O, and the curve of each timber, from the body plane to the correſponding perpendiculars in the floor plane, where it is marked *Watr* L. It muſt be obſerved that the line K O, in the body plane, repreſents the ſeveral perpendiculars that are drawn in the ſheer plane to repreſent the planes of the timbers: for the ſpaces in the body plane, contained between the line K O and the curves of each timber, are ſo many different planes; and, when in their proper places, they will be parallel to one another, if perpendicular to the ſheer and floor planes. Thus the plane contained between the line K O, and the curve of timber ⊕ is (when in its proper place) ſuppoſed to be erected perpendicular to the ſheer plane, in the line which repreſents the plane of ⊕; and the like may be ſaid of all the reſt. The planes of the cant timbers will not be parallel to one another, becauſe they are differently inclined to the ſheer plane; but, as they are perpendicular to the floor plane, they will interſect the ſheer plane in a line perpendicular to the keel: ſo the plane of the faſhion piece interſects the ſheer plane in the dotted perpendicular, erected from the point F, which is the ſame with the line K O, in the body plane. We thought it neceſſary to take notice of this, becauſe ſome who are learning to draw, miſtake the line K O; for they imagine it only repreſents the poſt or ſtem.

Another error which they frequently fall into, is about forming the water lines when their planes are not parallel to the keel. They imagine that the half breadths muſt be ſet off from the line W K which repreſents the lower edge of the keel; whereas it is indifferent what ſtraight line they are ſet off from, ſo the timbers be exactly ſpaced, and perpendiculars drawn to repreſent their planes. Now, when the water lines are ſuppoſed parallel to the keel, the timbers are properly ſpaced, and the perpendiculars ready drawn to the line W K; which is the reaſon it is uſed in ſuch caſes: Though, when the plane is in its true place, the line W K will be in the line M N. But the caſe will be quite different when the water lines are not parallel to the keel; for then their planes will interſect the ſheer plane in a ſtraight line, forming oblique angles with the planes of the timbers; this is the caſe in the plane of the third tranſom. The diſtances between the timbers will be more in this line than in the line W K; ſo the half breadths cannot be ſet off from the line W K, upon the perpendiculars that repreſent the planes of the timbers, unleſs they be properly ſpaced at the ſame diſtance they are upon the line that repreſents the plane of the third tranſom in the ſheer plane; upon which account we have made uſe of that line to ſet off the half breadths from, and drawn the dotted perpendiculars at the points where it interſects the planes of the timbers 8, 7, and at the point where it interſects the lower heighth of breadth line. The heighths of the points of interſection are transferred from the ſheer to the body plane; and the half breadths, at theſe heighths, transferred from the body plane to the dotted perpendiculars before drawn: the half breadth to be ſet off upon the perpendicular where it interſects the lower height of breadth line, is had from the floor plane, and the dotted perpendicular *a a* will ſhew the place where the half breadth muſt be taken: this perpendicular, if produced, will interſect the plane of the third tranſom in the lower height of breadth.

Having now formed four diagonal ribbands with their correſponding horizontals, and alſo two water lines; we may, by theſe, form the faſhion piece, either upon the body plane or ſheer plane; but, as the plane of the faſhion piece is parallel to neither of theſe, it will require two operations.

Now the line F P will interſect all the ribband and water lines; but, becauſe the diagonal ribbands are not in their proper poſition, the line F P will not interſect them in the point where the plane of the faſhion piece interſects them. The firſt thing then to be done, is to find the true place of the faſhion piece on each diagonal ribband: and firſt, to find its place upon the fourth diagonal ribband, from the point *t*, where the fourth horizontal ribband interſects the line F P, let fall a perpendicular to the point *s*, and produce it to interſect the diagonal ribband in *r*; ſo ſhall *r* be the true place of the faſhion piece upon that ribband; that part of the perpendicular between *t* and *s* is not drawn in the plate to avoid the confuſion of too many lines. The reaſon of this will be very evident, if we ſuppoſe the whole plane of the ribband to be turned round upon the axis W K; for then the point *r* will always be right over ſome point of the perpendicular *r t s*; and, when the ribband is in its proper inclination, a perpendicular from *r* will fall into the point *t*, and the plane of the faſhion piece will interſect the floor plane in the line *t* F, and the plane of the diagonal ribband in a ſtraight line drawn from *r* to F: for it muſt be obſerved that, when the ribband is in its proper place, the line W K will be in the ſheer plane, in a line parallel to the keel; the height of which may be had from the body plane. In this caſe it will be the diſtance between K and *r*, but it will be needleſs to draw this line in the plate.

Having now found the place of the faſhion piece on the fourth diagonal ribband, we muſt by the ſame method find its place on the other diagonals, as in the plate, where lines perpendicular to W K are drawn to the points *o*, *o*, *o*, in the diagonal ribbands, from the points where the line F P interſects the correſponding horizontal ribbands.

Theſe points being now found, we may take the neareſt diſtance of each point to the line W K, and ſet off thoſe diſtances on the proper diagonals in the body plane. Thus, for the fourth ribband, place one foot of the compaſſes in the point *r*, and the other in the point *s* in the floor plane; and ſet off that diſtance from *r* to S, on the fourth diagonal in the body plane: do the ſame by all the reſt of the diagonals; and a curve interſecting the diagonals in theſe points would be the projection of the faſhion piece in the body plane, but we have not drawn this in the plate; for, as the plane of the faſhion piece is not parallel to that of the body plane, its projection will be leſs than the original: however this may be found by the following method:

Firſt, draw a perpendicular to the line K O, in the body plane, to paſs through the point S to F.

Second, take the diſtance from *r* to F, in the floor plane, and ſet it off from *r* to F, in the body plane. In like manner draw perpendiculars to the line K O, in the body plane, through the points before found on the diagonals, as in the plate, where only that part of the perpendicular is drawn which lies without the diagonal; and take the ſeveral diſtances between the points *o* and F, in the floor plane, and ſet them off from the interſections of their correſponding diagonals, with the line K O, to the points *o*, *o*, in the body plane: ſo we have the points *o*, *o*, F, through which the curve muſt paſs.

Thirdly, to find the point P in the body plane, through which the curve muſt paſs, transfer the point P in the floor plane, to the point P, in the ſheer plane, by a perpendicular to the line W K, to interſect the height of breadth line in the point P; and ſet off this height upon the line K O, in the body plane, which will be a little above W, the height of the wing tranſom: draw a perpendicular at this point, to the line K O; take the line F P, in the floor plane, and ſet it off upon this perpendicular, from the line K O, to the point P: ſo ſhall the curve P F *o o* be the form of the faſhion piece.

Theſe points may all be found without the diagonal ribbands, by half breadth lines and water lines, formed on the floor plane; as, for inſtance, to find the point F, place one foot of the compaſſes in *t*, the point where the horizontal ribband interſects the plane of the faſhion piece, and the other in *s*; *t s* being perpendicular to W K: with that extent, move the compaſſes with one point in the line K O, and the other point perpendicular to it, till it interſect the fourth diagonal, in the point S; through which draw the perpendicular *t* F. Then take the diſtance from *t* to F, in the floor plane, which ſet off from *t* to F, in the body plane; ſo ſhall F be the point required, as before: in like manner the points *o*, *o*, may be found: but this, as well as the other method, requires two operations; whereas, if ſeveral water lines were formed, with their planes parallel to the keel, we might find the points by one operation. Thus, ſuppoſe it was required to find a point in the level line, that repreſents the plane of the water line formed in the floor plane, which is marked *Wat*^{r} L, fix one foot of the compaſſes in the point *f*, where the line F P interſects the water line in the floor plane, and the other foot in the point F. Set off this upon the level line in the body plane, from the line K O to *f*, which will be the point required. All the other cant timbers, both in the fore and after body, are formed after the ſame manner as the faſhion piece. We have formed but one more in the plate, which is abaſt the faſhion piece, to aſſiſt us in forming the tranſoms.

The tranſoms are faſtened to the ſtern poſt, in the ſame manner that the floor timbers are to the keel; and, as the floor timbers have a riſing, ſo likewiſe have the tranſoms, which is called the flight; and beſides this flight, the wing tranſom has a round aft, and a round up, both which are arbitrary: the deck tranſom has a round up, the ſame with that of the beams: but, in forming the tranſoms, there is no regard had to the round up; for that may be done by the beam mould, after the tranſom is properly hewed the moulding way.

In forming the tranſoms, the firſt thing to be done, is to aſſign each its proper place upon the poſt, and then to determine the poſition of their planes with reſpect to the floor plane; for their planes are always perpendicular to the ſheer plane. In the plate there are five tranſoms: their upper ſides upon the poſt are in the points W, D^k, 1^{st}, 2^d, and 3^d: the planes of the wing, deck, firſt and ſecond tranſoms, are ſuppoſed parallel to the floor plane, and repreſented in the ſheer plane by lines drawn parallel to the keel from the poſt, till they interſect the lower height of breadth line; and the plane of the third is repreſented by a line perpendicular to the poſt, as in the plate. So it will not be parallel to the floor plane.

The height and poſition of the tranſoms being determined, we have no more to do, but to form water lines for each. That for the third we have already formed: the reſt, being ſuppoſed parallel to the floor plane, may be formed in the ſame manner as the water line there laid down: the only difficulty will be to find a ſufficient number of points to determine their forms; becauſe, in the deck and firſt tranſoms, their planes interſect the breadth; ſo that we could only have a point in timber 8, if the faſhion piece and a timber abaft it had not been formed by the ribbands; but, now they are formed, we may have likewiſe a point in each of their planes, through which the curves of the water lines ſhall paſs.

We ſhall begin with the wing tranſom. Firſt, determine the round aft which ſuppoſe the line W T, in the floor plane: take its height from the ſheer plane, and ſet it up in the body plane from K to W, and draw the line W T: then take this line W T, and ſet it off on the floor plane, on the line F P, which will reach to the point *n*. A curve drawn through the point *n*, to break in fair with the breadth line, as in the plate, will interſect the line W T in T; ſo ſhall W T *n* be the aft ſide of the wing tranſom. Next, for the deck tranſom, draw a level line in the body plane at the point D^k to timber 8. Set off this diſtance upon timber 8, in the floor plane, from the line W K; which will give us a point through which the curve muſt paſs: then take the diſtance in the level line, between the line K O and the curve of the faſhion piece; which ſet off from the point F, upon the line F P, in the floor plane; and this will give another point through which the curve muſt paſs: again, take the diſtance in the ſame level line, between the line K O and the curve of the timber abaft the faſhion piece; which ſet off from the point G upon the line G *g*, in the floor plane; and we ſhall have a third point through which the curve muſt paſs. Laſtly, let fall a perpendicular to the line W K, from the point D^k upon the poſt, and produce it into the floor plane, upon which ſet off half the thickneſs of the poſt, allowing for the rabbet, which will limit the end of the water line that forms the deck tranſom. After the ſame manner are the firſt and ſecond tranſoms formed, by drawing level lines in the body plane, at their heights upon the line K O.

Now ſome are apt to miſtake theſe level lines for the lengths of the tranſoms: the reaſon, as was before obſerved, is becauſe they imagine the line K O to be the ſtern poſt; whereas it is the perpendicular in which the plane of the faſhion piece interſects the ſheer plane; and ſo theſe lines are drawn upon the plane of the faſhion piece.

All that now remains, is to determine the length of each tranſom; and this is done by the line F P, in the floor plane, which interſects the wing, deck, firſt and ſecond tranſoms, to their proper lengths. But, before we can find the length of the third, the plane of the faſhion piece muſt be projected upon the ſheer plane: thus, take the neareſt diſtance between any perpendicular in the floor plane, and the point where the line F P interſects the water line; and ſet that off from the ſame perpendicular upon the line that repreſents the ſame water line in the ſheer plane. Now the curve P F will be found to be the projection of the aft ſide of the faſhion piece upon the ſheer plane: for the diſtance between the perpendicular of timber 8, and the point *f*, where the line F P interſects the lower water line in the floor plane, is equal to the diſtance between the ſame perpendicular and the curve P F, taken in the line M N. The diſtance between the perpendicular of timber 8, and the point where the line F P interſects the ſecond water line in the floor plane, is equal to the diſtance between the ſame perpendicular and the curve P F, taken in the line that repreſents the ſecond tranſom in the ſheer plane. And by the ſame method, we find points in the lines that repreſent the deck and firſt tranſoms. The point P is transferred from the half breadth line in the floor plane, to the height of breadth line in the ſheer plane. The curve, being thus drawn, will interſect the line that repreſents the plane of the third tranſom, in the point *z*: from which point draw the perpendicular *z* F, to the curve of the dotted water line; ſo ſhall 3^d *z*, F, be the true form of the third tranſom; and a line drawn from F to P will be the plane of the faſhion piece. It muſt be obſerved that the ends of the tranſoms are let into the faſhion piece; for which there muſt be a proper allowance left without the lengths found by the line F P. We have in the plate only laid down the half of each tranſom. Thoſe who incline to lay down the whole tranſoms, may eaſily tranſfer the halfs already deſcribed to the other ſide of the line W F.

Having now formed all the timbers, both ſquare and cant, in the after body; we ſhall proceed to the fore body. The cant timbers are laid down in the ſame manner as thoſe in the after body, by the diagonal and horizontal ribbands; where the dotted line K T repreſents the plane of the knuckle timber, canted upon the floor plane; from whence it is transferred to the body plane, and repreſented by the dotted curve between timber H and G.

The hawſe pieces are ſeldom laid down in the loft; it being the general practice to make moulds for them after the other timbers are put up, and the harpins are brought about.

As the harpins are leveled acroſs, they will be formed by the ſection of a plane perpendicular to the ſheer plane: but there is no neceſſity for theſe ſections to be parallel to the keel. In the plate we have drawn only a ſtraight line to repreſent the plane of the harpin above the wale. It is drawn from the ſtem to timber E, and marked harpin. Now, in order to form the curve of this harpin, it would be proper to form timber F, in the body plane: alſo to draw perpendiculars to the ſeveral points where the plane of the harpin interſects the planes of the timbers E, F, G, and H, in the ſheer plane; and upon theſe to ſet off the half breadths correſponding to each, taken from the body plane. This would give us the points through which the curve muſt paſs, which would be a water line. But, as this is performed exactly in the ſame manner as the water line that repreſents the third tranſom, we judge it unneceſſary to form it in the plate.

The rails of the head are projected on the ſheer plane, according to their true hangings; and, in order to find their true lengths, draw the dotted line S T, parallel to the keel at the height of the rails, upon the head. We muſt then determine the ſtation of the cat-head upon the floor plane; and likewiſe the thickneſs of the head at the rail; and let fall a perpendicular from the point T, where the line S T interſects the cathead in the ſheer plane, to the point T in the floor plane; and likewiſe a perpendicular from S in the ſheer, to S in the floor plane; and draw the line T S: S S, in the floor plane, being half the thickneſs of the head of the figure at the rail; ſo ſhall T S, in the floor plane, be the true length of the rail. Let the line T S, in the ſheer plane, be divided into any number of equal parts: ſuppoſe into the points *x*, *y*, *z*; from which points draw perpendiculars to the line T S, to be limitted by the rail. Divide the line T S, in the floor plane, into the ſame number of equal parts, in the points *x*, *y*, *z*. Draw perpendiculars to theſe points, and make them equal to the correſponding ones in the ſheer plane; ſo we ſhall have the points through which the curve of the rail muſt paſs.

We have now ſhewn different ways of forming all the timbers; where it muſt be obſerved that we have always ſuppoſed every timber to be one intire piece of wood from the keel to the top of the ſide; whereas, in reality, they are in ſeveral different pieces; the head of the lower piece being cut ſquare to join to the heel of the next above it: and, in order to ſupport theſe joinings, another ſet of pieces are cut, and joined together in ſuch a manner, that, if both the ſets were faſtened together, the joinings in one ſet would be nearly againſt the middle of the pieces in the other ſet. In this manner are all the frames faſtened and erected, as if each was one piece of wood. The pieces laid acroſs the keel, to which they are faſtened, are called floor timbers: the other pieces are called futtocks, except that which goes to the top of the ſide, which is called a top timber. Hence it is plain that the mould which ſerves for the floor timber, will ſerve for the lower part of the correſponding futtock. The mould for the upper part of the firſt futtock will be the ſame with that for the lower part of the ſecond; and the mould for the lower part of the top timber will be the ſame with that of the upper part of the correſponding futtock. It is alſo of great importance, in building, to give proper ſcarph to the timbers. *Murray on Ship-building.*

SHIPWRIGHT'*s ſector*, the name of an inſtrument, invented by Mr. Mungo Murray, for forming the plane of a ſhip called the body.

This ſector has ſeven lines on each leg, meeting at the center of the joint, numbered I, II, III, IV, &c. ſo that every line upon one leg has a correſponding one upon the other, both divided and numbered alike. The after body is upon one ſide, and the fore body on the other.

The lines for the after body are as follows. See *Plate* XLII. *fig.* 7.

I. Has five diviſions, viz. ⊕, 4, 1ſt dl, 8, ſt^n; and marked at the end H B T^r, denoting the heighth of the top timber breadth line at four timbers; ſt^n is the ſtern timber, and 1ſt dl, the firſt diagonal in the body plane.

II. Has eight diviſions, viz. $\frac{L^r C,}{U, A,}$ $\frac{U^r C^r,}{A, U,}$ *St*^{n}, 8, 4, ⊕, and marked at the end $\frac{1}{2}$ B T^r, denoting the half breadth of the top timber at three timbers. L^r C^r ſignifies the lower counter, and U^r C^r the upper counter; U denotes the heighth, and A the rake of the counters, both taken from the wing tranſom; St^n is the rake of the ſtern timber, which is likewiſe taken from the wing tranſom at the heighth of the ſheer rail.

III. Has eight diviſions, viz. *d*st, u^r S. R *i s*, ⊕, 3, 5, 7, 8: it is marked at the end L H B, for the heighth of the lower breadth line for five timbers: *d*st is for the diſtance between the frames, and R *i s*, for the diſtance between the lower breadth line, and the dead riſing in the body plane: u^r S. is the radius of the upper breadth ſweep.

IV. Is in two parts. The innermoſt has four diviſions, viz. 7, 5, 3, ⊕, expreſſing the points where theſe timbers interſect the ſecond diagonal in the body plane: it is marked at the end 2 R for the ſecond ribband.

The outermoſt part has ſix diviſions, viz. ⊕, 3, 5, 7, 8, W T, and marked at the end U H B for the heighth of the upper breadth line at five timbers, and at the wing tranſom denoted by W T.

V. Is likewiſe in two parts. The innermoſt has four diviſions, viz. 7, 5, 3, ⊕, expreſſing the points where theſe timbers interſect the firſt diagonal: it is marked 1st R for the firſt ribband.

The outermoſt part has eight diviſions, viz. T, 8, 7, 5, 3, ⊕, *k l*, and then marked M $\frac{1}{2}$ Bth, for the main half breadth of five timbers; T for that at the wing tranſom, and *k l* for the half breadth of the keel in midſhips; without which, there is another diviſion marked 3^d dl for the third diagonal.

VI. Has four diviſions, viz. 7, 5, 3, ⊕, for the points where thoſe timbers interſect the third diagonal: it is marked 3d R, denoting the third ribband; without which, there is another diviſion marked 2d dl, for the ſecond diagonal.

VII. Has five diviſions, viz. 7, $\frac{1}{2}$ B F l, 5, 3, ⊕. $\frac{1}{2}$ B F l, denotes the half breadth of the floor: the other four are for the points where thoſe timbers interſect the fourth diagonal: it is marked 4th R, denoting the fourth ribband; without which there is another diviſion for the rake of the poſt marked R^k P.

The heighth of the gun-deck is between N^o. IV and V. G D ⊕ for that in midſhips, and G D *a* for that at the poſt. There is likewiſe another diviſion between N^o. I and II for the fourth diagonal: it is marked $\frac{1}{2}$ 4th dl, which muſt be doubled, becauſe the length of the ſector will not contain the whole.

Index to the After Body.

		N^o.
Heighth of breadth	lower	III
	upper	IV
	top timber	I
riſing		III
Half breadth	main	V
	top timber	II
	floor	VII
Counter and ſtern timber, heighth and rake		II
Rake of the poſt		VII
Upper breadth ſweep		III
		N^o.
Ribbands	1	V
	2	IV
	3	VI
	4	VII
Diagonals	1	I
	2	VI
	3	V
	4 between I and	II
Diſtance between the frames		III

The Lines for the Fore Body are.

I. Has three diviſions, viz. H^t ſtem, $\frac{G^d,\ H^d}{\text{rake } f^r\ G}$ denoting the heighth of the ſtem; and its rake from timber G at the gun-deck and head.

II. Has four diviſions, viz. *d*, *h*, and theſe marked H^t, T^r, for the heighth of the top timber line at theſe timbers; and again *d*, *h*, for the $\frac{1}{2}$ breadth of thoſe timbers; and the line marked $\frac{1}{2}$ B T^r.

III. Has four diviſions, viz. dst F for the diſtance between the frames, and *c*, *e*, *g*; it is marked L H B, denoting the heighth of the lower breadth line at theſe timbers.

IV. Is in *two* parts. The innermoſt has four diviſions, viz. *g*, *e*, *c*, ⊕, for the points of interſection of theſe timbers with the ſecond diagonal: it is marked 2^d R for the ſecond ribband.

The outermoſt part has three diviſions, viz. *c*, *e*, *g*: it is marked U H B, denoting the heighth of the upper breadth line at theſe timbers.

V. Is in two parts. The innermoſt has four diviſions, viz. *g*, *e*, *c*, ⊕, for the points of interſection of theſe timbers with the firſt diagonal: it is marked 1st R for the firſt ribband.

The outermoſt part has four diviſions, viz. *g*, *e*, *c*, ⊕: it is marked M $\frac{1}{2}$ Bth for the main half breadth at theſe timbers.

VI. Has four diviſions, viz. *g*, *e*, *c*, ⊕, for the points of interſection of theſe timbers with the third diagonal: it is marked 3^d R for the third ribband.

VII. Has four diviſions, viz. *g*, *e*, *c*, ⊕, for the points of interſection of theſe timbers with the fourth diagonal: it is marked 4th R for the fourth ribband. The ſweep of the ſtem is between N^o. III and IV; and the heighth of the gun deck between IV and V.

Index to the Fore Body.

		N^o.
Heighth of breadth	lower	III
	upper	IV
	top timber	II
Half breadth	main	V
	top timber	II
Stem heighth and rake		I
		N^o.
Ribbands	1	V
	2	IV
	3	VI
	4	VII
Diſtance of frames		III
Sweep of the ſtern between III and		V

The uſe of this inſtrument we have already given under the preceding article. *Murray's Treatiſe on Ship-building.*

SHI'VERY *Salt*, a name given by the ſalt-workers to a ſort of ſalt very little different from the common brine ſalt. See SALT.

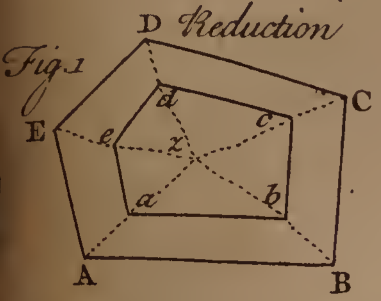
SHOAD, in mining, a term for a train of metalline ſtones mixed with earth, ſometimes lying near the ſurface, ſometimes at conſiderable depths; but always ſerving to the miners as a proof, that the load or vein of the metal is thereabouts. The deeper the Shoad lies, the nearer uſually the vein is. *Ray's Words.*

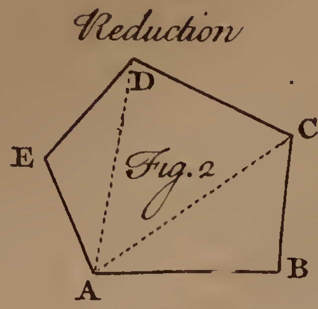
SHOAD-*ſtones*, a term uſed by the miners of Cornwall, and other parts of this kingdom, to expreſs ſuch looſe maſſes of ſtone as are uſually found about the entrances into mines, ſometimes running in a ſtraight courſe, from the load or vein of ore, to the ſurface of the earth.

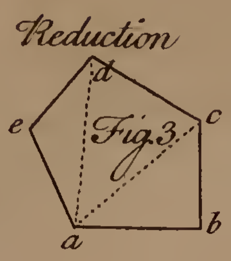
SHOT (*Dict.*)—*Plate* XXXV, *fig.* 13, is that ſpecies of Shot called chain Shot; its chief uſe is to deſtroy the rigging of the enemy. *Fig.* 18. repreſents a pile of Shot, in the manner they are placed in magazines, &c.

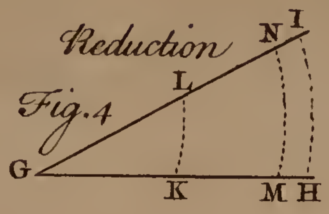
SICYO'NIUM *ſimplex*, the name of a medicine thus prepared: take of the root of wild cucumber two ounces, and put them into an Italian ſextary, or pint of oil, and boil the ſame in a double veſſel.

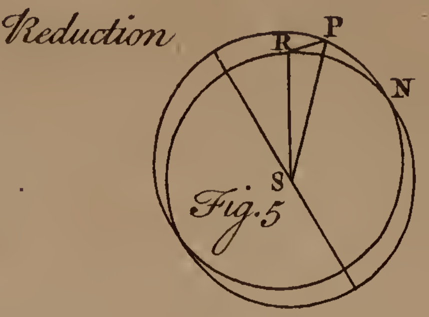
SIDERI'TIS, *iron-wort*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the labiated kind. The upper lip is erect,

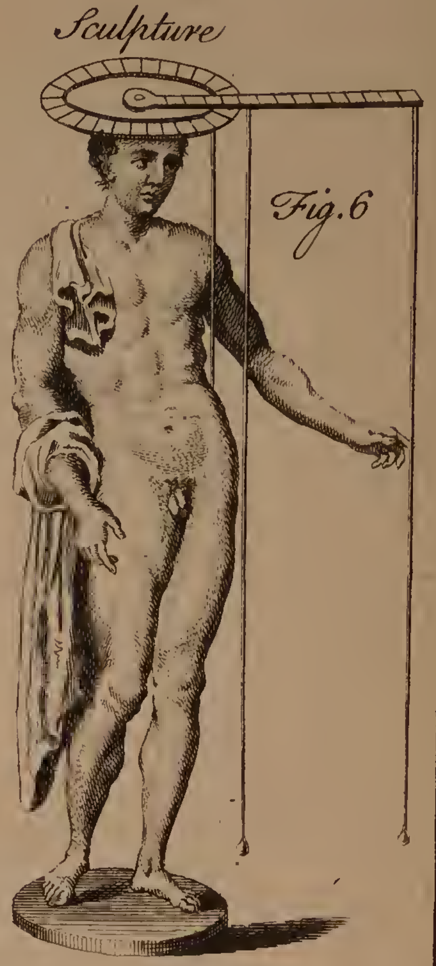


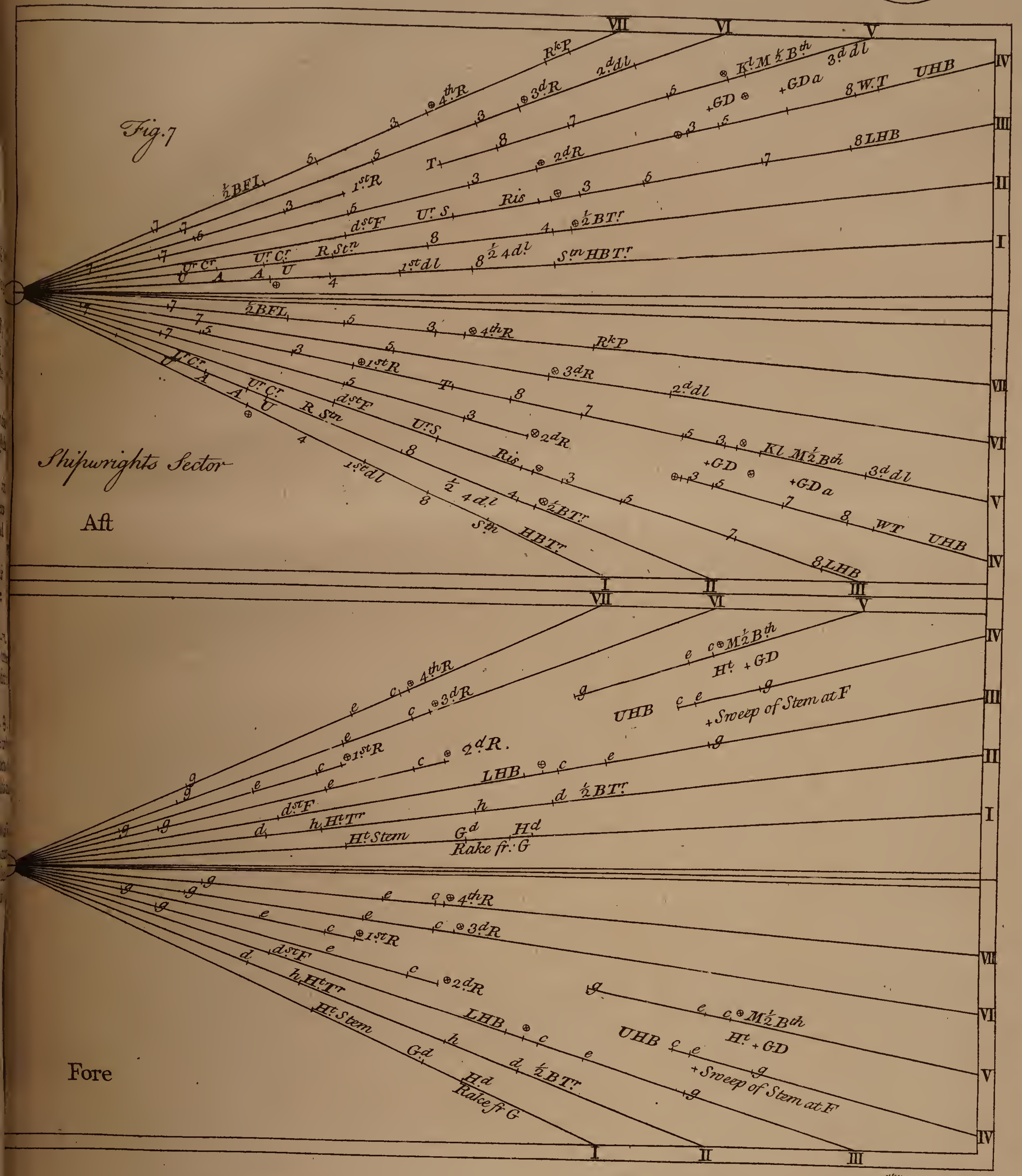


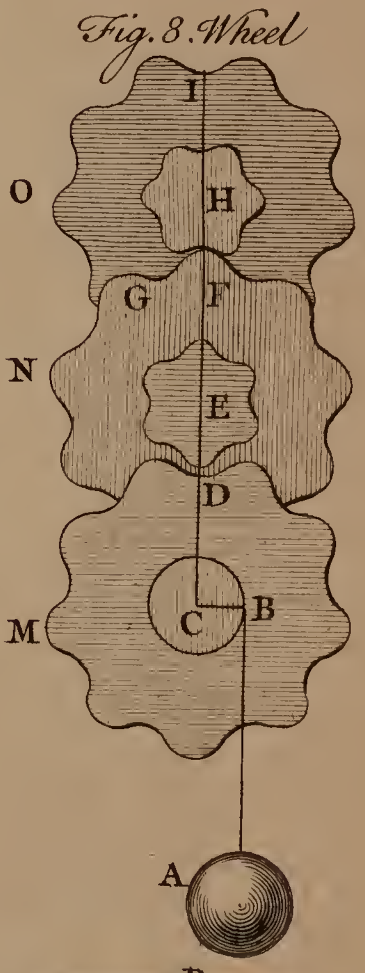


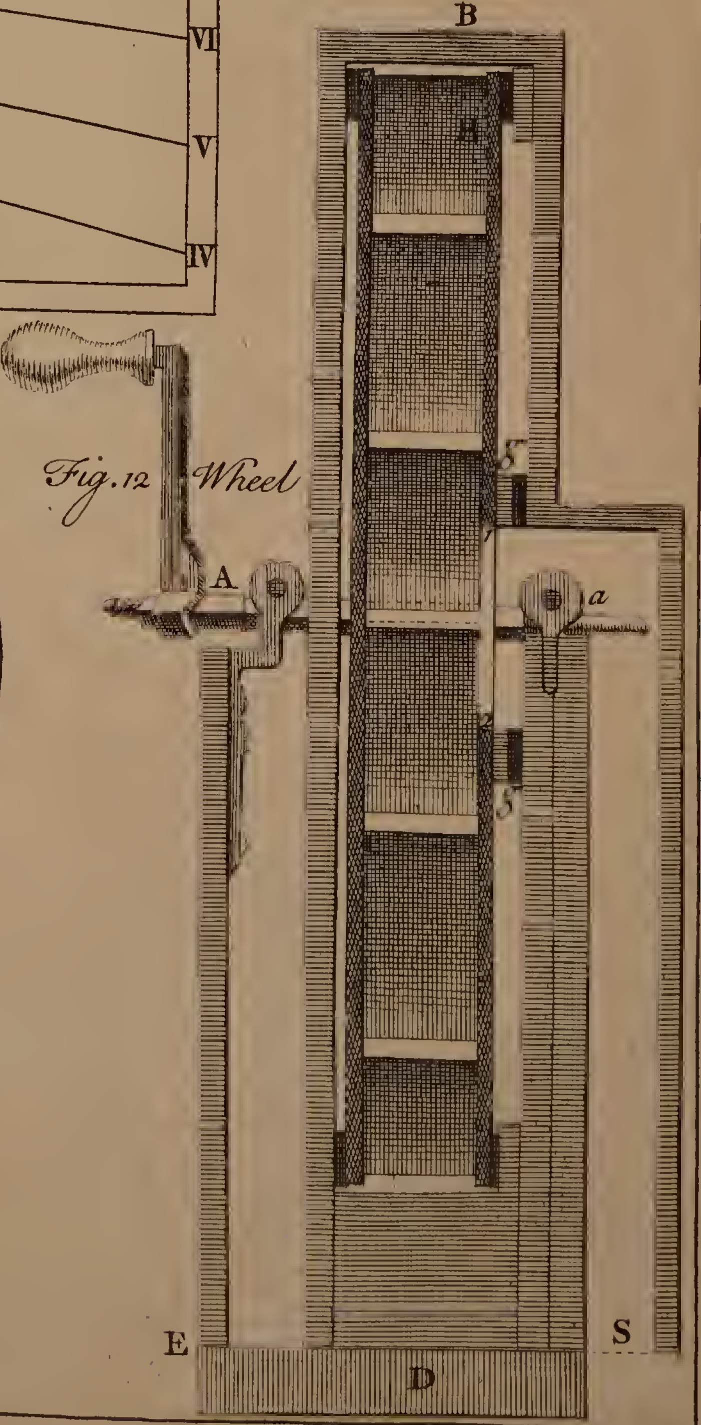


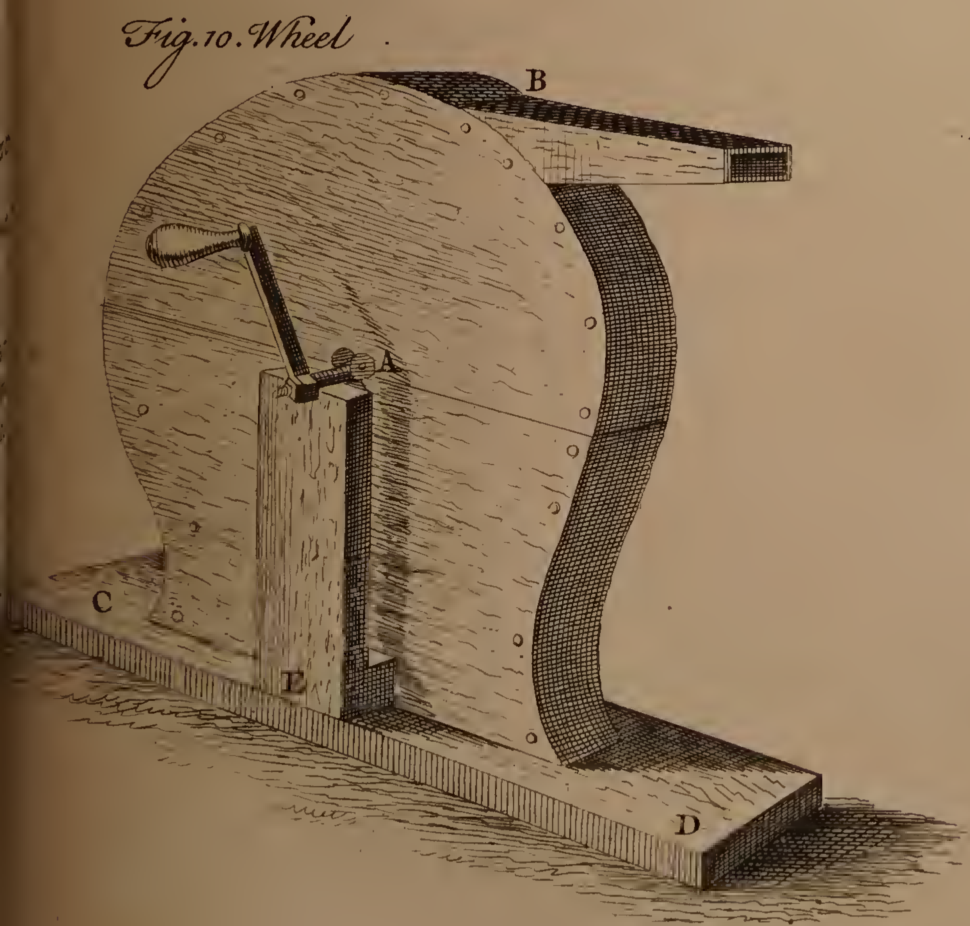


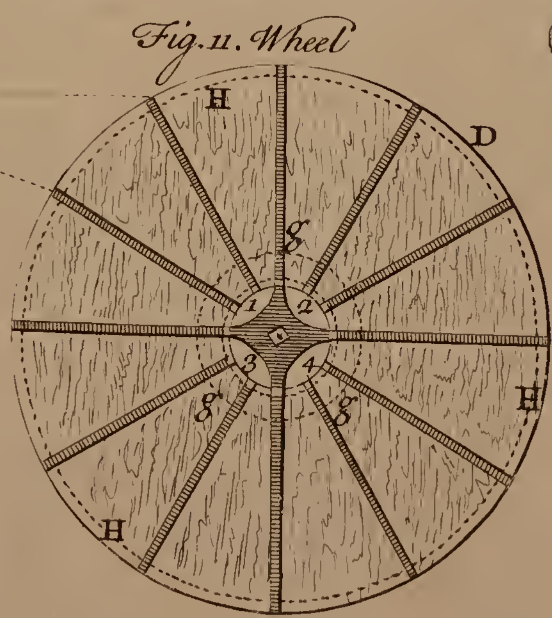


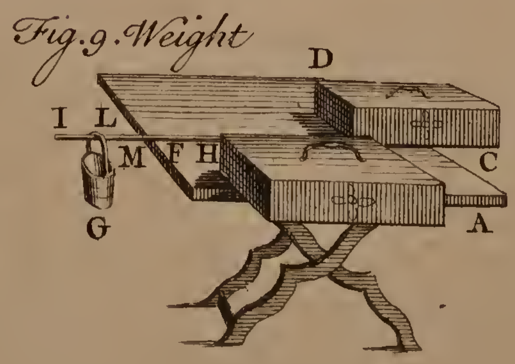












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erect, the lower divided into ſeveral ſegments. The piſtil ariſes from the cup, and is fixed in the manner of a nail into the hinder part of the flower, and ſurrounded by four embryo's, which afterwards become ſo many ſeeds ripening in an open capſule, which was the cup of the flower. To theſe marks it may be added, that in all the Siderites the flowers grow in circles round the ſtalks, at the joinings of the leaves.

SI'GATI-*guſh*, in zoology, the name of a Perſian animal, of the lynx kind, and no way differing from the lynx itſelf, but in that it has no ſpots. Its ears have the fine velvety black pencil of hairs at their top, which are the diſtinguiſhing character of the lynx; and theſe creatures differ ſo much in the variations and different diſpoſitions of their ſpots, that probably this is no other than an accidental variety of the ſame ſpecies. *Ray's Syn. Quad.*

SIGMOI'DES, a word uſed by medicinal writers to expreſs any thing that is in the ſhape of the letter ſigma. The valves of the heart have this epithet applied to them; the coracoide proceſs of the ſcapula is alſo expreſſed by the ſame word; the ſemicircular cavity of the cubit, at the articulation of the fore-arm with the humerus, is ſometimes alſo called the ſigmoidal cavity; and the cartilages of the ſigmoide circles of the aſpera arteria, or wind-pipe, have their denomination from the ſame occaſions.

SI'GNAL (*Dict.*)— Signals have been in uſe in all ages. The ancients who had no regular couriers or poſts, made uſe thereof to convey intelligence of what paſſed at a great diſtance. For which purpoſe they placed centinels on the eminences, from ſpace to ſpace; ſome mention whereof we find made by Homer himſelf, Iliad. Θ. v. 553, &c. Odyſſ. Ξ. v. 261. Thoſe people, thus diſpoſed, lighted fires, or flambeaux, in the night-time. In the Agamemnon of Æſchylus, that prince, at his departure for Troy, promiſes Clytemneſtra, that, the very day the city ſhould be taken, he would apprize her of his victory by fires lighted expreſs. He keeps his word, and tidings are brought the princeſs, that Troy is taken, and that Agamemnon's Signals are ſeen. Frontinus obſerves, they were in uſe among the Arabs; and Bonaventura Vulcanius, in his Scholia on Ariſtotle's book de Mundo, adds, that while the Moors were maſters of the greateſt part of Spain, they built, on the tops of the mountains, an infinity of turrets, or watch-houſes, called, in the Arabic, atalayas, a word the Spaniards ſtill retain; whence, by fires, they could immediately alarm the whole kingdom. Indeed the cuſtom was much more ancient than the Moors in Spain. Q. Curtius obſerves, it was very frequent among the Aſiatics, in the time of Alexander. Livy and Cæſar both mention it as uſed among the Romans. Polydore Virgil ſhews it of great antiquity in England; and Bœthius adds, that, in ſeveral places in England, there are the remains of huge poles that have ſerved for this purpoſe.

SIGNALS *at ſea*, are ſigns made by the admiral or commander in chief of a ſquadron of ſhips, either in the day or by night, whether for ſailing, for fighting, or for the better ſecurity of the merchant ſhips under their convoy.

Theſe Signals are very numerous and important; being all appointed and determined by order of the lord high admiral, or lords of the admiralty; and communicated in the inſtructions ſent to the commander of every ſhip of the fleet or ſquadron before their putting out to ſea.

SIGNALS *by day.*— When the commander in chief would have them prepare for ſailing, he firſt looſes his fore-top-ſail, and then the whole fleet are to do the ſame. When he would have them unmoor, he looſes his main-top-ſail, and fires a gun, which in the royal navy is to be anſwered by every flag-ſhip. When he would have them weigh, he looſes his fore-top-ſail, and fires a gun, and ſometimes hawls home his ſheats: the gun is to be anſwered by every flag-ſhip, and every ſhip to get to ſail as ſoon as it can. If with the leeward-ſide, the ſtern-moſt ſhip is to weigh firſt. When he would have the weather-moſt and head-moſt ſhips to tack firſt, he hoiſts the union-flag at the fore-top-maſt-head, and fires a gun, which each flag-ſhip anſwers; but, if he would have the ſtern-moſt and leeward-moſt ſhips to tack firſt, he hoiſts the union-flag at the mizen top-maſt-head, and fires a gun; and, when he would have all the whole fleet tack, he hoiſts an union, both on the fore and mizen-top-maſt-heads, and fires a gun. When, in bad weather, he would have them wear, and bring to the other tack, he hoiſts a pendant on the enſign-ſtaff, and fires a gun: and then the leeward-moſt and ſtern-moſt ſhips are to wear firſt, and bring on the other tack, and lie by, or go on with an eaſy ſail, till he comes a-head: every flag is to anſwer with the ſame Signal. If they are lying by, or ſailing by a wind, and the admiral would have them bear up and ſail before the wind, he hoiſts his enſign and fires a gun, which the flags are to anſwer: and then the leeward-moſt ſhips are to bear up firſt, and to give room for the weather-moſt to wear, and ſail before the wind with an eaſy ſail, till the admiral comes a-head. But if it ſhould happen, when the admiral hath occaſion to wear and ſail before the wind, that both jack and enſign be abroad, he will hawl down the jack, before he fires the gun to wear, and keep it down till the fleet is before the wind. When they are ſailing before the wind, and he would have them bring to, with the ſtar-board tacks abroad, he hoiſts a red flag at the flag-ſtaff, on the mizen-top-maſt-head, and fires a gun. But if they are to bring to, with the lar-board tack, he hoiſts a blue flag at the ſame place, and fires a gun, and every ſhip to anſwer the gun. When any ſhip diſcovers land, he is to hoiſt his jack and enſign, and keep it abroad, till the admiral or commander in chief anſwers him, by hoiſting his; on ſight of which, he is to hawl down his enſign. If any diſcovers danger, he is to tack and bear up from it, and to hang his jack abroad from the main-top-maſt croſs-trees, and fire two guns: but, if he ſhould ſtrike or ſtick faſt, then, beſides the ſame Signal with his jack, he is to keep firing, till he ſees all the fleet obſerve him, and endeavour to avoid the danger. When any ſees a ſhip or ſhips more than the fleet, he is to put abroad his enſign, and there keep it, till the admiral's is out, and then to lower it, as often as he ſees ſhips, and ſtand in with them, that ſo the admiral may know which way they are, and how many; but if he be at ſuch a diſtance, that the enſign cannot well be diſcovered, he is then to lay his head towards the ſhip or ſhips ſo deſcried, and to brail up his low ſails, and continue hoiſting and lowering his top-ſails, and making a waft with his top-gallant ſails, till he is perceived by the admiral. When the admiral would have the vice-admiral, or he that commands in the ſecond poſt of the fleet, to ſend out ſhips to chace, he hoiſts a flag, ſtriped white and red on the flag-ſtaff, at the fore-top-maſt head, and fires a gun. But, if he would have the rear-admiral do ſo, he then hoiſts the ſame Signal on the flag-ſtaff, at the mizen-top-maſt-head, and fires a gun. When the admiral would have any ſhip to chace to windward, he makes a Signal for ſpeaking with the captain, and he hoiſts a red flag in the mizen-ſhrowds, and fires a gun: but, if to chace to leeward, a blue flag; and the ſame Signal is made by the flag, in whoſe diviſion that ſhip is. When he would have them give over chace, he hoiſts a white flag on his flag-ſtaff at the fore-top-maſt-head, and fires a gun: which Signal is to be made alſo by that flag-ſhip which is neareſt the ſhip that gives chace, till the chacing ſhip ſees the Signal. In caſe of ſpringing a leak, or any other diſaſter, that diſables their ſhip from keeping company, they are to hawl up their courſes, and fire two guns. When any ſhip would ſpeak with the admiral, he muſt ſpread an Engliſh enſign, from the head of his main, or fore-top-maſt, downwards on the ſhrowds, lowering his main, or fore-top-ſail, and firing guns, till the admiral obſerve him; and if any ſhip perceive this, and judgeth the admiral doth not, that ſhip muſt make the ſame Signal, and make the beſt of his way to acquaint the admiral therewith, who will anſwer by firing one gun. When the admiral would have the fleet to prepare to anchor, he hoiſts an enſign, ſtriped red, blue, and white on the enſign-ſtaff, and fires a gun, and every flag-ſhip makes the ſame Signal. If he would have the fleet moor, he hoiſts his mizen-top-ſail, with the clew-lines hawled up, and fires a gun. If he would have the fleet cut or ſlip, he looſes both his top-ſails, and fires two guns; and then the leeward ſhips are to cut or ſlip firſt, to give room to the weathermoſt to come to ſail. So if he would have any particular ſhip to cut or ſlip, and to chace to windward, he makes the Signal for ſpeaking with that ſhip, hoiſts a red flag in the mizen ſhrowds, and fires a gun: but, if the ſhip is to chace to leeward, he hoiſts a blue flag as before. If he would have the fleet exerciſe their ſmall arms, he hoiſts a red flag on the enſign-ſtaff, and fires a gun; but, if the great guns, then he puts up a pendant over the red flag.

SIGNALS *by night.*— To be obſerved at an anchor, weighing anchor, and ſailing, are as follow. When the admiral would have the fleet to unmoor, and ride ſhort, he hangs out three lights, one over another in the main-top-maſt ſhrowds, over the conſtant light in the main-top, and fires two guns, which are to be anſwered by flag-ſhips; and each private ſhip hangs out a light in the mizen-ſhrowds. Note, That all guns, fired for Signals in the night, muſt be fired on the ſame ſide, that they may make no alteration in the ſound. When he would have them weigh, he hangs a light in the main-top-maſt ſhrowds, and fires a gun, which is to be anſwered by all the flags, and every private ſhip muſt hang out a light in his mizen-ſhrowd. When he would have them tack, he hoiſts two flags on the enſign-ſtaff, one over another, above the conſtant light in his poop, and fires a gun, which is to be anſwered by all the flags; and every private ſhip is to hang out a light extraordinary, which is not be taken in, till the admiral takes in his. After the Signal is made, the leeward-moſt and ſtern-moſt ſhips muſt tack as faſt as they can, and the ſtern-moſt flag-ſhip, after he is about on the other tack, is to lead the fleet, and him they are to follow, to avoid running foul of one another in the dark. When he is upon a wind, and would have the fleet veer, and bring to on the other tack, he hoiſts up one light at the mizen-peek, and fires three guns, which is to be anſwered by the flag-ſhips, and every private ſhip muſt anſwer, with one light at the mizen-peek. The ſtern-moſt and leeward-moſt ſhips are to bear up as ſoon as the Signal is made. When he would have them, in blowing weather, to lie a try, ſhort, or a hull, or with the head-ſails braced to the maſt, he will form lights of equal height, and fire five guns, which are to be anſwered by the flag-ſhips, and then every private ſhip muſt ſhew four lights: and after this, if he would have them to make ſail, he then fires ten guns, which are to be anſwered by all the flags, and then the head-moſt and weather-moſt ſhips are to make ſail firſt. When the fleet is ſailing large, or before the wind, and the admiral would have them bring to, and lie by with their ſtar-board tacks aboard, he puts out four lights in the fore-ſhrowds, and fires ſix guns; but if with the lar-board tacks aboard, he fires eight guns, which are to be anſwered by the flag-ſhips; and every private ſhip muſt ſhew four lights. The wind-moſt ſhips muſt bring to firſt. Whenever the admiral alters his courſe, he fires one gun, without altering his lights, which is to be anſwered by all the flag-ſhips. If any ſhip hath occaſion to lie ſhort, or by, after the fleet hath made ſail, he is to fire one gun, and ſhew three lights in his mizen-ſhrowds. When any one firſt diſcovers land, or danger, he is to ſhew as many ſigns as he can, to fire one gun, and to tack, or bear away, from it: and, if any one happen to ſpring a leak, or any be diſabled from keeping company with the fleet, he hangs out two lights of equal height, and fires guns till he is relieved by ſome ſhip of the fleet. If any one diſcovers a fleet, he is to fire guns, make falſe fires, put one light out on the main-top, three on the poop, to ſteer after them, and to continue firing of guns, unleſs the admiral call him off, by ſteering another courſe, and fire two or three guns; for then he muſt follow the admiral. When the admiral anchors, he fires two guns, a ſmall ſpace of time one from the other, which are to be anſwered by the flag-ſhips; and every private ſhip muſt ſhew two lights. When the admiral would have the fleet to moor, he puts a light on each top-maſt-head, and fires a gun, which is to be anſwered by the flag-ſhips, and every private ſhip is to ſhew one light. If he would have them lower their yards and top-maſts, he hoiſts one light upon his enſign-ſtaff, and fires one gun; which is to be anſwered by the flag-ſhips, and every private ſhip muſt ſhew one light. And when he would have them hoiſt their yards and top-maſts, he puts out two lights, one under the other, in the mizen-top-maſt-ſhrowds, and fires one gun; which is to be anſwered by the flag-ſhips, and each private ſhip muſt ſhew one light in the mizen-ſhrowds. If any ſtrange ſhip be diſcovered coming into the fleet, the next ſhip is to endeavour to ſpeak with her, and bring her to an anchor, and not ſuffer her to paſs through the fleet. And if any one diſcovers a fleet, and it blow ſo hard that he cannot come to give the admiral notice timely, he is to hang out a great number of lights, and to continue firing gun after gun, till the admiral anſwers him with one. When the admiral would have the fleet to cut or ſlip, he hangs out four lights, one at each main-yard-arm, and at each fore-yard-arm, and fires two guns, which are to be anſwered by the flag-ſhips, and every private ſhip is to ſhew one light.

Signals *uſed, when a fleet ſails in a fog.*—If the admiral would have them weigh, he fires ten guns; which every flag-ſhip is to anſwer. To make them tack, he fires four guns, which are to be anſwered by the flag-ſhips; and then the lee-ward-moſt and ſtern-moſt ſhips muſt tack firſt, and, after they are about, to go with the ſame ſail they tacked with, and not to lie by, expecting the admiral to come a-head: and this is to avoid the danger of running foul of one another in thick weather.

When the admiral brings to, and lies with his head-ſails to the maſt; if with the ſtar-board tack abroad, he fires ſix guns; but, if with the lar-board tack, he fires eight guns, which the flag-ſhips are to anſwer. And after this, if he makes ſail, he fires ten guns, which the flag-ſhips muſt anſwer, and then the head-moſt and weather-moſt ſhips are to make ſail firſt. If it grow thick and foggy weather, the admiral will continue ſailing, with the ſame ſail ſet that he had before it grew foggy, and will fire a gun every hour, which the flag-ſhips muſt anſwer, and the private ſhips muſt anſwer, by firing of muſkets, beating of drums, and ringing of bells. But if he be forced to make either more or leſs ſail than he had, when the fog began, he will fire a gun every half-hour, that the fleet may diſcern, whether they come up with the admiral, or fall a-ſtern of him; and the flags and private ſhips are to anſwer as before. If any one diſcovers danger, which he can avoid, by tacking and ſtanding from it, he is to make the Signal for tacking in a fog; but if he ſhould chance to ſtrike and ſtick faſt, he is to fire gun after gun, till he thinks the reſt have avoided the danger. When the admiral would have the fleet to anchor, he fires two guns, which the flags are to anſwer; and after he hath been half an hour at an anchor, he will fire two guns more, to be anſwered by the flags, as before; that all the fleet may know it.

Signals *for calling officers on board the admiral.*—When the admiral puts aboard an union-flag in the mizen-ſhrowds, and fires a gun, all the captains are to come aboard him: and if, with the ſame Signal, there be alſo a waft made with the enſign, then the lieutenant of each ſhip is to come on board. If an enſign be put aboard in the ſame place, all the maſters of the ſhips of war are to come on board the admiral. If a ſtandard on the flag-ſtaff be hoiſted at the mizen-top-maſt-head, and a gun fired, then all the flag-officers are to come aboard the admiral. If the Engliſh flags only, then a ſtandard in the mizen-ſhrowds, and fire a gun: if the flags and land general officers, then the admiral puts aboard a ſtandard at mizen-top-maſt-head, and a pendant at mizen-peek, and fires a gun. If a red flag be hoiſted in the mizen-ſhrowds, and a gun fired; then the captains of his own ſquadron are to come aboard the admiral; and if, with the ſame Signal, there be alſo a waft with the enſign, the lieutenant of each ſhip muſt come aboard. If he hoiſts a white flag, as before, then the vice-admiral, or he that commands in the ſecond poſt, and all the captains of his ſquadron, are to go on board the admiral: if a blue flag, &c. then the rear-admiral, and the captains of his ſquadron, muſt come on board; and if a waft, as before, the lieutenants. When a ſtandard is hoiſted on the enſign-ſtaff, and gun fired, the vice and rear-admirals muſt come on board the admiral's ſhip. When the admiral would ſpeak with the captains of his own diviſion, he will hoiſt a pendant on the mizen-peek, and fire a gun; and if with the lieutenants, a waft is made with the enſign, and the ſame Signal: for whenever he would ſpeak with the lieutenants of any particular ſhip, he makes the Signal for the captain, and a waft alſo with the enſign. When the admiral would have all the tenders in the fleet come under his ſtern, and ſpeak with him; he hoiſts a flag, yellow and white, at the mizen-peek, and fires a gun. But if he would ſpeak with any particular ſhip's tender, he makes a Signal for ſpeaking with the captain ſhe tends upon, and a waft with the jack. If all the pinnaces and barges are to come on board, manned and armed, the Signal is a pendant on the flag-ſtaff, hoiſted on the fore-top-maſt-head, and a gun fired; and if he would have them chace any ſhip, veſſel, or boat, in view, he hoiſts the pendant, and fires two guns. The Signal for the long-boats to come on board him, manned and armed, is the pendant hoiſted on the flag ſtaff, and the mizen-top-maſt-head, and a gun fired; and if he would have them chace any ſhip, veſſel, or boat, in open view, without coming on board him, he hoiſts the pendant, as aforeſaid, and fires two guns. When the admiral would have all the boats in the fleet come on board him, manned and armed, he hoiſts a pendant on the flag-ſtaff, both on the fore-top-maſt, and mizen-top-maſt-head, and fires one gun; but if he would have them chace, he hoiſts his pendants, as before, and fires two guns. When the admiral would ſpeak with the victualler, or his agent, he puts an Engliſh enſign in the mizen-top-maſt-ſhrowds; and when with him that hath the charge of the gunner's ſtores, he will ſpread an enſign at his main-top-ſail-yard-arm.

Signals *for managing a ſea-fight.*—When the admiral would have the fleet form a line of battle, one ſhip a-head of another, he hoiſts an union-flag at the mizen-peek, and fires a gun; and every flag-ſhip does the like. But when they are to form a line of battle, one a-breaſt of another, he hoiſts a pendant with the union-flag, &c. When he would have the admiral of the white, or he that commands in the ſecond poſt, to tack, and endeavour to gain the wind of the enemy, he ſpreads a white flag under the flag at the main-top-maſt-head, and fires a gun; and when he would have the vice-admiral of the blue do ſo, he doth the ſame with the blue flag. If he would have the vice-admiral of the red do ſo, he ſpreads a red flag from the cap, on the fore-top-maſt-head, downward on the back-ſtay; if the vice-admiral of the blue, he ſpreads a blue flag, &c. and fires a gun. If he would have the rear-admiral of the red do ſo, he hoiſts a red flag at the flag-ſtaff, at the mizen-top-maſt-head; if the rear-admiral of the white, a white flag; if the rear-admiral of the blue, a blue flag, and under it a pendant of the ſame colour, with a gun. If he be to leeward of the fleet, or any part of it, and he would have them bear down into his wake or track, he hoiſts a blue flag at the mizen-peek, and fires a gun. If he would be to leeward of the enemy and his fleet, or any part of it to be to leeward of him; in order to bring theſe ſhips into the line, he bears down with a blue flag at the mizen-peek, under the union-flag, which is the Signal for battle, and fires a gun; and then thoſe ſhips, that are to leeward of him, muſt endeavour to get into his wake or track, according to their ſtation in the line of battle. When the fleet is ſailing before the wind, and he would have him, who commands in the ſecond poſt, and the ſhip of the ſtar-board quarter to clap by the wind, and come to the ſtar-board tack, he hoiſts a red flag at the mizen-top-maſt-head: but a blue one, if he would have ſhips of the lar-board quarter come to the lar-board tack, with a gun. If the van are to tack firſt, he ſpreads the union-flag at the flag-ſtaff, on the fore-top-maſt-head, and fires a gun, if the red flag be not abroad; but if it be, then he lowers the fore-top-ſails a little; and the union-flag is ſpread from the cap of the fore-top-maſt downwards; and every flag-ſhip doth the ſame. If the rear be to tack firſt, he hoiſts the union-flag on the flag-ſtaff, at the mizen-top-maſt-head, and fires a gun; which all the flag-ſhips are to anſwer. If all the flag-ſhips are to come into his wake or track, he hoiſts a red flag at his mizen-peek, and fires a gun; and all the flag-ſhips muſt do the ſame. If he would have him that commands in the ſecond poſt of his ſquadron to make more ſail, though he himſelf ſhorten ſail, he hoiſts a white flag on the enſign-ſtaff. But, if he that commands in the third poſt be to do ſo, he hoiſts a blue flag, and fires a gun, and all the flag-ſhips muſt have the ſame Signal. Whenever he hoiſts a red flag on the flag-ſtaff at the fore-top-maſt-head, and fires a gun; every ſhip in the fleet muſt uſe their utmoſt endeavour to engage the enemy, in the order preſcribed them. When he hoiſts a white flag at his mizen-peek, and fires a gun; then all the ſmall frigates of his ſquadron, that are not of the line of battle, are to come under the ſtern. If the fleet be ſailing by a wind in the line of battle, and the admiral would have them brace their head ſails to the maſt, he hoiſts up a yellow flag, on the flag-ſtaff, at the mizen-top-maſt-head, and fires a gun; which the flag-ſhips are to anſwer: and then the ſhips in the rear muſt brace firſt. After this, if he would have them fall their head-ſails, and ſtand on, he hoiſts a yellow flag on the flag-ſtaff of the fore-top-maſt-head, and fires a gun, which the flag-ſhips muſt anſwer, and then the ſhips in the van muſt fall firſt, and ſtand on. If, when this Signal is made, the red flag at the fore-top-maſt-head be abroad, he ſpreads the yellow flag under the red. If the fleets being near one another, the admiral would have all the ſhips to tack together, the ſooner to lie in a poſture to engage the enemy; he hoiſts an union-flag on the flag-ſtaves at the fore and mizen-top-maſt-heads, and fires a gun; and all the flag-ſhips are to do the ſame. The fleet being in a line of battle, if he would have the ſhip that leads the van, hoiſt, lower, ſet, or hawl up any of the ſails, he ſpreads a yellow flag, under that at his main-top-maſt-head, and fires a gun, which Signal the flag-ſhips are to anſwer; and then the admiral will hoiſt, lower, ſet, or hawl up the ſail, which he would have the ſhip that leads the van, do; which is to be anſwered by the flag-ſhips of the fleet. When the enemies run, and he would have the whole fleet follow them, he makes all the ſail he can after them himſelf, takes down the Signal for the line of battle, and fires two guns out of his fore-chaſe, which the flag-ſhips anſwer; and then every ſhip is to endeavour to come up with, and board the enemy. When he would have the chace given over, he hoiſts a white flag at the fore-top-maſt-head, and fires a gun. If he would have the red ſquadron drawn into a line of battle, one a-breaſt of another, he puts abroad a flag, ſtriped red and white, on the flag-ſtaff at the main-top-maſt-head, with a pendant under it, and fires a gun: if the white or ſecond ſquadron is to do ſo, the flag is ſtriped red, white, and blue: if the blue or third ſquadron is to do ſo, the flag is a Genoeſe enſign and pendant: but if they are to draw into a line of battle, one a-head of another, the ſame Signals are made without a pendant. If they are to draw into the line of battle one a-ſtern of another, with a large wind, and he would have the leaders go with the ſtar-board tacks, a-board by the wind; he hoiſts a red and white flag at the mizen-peek, and fires a gun: but if they ſhould go with the lar-board tacks aboard, by the wind, he hoiſts a Genoeſe flag at the ſame place; which Signals, like others, muſt be anſwered by the flag-ſhips.

SI'LEX, *flint*, in natural hiſtory, the name of a genus of ſemipellucid ſtones, the matter of which is a cryſtal, debaſed by an admixture of a peculiar and appropriated earth, which is of a blackiſh grey; always free from veins, but, according to the different quantity and diſpoſition of the earth in its compoſition, ſubject to clouds of a darker or paler colour, and naturally inveſted with a thin whitiſh cruſt.

Naturaliſts, in general, have accounted various ſpecies of flint, but erroneouſly; nature has eſtabliſhed it into a genus of itſelf, and allowed no other ſpecies than one, which is ever compoſed of the ſame matter, and differs only in the proportions of its admixture. When cryſtalline matter is debaſed by earths of other colours, or clouded and veined, it ceaſes to be flint, and becomes the pebble, the agate, or the onyx; and the not attending to this diſtinction has made many deſcribe theſe variouſly-coloured bodies twice over: one under the name of coloured flints, and a ſecond time under that of Engliſh agates, &c.

The characters of genuine flint are, that it is a ſtone of an extremely fine and even texture; of a very uncertain ſurface, ſometimes rough, ſometimes ſmooth; of a colour always, in ſome degree, between blackiſh and whitiſh, unleſs accidentally tinged, as all other foſſils are ſubject to be; very readily giving fire with ſteel; not fermenting with acids. *Hill's Hiſt. of Foſſils.*

SI'LIQUA, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the apetalous kind, being compoſed only of a number of ſtamina, which ariſe from the ſegments of the cup, the middle of which is occupied by a piſtil, which finally becomes a flatted pod of a fleſhy ſubſtance, and containing flat and roundiſh ſeeds.

SILIQUA'STRUM, *judas-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the papilionaceous kind; the wings, however, ſtand over the vexillum, and the carina is compoſed of two leaves. The piſtil ariſes from the cup, and is ſurrounded by ſtamina; this finally becomes a flat membranaceous pod, filled with ſeeds of a kidney-like form. To this it is to be added, that the leaves ſtand alternately.

SILK-*worm*, *bombyx*. This inſect conſiſts of eleven rings, and each of theſe of a great number of other ſmaller ones, joined to each other; and the head, which terminates theſe rings, is furniſhed with two jaws, which work and cut the food, not by a perpendicular, but a lateral action. The humours, found in the body of this creature, all ſeem approaching to the nature of the Silk which it ſpins, for on being rubbed in the hands, they leave a hard or ſolid cruſt behind them. Under the ſkin there is always found a muſcous roſy-coloured membrane, enveloping the animal, and ſuppoſed to be the new ſkin in which it is to appear, on throwing off the old one. The heart of this creature reaches from the head to the tail, running the whole length of the body: it is indeed rather a ſeries of many hearts connected together, than one. The motion of ſyſtole and diaſtole is very evident in this whole chain of hearts; and it is an elegant ſight to obſerve the manner of the vital fluids paſſing from one of them to the other. The ſtomach of this animal is as long as the heart, reaching, like it, from one end of the body to the other. This large receptacle for food, and the ſudden paſſage of it through the animal, are very good reaſons for its great voracity.

In the ſides of the belly, all about the ventricle, there are depoſited a vaſt number of veſſels, which contain the ſilky juice; theſe run with various windings and meanders to the mouth, and are ſo diſpoſed, that the creatures can diſcharge their contents at pleaſure at the mouth; and according to the nature of the juices, that they are ſupplied with, furniſh different ſorts of ſilk from them, all the fluid contents of theſe veſſels hardening in the air into that ſort of thread, that we find the web or balls of this creature conſiſt of.

Theſe creatures never are offended at any ſtench of whatever kind, but they always feel a ſouthern wind, and an extremely hot air always makes them ſick. *Malpighi de Bombyce.*

SI'LVERING.—To ſilver braſs: fine ſilver is diſſolved in aqua-fortis in a broad-bottomed veſſel of glaſs, or glazed earth, and the aqua-fortis being afterwards evaporated, and the operation repeated as often as there is occaſion; the fire being increaſed towards the latter end, ſo as to leave a perfectly dry and white calx, which will be thus tolerably freed from the aqua-fortis. Of this calx take one part, and an equal meaſure, not weight, of common ſalt, and of the cryſtals of tartar, and mix them together into a fine powder; then, having firſt plunged the ſcowered braſs into fair water, rub ſome of the powder upon it with your wet fingers, till the cavities of its ſurface be ſufficiently filled therewith. Laſtly, waſh the metal well in water, and give it a gloſs by rubbing it hard with a dry cloth.

This waſhing, Mr. Boyle obſerves, is expeditious, cheap, requires no quick-ſilver, and may be made to laſt ſome years, and is eaſily renewable, when it begins to wear. *See his Works Abr. Vol. Iſt.*

SINA'PI, *muſtard*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is compoſed of four leaves, and is of the cruciform kind. The piſtil ariſes from the cup, and finally becomes a long pod, divided by an intermediate membrane into two cells, and containing roundiſh ſeeds; the pod alſo uſually terminates in a fungoſe horn, which has ſome ſeeds in it. To this it is to be added, that theſe plants have all a hot, acrid, and biting taſte.

SI'REN (*Dict.*)—Artedi ſuppoſes it to conſtitute a peculiar genus of the plagiuri, or cetaceous fiſhes. The characters he gives of it are theſe: it has no pinnated tail; the head, neck, and breaſt, down to the navel, repreſent thoſe of the human ſpecies; there are only two fins on the whole body, and thoſe ſtand on the breaſt. Bartholine, in his hiſtory of Curioſities, deſcribes ſuch a fiſh as this, under the name of Syrene, and Barchewitz under the name of homo marinus. This author ſays that he ſaw one at ſea, and that it is wholly different from the manati, and from all other fiſhes. The Philoſophical Tranſactions alſo contain an account of a ſea-man ſeen in the American ſeas, and ſeveral other writers of credit give countenance to the ſtory. Their deſcriptions tell us, that from the navel to the tail it is one ſhapeleſs maſs of fleſh, without any appearance of finny tail, or any other part of the ſtructure of a fiſh. The pectoral fins reſemble hands, and are compoſed of five bones, or fingers, joined by a membrane. With theſe it ſwims. It were much to be wiſhed, that ſome accurate ichthyologiſt might have an opportunity of ſeeing and examining this creature, if it really exiſts different from the other animals of the ſea. Artedi ſeems to doubt the truth of the accounts, but thinks it better not to judge of a thing not yet ſeen, than to pronounce any thing raſhly againſt the accounts of creditable authors. *Artedi, Geſner. Piſc.*

SKIN, in commerce. The Indians in Carolina and Virginia dreſs buck and doe ſkins in this manner: the felt being taken off, they ſtrain them with lines, or otherwiſe, much like the clothiers racks, in order only to dry them. When the hunting time is over, the women dreſs the ſkins, by putting them in a pond, or hole of water, to ſoak them well; then with an old knife, fixed in a cleft ſtick, they force off the hair, whilſt they remain wet. This done, they put them into a kettle, or earthen-pot, and a proportion of deers brains, dried and preſerved for this purpoſe, is put in along with them; this veſſel is ſet on the fire till they are more than blood-warm, which will make them lather and ſcour clean; after this, with ſmall ſticks, they wreſt and twiſt each ſkin, as long as they find any wet to drop from them, letting them remain ſo wreſted for ſome hours; and then they untwiſt and ſtretch each of them in a ſort of a rack, ſo that every part is extended: and, as the ſkin dries, they take a dull hatchet, or ſome ſuch inſtrument, and rub them well over to force all the water and greaſe out of them, till they become perfectly dry, and then their work is done.

In this manner one woman (for the men never employ themſelves in this work) will dreſs eight or ten ſkins in a day, that is, begin and finiſh them. *Phil. Tranſ.* N°. 194.

SKI'NUS σκινὸς, a name given by the antient naturaliſts to the lentiſk-tree, and alſo to a peculiar ſpecies of the ſquill, or ſcilla, which was not nauſeous and emetic as the common ſquill, but eſculent and pleaſant to the taſte.

SKY-*colour*. To give this colour to glaſs, ſet in the furnace a pot of pure metal of frit from rochetta, or barillia, but the rochetta frit does beſt; as ſoon as the metal is well purified, take for a pot of twenty pounds of metal ſix ounces of braſs calcined by itſelf, put it by degrees, at two or three times, into the metal, ſtirring and mixing it well every time, and diligently ſcumming the metal with a ladle: at the end of two hours the whole will be well mixed, and a proof may be taken; if the colour be found right, let the whole ſtand twenty-four hours longer in the furnace, and it will then be fit to work, and will prove of a moſt beautiful ſky-colour. *Neri's Art of Glaſs.*

SLABS *of tin*, the leſſer maſſes, which the workers at the tin mines caſt the metal into: theſe are run into moulds made of ſtone. *Ray's Engliſh Words.*

SLA'CKEN, in metallurgy, a term uſed by the miners to expreſs a ſpungy and ſemivitrified ſubſtance, which they uſe to mix with the ores of metals, to prevent their fuſion. It is the ſcoriæ or ſcum, ſeparated from the ſurface of the former fuſions of metals. To this they frequently add lime-ſtone, and ſometimes a kind of coarſe iron ore, in the running of the poorer golden ores.

SLAU'GHTER-*ſkins*, a term uſed by our curriers and leather-dreſſers for the ſkins of oxen, or other beaſts, when freſh, and covered with the hair: ſuch as they receive them from the Slaughter-houſes where the butchers flea the carcaſe.

SLEDGE, in the mechanic arts, is a large ſmith's hammer, to be uſed with both hands: of this there are two ſorts, the uphand-ſledge, which is uſed by under workmen, when the work is not of the largeſt ſort; it is uſed with both the hands before, and they ſeldom raiſe it higher than their head. But the other which is called the about-ſledge, and which is uſed for battering or drawing out the largeſt work, is held with both the hands, and ſwung round over their heads, at their arms end, to ſtrike as hard a blow as they can. *Moxon's Mechanic Exerciſes.*

SLEE'PERS, in natural hiſtory, a name given to ſome animals which ſleep all the winter: ſuch are bears, marmotes, dormice, bats, hedge-hogs, ſwallows, &c. Theſe do not feed in winter; have no ſenſible evacuations, breathe little, or not at all, and moſt of the viſcera ceaſe from their functions. Some of theſe creatures ſeem to be dead, and others to return to a ſtate like unto that of the fœtus before birth. In this condition they continue, till by length of time maturating the proceſs, or by new heat, the fluids are attenuated, the ſolids ſtimulated, and the functions begin where they left off. See *Dr. Stevenſon in Med. Eſſ. Edinb.* Vol. V. *Art.* 77.

Sleepers, in the glaſs trade, are the large iron bars croſſing the ſmaller ones, and hindering the paſſage of the coals, but leaving room for the aſhes. *Neri's Art of Glaſs, Appendix.*

Sleepers, in a ſhip, timbers lying before and aft in the bottom of a ſhip, as the rung-heads do; the lowermoſt of them is bolted to the rung-heads, and the uppermoſt to the futtocks, in order to ſtrengthen and faſten the futtocks and rungs.

SLICH, in metallurgy, the ore of any metal, particularly of gold, when it has been pounded, and prepared for farther working.

SLOTH, in natural hiſtory, the name of an animal remarkable for its ſlow motion. This creature is ſo very tedious in all its motions, that it will be three or four days in climbing up and coming down a tree, and does not go the length of fifty paces upon even ground in a day.

SLOE-*worm*, in natural hiſtory, the name of an inſect found on the leaves of the Sloe, or black-thorn, and ſometimes on thoſe of the garden-plum.

SLOW-*worm*, the Engliſh name of the cæcilia, called alſo the blind-worm, and by ſome the deaf adder: it is very venomous, and its bite often fatal.

SLUDS, a term uſed by the miners in Cornwal for half-roaſted ores.

SMALL-*ſtones*, among jewellers, denote diamonds under the weight of a carrat. *Jeffreys on Diamonds.*

Small-*work*, among jewellers, is uſed to denote the ſtar and ſhell-facets of diamonds. *Jefferys on Diamonds.*

SMALT (*Dict.*)— Some cobalt yields Smalt before roaſting, even better than it would afterwards; this is a peculiar kind of cobalt, that is ſo like the reſt, that it cannot be diſtinguiſhed by the eye, but experiment alone ſhews this property in it. Though cobalt in general requires roaſting, in order to fit it for yielding the Smalt, yet its different kinds require ſome more, and ſome leſs roaſting; and the degree can never be judged of by the inſpection of the mineral, but is only known by the experienced artiſt in the proceſs. Hence it is, that expert and intelligent perſons are neceſſary in the Smalt-works more than in almoſt any other branch in this ſort of buſineſs. The addition of a ſmall quantity of arſenic, or of the arſenical flowers, during the time that the Smalt is in fuſion, adds greatly to the beauty of the colour: this is a practice kept ſecret by the workmen of ſome places; and by this means their Smalt is always rendered better than that of their neighbours. It is eaſy to ſee from this, that the roaſting of the cobalt is the neceſſary beginning of the Smalt-work, not the diveſting it of its arſenic, which only happens accidentally in that proceſs; and it would be much better if it did not happen, ſince we find the arſenic added afterwards exalts the colour. From hence it is evident, that thoſe cobalts which will make Smalt without previous roaſting, muſt, as they are found to do, make the very fineſt Smalt, becauſe their arſenic is yet left in them in great part: and from this alſo appears the neceſſity of having expert workmen for the Smalt-making; ſince the knowing the degree of fire neceſſary to the ore is a moſt eſſential article, and, after the roaſting has been carried to a ſufficient degree, every moment's heat, diveſting it of more of its arſenic than was neceſſary, makes the colour of the Smalt to be made afterwards ſo much the worſe. From this alſo appears the reaſon why the blue, made by precipitation from a ſolution of cobalt, is ſo much ſuperior to the common Smalt made by fire; becauſe in this the arſenic is all preſerved, whereas, in the common way of preparing it by fire, it is driven off. *Philoſ. Tranſ.* N°. 396.

SME'CTIS, in natural hiſtory, a name uſed by ſeveral authors for the common fuller's earth, more commonly called cimolia purpuraſcens.

SMELL, is uſed as the name of a particular ſort of wine, of which there are two ſpecies; the one ſort is very fragrant, muſcatelline, and aromatic; this is called ſimply the Smell-wine; but the other, which is very rank and offenſive to the noſe, is called by the Germans Smel-bruntzer. Many have been the conjectures about the occaſion of the rank Smell of this wine, it not being owing to the grape it is made from, thoſe of the ſame vineyard often affording the aromatic, and often the rank wine: ſome have imputed the ſtrange difference to the veſſel, others to the vine, and others to the earth it grows in; but the firſt of theſe is too trifling a cauſe for ſuch an effect, and the others are confuted by experience of the ſame vine, in the ſame place, yielding both. The opinion of Portzius is, that the rankneſs of the Smell of ſome of this wine is owing to ſome irregularities in the working; this is certain, that it never is perceived before the working. The Smell is truly urinous, and is that of a volatile alkali; which not being embodied in, or ſubdued by the acid of the grape, in this imperfect fermentation, ſhews itſelf in this rank manner. It is evident that the Smell is of a volatile nature, for it is often loſt in the drawing the wine ſeveral times out of one veſſel into another, evaporating during the time of the drawing it out. *Portzius, de Vin. Rhen.*

SMELT, *aqua phalerica*, in ichthyology, the name of a well known fiſh.

Theſe fiſh will live almoſt any where, but they are very apt to degenerate. They are common in the rivers of New-England, and are as large as with us, often weighing two ounces and a half; but, a pail-full of theſe being taken from one of their rivers, and put into an adjoining pond, they all degenerated in ſuch a manner, that they were afterwards found ſo ſmall, that the largeſt did not weigh more than five pennyweights. Though thus ſmall, however, they are much valued, and are better taſted than the others. They are very tranſparent, and of a beautiful ſhining pearl colour. *Philoſ. Tranſ.* N°. 374.

SME'LTING-*houſe*, a houſe where they run and ſmelt the ore into lead: one of theſe will run a ton in ten or twelve hours; a fodder is their uſual day's work, that is, twenty-two hundred and an half weight. *Houghton's Compl. Min. in the Explan. of the Terms.*

SMI'LAX, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of ſeveral petals arrayed in a circular form. The piſtil finally becomes a ſoft roundiſh berry, containing a roundiſh or oval ſeed.

SMUT, in huſbandry, a diſeaſe in corn, in which the grains, inſtead of being filled with flower, are full of a black ſtinking powder.

Many things have been ſuſpected as the cauſes of this diſtemperature in corn; but Mr. Tull ſeems convinced by experiment, that it is cauſed only by too much moiſture, the ſeveral plants of corn, which he had taken up by the roots and planted in troughs of very moiſt earth, all bringing forth ſmutty ears, while very few ſuch were found in the corn of the field from whence theſe plants were taken. It is obſervable, alſo, that thoſe ears, the grains of which are to be ſmutty, never ſend up any flowers at all.

The two things, recommended by writers of huſbandry as remedies or preventions of this diſeaſe are brining and changing the ſeed. The firſt of theſe methods was accidentally diſcovered about a century ago: a ſhip loaded with wheat was, about autumn, ſunk near Briſtol, afterwards the wheat was taken up at the ebbs at ſeveral times, after being thoroughly ſoaked in ſea-water. When the wheat was all taken up, it was found unfit to make bread of; but a farmer, trying ſome of it for ſowing, found it anſwer very well, and himſelf, and the neighbouring farmers, bought it all up at a ſmall price; the country all about was ſown out of this cargo. It happened that ſmuttineſs in the wheat-corn was a reigning diſtemper in all parts of the kingdom at that time, but it was remarkable, that all the fields ſown with this ſalt wheat were abſolutely free from the miſchief: this eaſily introduced the practice of ſoaking wheat, before ſowing, in a brine of ſalt and water, to prevent it in other places, and it has ſucceeded well. Mr. Tull gives an inſtance of the certainty of its effect, in the caſe of two farmers whom he perſonally knew, and whoſe farms lay intermixed: theſe men bought the ſame ſeed between them from a very good change of land, and parted every land between them in the field; the oldeſt farmer believed the brining to be a fancy, and ſowed his ſeed unbrined; the other brined all his ſeed, and the conſequence was, that the old farmer had a great deal of Smut in his corn, while the other had not one ſmutty ear.

When wheat is intended for drilling, it muſt be ſoaked in no other brine than that of pure ſalt and water; for, if there be any greaſe among it, it will never be dry enough for this manner of ſowing. If ſeed wheat be ſoaked in urine, it will not grow; and, if it be only ſprinkled, it will moſt of it die, unleſs it be planted preſently. The moſt expeditious way of brining wheat for drilling, is to lay it in a heap, and waſh it with a ſtrong brine ſprinkled on it, ſtirring it up with a ſhovel, that it may be all equally brined or wetted with it: after this, ſift on ſome fine lime all over the ſurface, and ſtir it up, ſtill ſifting on more in the ſame manner till the whole is duſted with the lime; it will then be ſoon dry enough to be drilled without farther trouble. It muſt be quick-lime, in its full ſtrength, that is uſed on this occaſion.

Bad years will cauſe Smut in corn, and good years will prevent it: it is, however, obſervable, that the crops in which there is ſmutty corn, will, if uſed for ſeed, be liable to produce ſmutty corn again, rather than other ſeed. The brining is a defence againſt bad years, and againſt the miſchiefs attending the ſowing corn among which there has been Smut.

The other method of changing the ſeed is by many held effectual, to prevent ſmuttineſs in the crop; ſeveral, who have tried this with due care, have found perfect ſucceſs from it; and it is to be obſerved, as to the great ſucceſs of the drowned wheat at Briſtol, that it was a change of ſeed to the lands on which it was ſown, as well as brined ſeed.

Seed-wheat ſhould be brought from the crop on a ſtrong clay land, whatever kind of land it is to be ſowed upon. A white clay is a good change for a red clay, and a red clay for a white; but whatever the land be, from which the ſeed is taken, it may be infected, if that be not changed there the preceding year; and then there may be danger, though it be had from ever ſo proper a land. It is a rule among the farmers, never to buy ſeed-wheet from a ſandy ſoil; they expreſs their diſlike of this by the coarſe rhime, Sand is a change for no land.

A crop of wheat, very early planted, is not ſo apt to be ſmutty, as one planted leſs early; and the farmers have obſerved, that the largeſt and plumpeſt ground fat wheat is more liable to be ſmutty than the ſmall ground wheat. *Tull's Horſe-hoeing Huſbandry.*

SMY'RNIUM, *Alexanders*, in botany, the name of a genus of the umbelliferous plants, the characters of which are theſe: the flower is of the roſaceous kind, conſiſting of ſeveral petals, arranged in a circular order on a cup, which afterwards becomes a fruit of a ſort of globular figure, compoſed of two thick, and, in ſome degree, lunated ſeeds, being gibboſe and ſtriated on one ſide, and flat and ſmooth on the other.

SNAILS, are great deſtroyers of fruit in our gardens, eſpecially of the bitter ſorts of wall-fruit. Lime and aſhes, ſprinkled on the ground where they moſt reſort, will drive them away, and deſtroy the young brood of them. It is a common practice to pull off the fruit they have bitten; but this ſhould never be done, for they will eat no other till they have wholly eat up this, if it be left for them.

The Romans were fond of Snails, and had them fed on purpoſe for their tables. Their taſte is not delicious, but rather diſagreeable; but this they diſguiſed by means of good ſauces, and had other reaſons for the receiving them into the liſts of foods.

They uſed them as provocatives or inciters to venery, and with this intent they eat only the necks, as the part in which the parts of generation of the creature were placed; and they had the greater opinion of the efficacy of theſe, as the parts of generation were double in each individual, that is, the male and female parts both ſituated in the neck of every Snail.

Ariſtotle, and the old Greeks, had no idea of the generation of theſe inſects, in the manner of other animals, but ſuppoſed them produced ſpontaneouſly; but the Romans ſhew, by many paſſages in their writings, that they had got over this error, and even ſeem, by the preference they give to the neck of this animal, in this intention, to have underſtood the hermaphrodite ſtructure of this inſect, which much later ages have pretended to make a new diſcovery.

The eaſtern nations at preſent run much into the opinions of the Romans of old, as to provocatives; they uſe, as the others did, every thing that ſerves to the purpoſes of generation in other animals, and every thing that has but the reſemblance of the external figure of the parts ſubſervient to it. The orchis roots, which reſemble the teſticles of animals in ſhape, and contain a white and ſlimy, or viſcous liquor, have introduced themſelves into uſe on this plan, and ſo of many other things. *Phil. Tranſ.* N°. 50.

Oat SNAIL, a name given by Dr. Liſter, in the Philoſophical Tranſactions, to a ſmall Snail, which he obſerved under the looſe bark of old willows, elms, and other trees, and which is of a very ſingular ſtructure; the ſhell reſembling an oat-corn, whence the name and its volutæ, or wreaths, running contrary to the direction of them in other Snails, that is, eaſt and weſt, as the philoſophers expreſs it, referring it to the motion of the ſun; but theſe ſhells, to uſe that language, have the turns weſt and eaſt, or, more plainly, they have the turns running from the right-hand to the left, not from the left to the right as other Snails. *Phil. Tranſ.* N°. 250.

SNAKE, *anguis*, in natural hiſtory, the name of a well-known reptile, of the ſerpent kind.

SNAKE with two heads, a kind of Snake in Brazil, having a ſwelling at his tail, which, at a diſtance, has the appearance of a head.

The Portugueſe call it Snake with two heads; their fear of this creature, for the bite of which they pretend there is no remedy, having prevented their examining into the truth. They alſo pretend that it is dangerous to meddle with theſe Snakes after they are dead, and that barely touching them will give the itch. Mr. Couplet was, notwithſtanding, bold enough to flea ſeveral of them, but found himſelf, after having performed this operation on two or three, all covered with puſtules filled with a reddiſh water. Theſe remained on him a conſiderable time, and he was not quite well in three months.

The country of Brazil abounds with large Snakes, the bite of which is venomous, but the natives and blacks make no ſcruple of eating them. *Mem. de l'Acad. des Sciences*, 1700.

SNA'PDRAGON, *antirrhinum*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf of a tubular form, perſonated, and having two lips, the upper of which is bifid, and the lower trifid. The piſtil ariſes from the cup, and is fixed, in the manner of a nail, in the hinder part of the flower; and afterwards becomes a ſeed-veſſel, of the ſhape of the head of a hog, divided into two cells, and uſually filled with ſmall ſeeds fixed to a placenta.

Many of the ſpecies of this plant are very beautiful, and much eſteemed in gardens, and are all eaſily propagated from ſeeds, which muſt be ſown in a dry ſoil, not too rich, in April or May. In July the plants may be planted out into large borders, where they will flower the ſpring following; or they may be ſown early in the ſpring, and they will then flower in the next autumn; but then they are not ſo likely to ſtand the winter, and, if the autumn proves not kindly, they will hardly produce a perfect thin ſeed. They all grow very well on old walls, where they have happened to ſow themſelves. *Miller's Gard. Dict.*

SNATCH-*block*, in a ſhip, is a great block with a ſhiver in it, having a notch cut through one of its cheeks, for the more ready receiving in of any rope; for by this notch the middle part of a rope may be reeved into this block, without paſſing it in endways. This ready block is commonly faſtened with a ſtrap about the main-maſt, cloſe to the upper deck, and is chiefly uſed for the fall of the winding tackle, which is reeved into this block, and then brought to the capſtan.

SNIPE, in zoology.—Theſe birds are eaſily taken, by means of lime-twigs, in this manner: take fifty or ſixty birchen twigs, and lime them all very well together; take theſe out into places where there are Snipes, and, having found the places which they moſt frequent, which may be ſeen by their dung, ſet the twigs in theſe places, at about a yard diſtance one from another. Other places are thoſe where the water lies open in hard froſty and ſnowy weather: in theſe places alſo, and wherever they are ſuſpected to come to feed, let more lime-twigs be placed in the ſame manner. The twigs are not to be placed perpendicularly in the ground, but ſloping, ſome one way and ſome another; the ſportſman is then to retire to a diſtance, and watch the coming of the birds to theſe places. When they fly to them, they naturally take a ſweep round the earth, and by this means they will almoſt always be caught by one or other of the twigs. When a firſt Snipe is taken, the ſportſman is not to run to take it up, for it will feed with the twig under its wings, and this will be a means of bringing down more of them to the place. When three or four are taken, they may be taken up, only leaving one faſt to entice others; and thus the ſport may be continued, as long as there are any birds of this kind about the place. It may be very proper, when the twigs are planted, to go about, and beat all the open and watery places near, that they may be raiſed from thence, and fly to thoſe places where the twigs are placed to receive them.

SNOW-*drop-tree*, a very beautiful American tree, which bears the cold of our climate in the open air; but it is very difficult to encreaſe, the layers being two years before they take root, nor will they ever take root at all, except the branches are very young, and are ſlit in the joint, as in the laying carnations. When thoroughly rooted, they may be tranſplanted into ſmall quarters of flowering-ſhrubs, where, among thoſe of a middling growth, they add much to the variety. *Miller's Gard. Dict.*

SNOW-*ſtone*, in natural hiſtory, a name given by ſome to a very beautiful ſtone found in America; of which the Spaniards are very fond, making it into tables, and other ornaments in their houſes. Alonſo Barba, who had ſeen much of it, tells us, that it is found in the province of Atocama, and is uſually found in pieces of four feet long, and four or five inches broad; ſo that it is forced to be joined in the working, Its general thickneſs is about two inches. It has a great variety of colours, which form clouds and variegations of a very beautiful kind. The principal colours are, red, yellow, green, black, and white. The white is generally formed into ſpots on the very blackeſt parts of the maſs, and is ſo beautifully diſpoſed, that it repreſents Snow falling in all its whiteneſs upon a jetty ſurface. *Alonſo Barba, of Metals.*

SOAL, in ichthyology, the Engliſh name of the fiſh, called by the generality of authors the bugloſſus, by ſome ſolea.

It is, according to the new ſyſtem of Artedi, a ſpecies of the pleuronectes, and is of that kind which have the eyes placed on the left ſide. Some authors call it the linguacula.

Almond SOAP, *amygdalinus*, a new form of medicince got much into uſe of late in nephritic caſes, and made to ſupply the place of the common hard Soap for internal uſes, in a more determinate manner for the phyſician, and a more cleanly one for the patient.

It is thus made:—Take any quantity of freſh oil of almonds, and thrice its quantity of Soap lees; digeſt them together in ſuch a heat as will make them but juſt boil; within a few hours the oil and lees will be united, and the liquor will ſoon after become ropy, and ſomething tranſparent, and will cool into the conſiſtence of a jelly; then throw in ſea-ſalt till the boiling liquor has loſt its ropineſs; continue the boiling till, drops of the liquor being received upon a tile, the water is ſeen to ſeparate freely from the coagulated Soap; then take away the fire, and the Soap will riſe to the top of the water, and is to be taken off for uſe. *Pemberton's College Diſp.*

SOAP-*earth* (*Dict.*)— The people of Duraclea make Soap with this earth in the following manner: they mix three-fourths of this earth with one fourth of lime, and then pour boiling water upon the mixture; they ſtir this with a ſtick, and there ariſes to the top a thick browniſh ſubſtance, which they ſcum off; they ſave this in veſſels by itſelf. They uſe both this and the clear liquor in making Soap, but this is much ſtronger than the liquor. They put fifty kintals of oil into a large copper furnace, and, kindling a large fire under it, they let the oil boil a little, and then throw in, by little and little, firſt the ſcum of the ley, and afterwards the liquor itſelf; though ſometimes they uſe only the one, or only the other. They continue adding more and more of theſe till the oil acquires the conſiſtence of Soap, which is often ſeveral days. The fire muſt be all this time kept up very ſtrong. The ſcum of the lye, and the ſtronger part of the ley itſelf, mix with the oil in the boiling, and the weaker part, unmixing itſelf, ſinks to the bottom, and is let out by a cock prepared for that purpoſe. This is not thrown away, but is let run upon freſh lime and earth, to make a ley for future uſe; and, when the Soap is perfectly made, it is ladled out, and put upon a brick or lime floor to harden.

The common proportion, in the making the Soap, is two loads of earth of five kintals each, to fifty kintals of oil, and the produce is between ſeventy and eighty kintals of Soap. The earth is bought at a dollar a load, and the Soap at ſix-pence half-penny a kintal. There are employed annually, in making Soap at Smyrna, at leaſt ten thouſand kintals of oil. The bringing the Soap earth to Smyrna employs a thouſand or fifteen hundred camels, for eight months of the year, the four ſummer months being too hot for camels to travel in. A common Soap-houſe produces, at a medium, a thouſand dollars a year clear profit. *Phil. Tranſ.* N°. 220.

There is great reaſon to believe that, when we know the proper manner of working, this will, one way or other, make a great ingredient in our porcelain manufactures.

The Chineſe have of late diſcovered a ſort of earth which they call hoache. They ſay that this is hard, ſmooth, and ſoft to the touch, like Soap; theſe, and its other qualities, ſeem to prove it to be the ſame with our Soap-rock, and this, with them, makes a ſort of porcelain, ſuperior to the common kind in beauty, and in the compactneſs of its texture, but it is more apt to crack. They uſe it ſeveral ways, ſometimes alone, ſometimes with the petunſe, which is a ſtone; and ſometimes they make a varniſh, by diſſolving this in water, with which they coat over the common China, covering it finally with the other varniſh. All theſe ways of uſing it produce very beautiful wares, and it will be extremely worth our while to try them all round, before we give up the uſe of ſo valuable a thing. *Obſerv. ſur les Coutumes de l'Aſie.*

SOIL (*Dict.*)— The land of England, as conſidered by the farmer, is reduced into nine ſorts of Soils; the ſandy, the gravelly, the chalky, the ſtony, the rocky, the hazely, the black earth, the marſh, and the clay land. Of this kind there are four varieties, diſtinguiſhed by their colours; the black, the blue, the yellow, and the red. In many places theſe Soils are mixed and blended together, and where it is ſo, it is much better than where they are ſeparate or ſingle; eſpecially where the mixtures happen to be of a right kind, as thoſe of the hot and dry Soils blended with the cold and the moiſt. Nature does this often, and art may imitate it. All ſands are hot, and all clays are cold; and therefore the laying clay upon ſandy lands, or ſand upon clayey lands, is the beſt of all manure: this alters and changes for the better the very nature of the land itſelf, whereas dung only improves it for a time, and after that leaves it as bad as it was before. Mixed Soils, that tend to the clayey kind, are the beſt of all others for corn. It is not only the natural Soil we are to conſider, but the depth of it, and what Soil is underneath; for the richeſt Soil, if it be only eight or ten inches deep, and lies upon a cold clay, or upon ſtones, will not be ſo fruitful to the farmer as the leaner Soils that lie upon better under-ſtrata. Gravel or ſand are the beſt under-ſtrata, of all others, to make the land above prolific.

Cold and wet clays are much more fruitful in the ſouthern parts of England, than in the north. The climates, therefore, are to be conſidered, and the quantities or proportions of the different kinds in the mixed Soils. The natural produce of the land, as to weeds or graſs, is alſo to be greatly regarded by the perſon who intends to improve upon it.

What is the effect of plowing is next to be enquired into, and experiment muſt ſhew what kind of corn agrees beſt with it.

All land that moulders into duſt with froſt, with all ſorts of warm lands, black mould, yellow clays, if not too ſpewy when wet, and all that turn black after rain, are in general good lands for corn. Land that produces large trees, as alſo ſuch as produces black-thorn, weeds, thiſtles, rank graſs, and the like, and that lies in bottoms open to the eaſt or ſouth, being well ſheltered from the other winds, may be always eſteemed to bid fair for good land. Thyme, ſtrawberries, betony, and wild ſage, direct to the places where wood will thrive beſt; and camomile is always an indication of a land being diſpoſed to bear corn in large crops.

All land that binds after froſt and rain, all that turns white, and is full of worms, or is very moiſt and cold, or that is too hot and dry, and that lies open to the north on the ſides of hills, expoſed to cold winds and froſts in winter, and to the ſun's ſcorching heat in ſummer; and all that bears naturally holly, box, ivy, juniper, fern or brakes, furzes, broom, and heath; and lands that bear moſſes, ruſhes, yarrow, and wild tanzy, with flags, and other ſuch weeds, which betoken a cold and damp ground; are leſs fit for corn, though other things may ſucceed on it. Where plants appear blaſted, ſhrubby, and curled, theſe are diſtempers in them occaſioned by ſudden changes of wet and cold, and a dry heat. All theſe lands are, by their natural produce, to be judged leſs fruitful than the others. Blackiſh, dun, or yellow land, and very hot ſtony gravel, are generally eſteemed very unfruitful. Chalky lands are naturally cold, and therefore they require warm compoſts; and this is the reaſon why chalk itſelf is ſo good a manure for hot and dry land. Sandy land, well manured with marl, will bear turneps, or white or blue peaſe, to great advantage. *Mortimer's Huſbandry.*

The ſupply of freſh vegetable matter, in the place of that which was drained away by the ſucceſſive growths of plants, is done by ſeveral ways, but by none ſo well, as by letting it lie fallow for ſome time; in this caſe the rain falling upon it, the vegetable earth, which this water contains, is depoſited in ſufficient quantity, and this is alone ſufficient to give nutriment to new crops; and it is proved by this, that the rain water, as well as other water, does contain ſuch earth as is neceſſary to vegetation. The other means of giving a ſupply to the exhauſted earth are the manures laid on it by the farmer, and theſe are, all of them, ſome animal or vegetable remains, and their uſe is to drain into the earth thoſe particles from themſelves, which may be again received into the bodies of new productions of the ſame kinds. Blood, urine, the excrements of animals, with their ſeveral parts, as horns, hoofs, hair, feathers, calcined ſhells, and vegetable bodies in an altered ſtate, ſuch as lees of wine and beer, aſhes of burnt vegetables, leaves, ſtraw, roots, ſtubble, and the like, when in a decaying ſtate, turned under the earth again by plowing, there become diſunited into their component parts, and theſe again are carried up into other new plants.

If we take off our thoughts from the fields, and look among the gardens, we there meet with farther confirmations of the ſame thing: the trees, ſhrubs, and herbs cultivated in theſe, after they have continued in one ſtation, till they have derived thence the greater part of the matter fitted for their increaſe and nouriſhment, will either decay, or degenerate, unleſs they have a new ſupply of manure added to the earth about their roots, or are themſelves tranſlated into other earth, not ſo drained of that particular matter out of which they are to be fed.

The older trees have ſome more ſupplies of fit matter than the younger, by means of the length of their roots, which, when they have drained one ſpot of ground, uſually are carried much farther into another, and reach a very great way; but at laſt they can reach no farther, and all fails, unleſs ſuch a ſupply of manure, or the being removed into freſh earth, ſupply that nouriſhment they can no longer have where they ſtand. The gardeners, when they tranſplant trees, cut off theſe long roots; but, though they only do this to prevent the trouble of opening a larger hole than neceſſary for their reception, yet there is in nature this good reaſon for it, that they have, when brought to a freſh Soil, no occaſion for thoſe long roots to draw nouriſhment from afar off, when there is enough of it every-where about them. What is to be learned from the whole of this, is, that the modern ſyſtem is erroneous, which ſays that water is the only thing that gives nouriſhment and increaſe to plants; ſince, if this was the caſe, there could be no need of manures, nor any need of altering the crop, in order to its ſucceeding, or of tranſplanting trees to make them thrive. It is plain that ſome ſort of terreſtrial matter, taken from among the Soil, is what gives increaſe and bulk to plants; for, where it is only water, the rain falling in all places alike, all would alike be at all times ſuited to produce all plants; and, if the earth, according to Lord Bacon's ſyſtem, ſerved to no other purpoſe to plants and trees, but to keep their roots firm, and to defend them from theſe uſes as another, and the ſame earth would do as well for over-heat, and over-cold, one earth would do as well for the ſame plant as a different earth. *Phil. Tranſ.* N°. 253.

Brickiſh Soil, a term uſed by our farmers to expreſs a kind of hazely earth or land, with a reddiſh caſt. It is frequent in Eſſex, and ſome other counties, and approaches to the nature of a loam. It has no ſtones in it, and does not bind after wet as clay does, but lets all the water in that comes, and has no ſlates in it; whereas all clays hold the water till the ſun exhales, and, after rain, with a froſt, moulder into duſt.

Theſe loams are an excellent mixture for other earths, being a happy medium between two extremes, uniting what is too looſe, cooling what is too hot, and entertaining a moderate ſhare of moiſture.

The beſt produce of the brick earth is rye; if well dunged, it will bear white oats, turneps, barley, wheat, buckwheat, and peaſe. The natural produce, in weeds, is broom, fern, quick-graſs, and the like. If it be well dunged, it will produce large crops of clover, but it ſoon wears out of it, and ſhould therefore be ſowed mixed with rye-graſs. The beſt manure for theſe lands is chalk, mixed with coal-aſhes: marl makes a great improvement in them, and there is a ſtiff yellow kind of clay, that moulders with the froſt, that anſwers the ſame purpoſe. Whatever amendment is beſtowed upon this ſort of land by dung, and other enriching things, that do not abſolutely alter the nature of the earth, laſts but a little while. Theſe lands bind very much after rain, and turn whiter; no froſt will diſſolve the clod, and if they are newly plowed up, and never ſo much rain comes on them, people may walk or ride over them almoſt as firm as over gravel. If they are not frequently plowed, they are very ſubject to worms, which deſtroy the winter corn. They yield but poor crops in wet years; the weeds are generally very rank, and the wheat runs all into ſtraw. Plowing is a great improvement of them, they always grow well the year after it. Theſe lands are to be ordered for corn in the ſame manner with the clay land, only as they are rank, and carry the crop much into ſtraw, it is beſt to dung them on the etch crop, and to ſow them with barley, and never to dung the fallows. Where the farmer has not a mind to plow them, but keep them for graſs, they ſhould be mowed one year, and then kept ſhort fed with ſheep, which will in time ſweeten them very much.

The red ſandy lands in Northamptonſhire are of this kind; they will not hold manure, ſo they plow but once for the year's crop, which is juſt before the ſowing-time, and manure juſt before they plow it; for if they plow it oftener, and manure it ſooner, they find a great quantity of the beſt mould waſhed away below the ſurface, and out of the reach of the roots of the corn.

In Oxfordſhire they have a ſort of red land, which they begin fallowing as ſoon in the year as they can, before the ſun is too high: if it is moderately moiſt, when fallowed, they eſteem it the better, but it ſhould not be too wet. They ſeldom give it a ſecond ſtirring, and they reckon that, if it is too fine and light, it runs to weeds. *Mortimer's Huſbandry.*

SOLA'NUM, *night-ſhade*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of a rotated form, and divided into ſeveral ſegments. The piſtil ariſes from the cup, and is fixed in the manner of a nail to the middle part of the flower, and finally changes into a roundiſh or oval berry, or ſoft ſucculent fruit, which contains many ſeeds, uſually of a flatted form.

SOLDANE'LLA, *ſea bind-weed*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, formed into the ſhape of a bell, and jagged or fimbriated at the edges in moſt ſpecies; from the cup of this flower riſes a piſtil, which perforates the bottom of the flower, and is fixed like a nail to its hinder part; this afterwards ripens into a cylindric fruit, which opens at the top and is filled with ſeeds fixed to a placenta.

SOLU'TION (*Dict.*)—No phænomenon in nature is more univerſally known, than the Solution of ſalts in common water; but the world has not yet attended to all that might be learned from the obſervations on it.

Mr. Lemery, who examined into this point with great aſſiduity, has obſerved, 1. That the firſt effect of water upon a ſalt is the reducing it into an inexpreſſibly fine powder. 2. That it is merely the conſequence of this pulveriſation carried greatly farther, that every particle of ſalt which, while in larger moleculæ, ſubſided to the bottom of the water, according to the known laws of hydroſtatics, becomes capable of being elevated and ſuſpended in the water, though in itſelf greatly heavier than that fluid; that, while in a proper ſtate of ſeparation in this manner, they remain imperceptible in all the water, and when by certain accidents they again approach one another, they form concretions like their original ones, and again ſubſide in that fluid, in which they floated while in form of this imperceptible powder.

In the Solutions of ſalts, the ſame author obſerves, that all the particles of water do not ſerve to the ſame purpoſe; ſome officiating only in the keeping the ſaline particles ſuſpended, others in the keeping them aſunder, and, as barriers, preventing their reunion.

The quantity of water, neceſſary to ſuſtain the particles of all ſalts in Solution, is the ſame; but the quantity, required to keep thoſe particles from joining again, is different, in regard to every ſalt. Hence though a quantity of water, equal to the weight of the ſalt, be ſufficient to the ſuſpenſion of its particles, yet every ſalt requires its own appropriated quantity of water to keep it in a ſtate of ſolution, that is, to keep its particles from cohering together again. In ſuch ſalts, the particles of which are not ſubject to form hard concretions, ſuch as the fixed ſalt of tartar, and the like, there requires no more water for a Solution than is neceſſary to ſuſpend the particles of the ſalt; but in thoſe which readily form ſolid concretions, ſuch as common ſalt, nitre, borax, and the reſt, there requires a large quantity beſides to act as a barrier.

The more the particles of any ſalt are diſpoſed to re-unite, the more water they require to keep them in a ſtate of Solution; and hence follows a very remarkable phænomenon, which is the Solution of ſeveral ſalts ſucceſſively in the ſame water: this is known to be poſſible, and the reaſon of the whole is this, that when a given ſalt, requiring a large quantity of water for its Solution, is diſſolved in that water; the greater part of that water, which in this Solution ſerves only to the ſecond purpoſe of keeping the particles of the ſalt aſunder, is ſtill at full liberty to act as water upon another ſalt that ſhall be thrown into it.

This, however, can be only the caſe in regard to ſalts which do not naturally ferment with one another, becauſe the whole proceſs is diſturbed by ſuch a fermentation, and, in conſequence of it, there is a third ſalt formed, which is not the ſame with either of the two; and the conſequence of the formation of this ſalt is the precipitation of the metallic or earthy matter, which was the baſe of one of the other ſalts. Thus an alkaline ſalt, added to a Solution of alum, or ſaccharum ſaturni, takes up the acid of either of theſe ſalts, and becomes, by its mixture with that acid, a new concrete ſalt, and at the ſame time throws down, in precipitation, the terreſtrial baſe of the alum, and the metallic one of the ſalt of lead.

To return to thoſe ſalts which excite no fermentation with one another. In regard to theſe, when a quantity of water has diſſolved as much as it can retain of one, it will readily take in and diſſolve a ſecond; and the particles of this, not fermenting with thoſe of the ſalt firſt diſſolved, will remain ſuſpended, and the water which diſſolves them, and which in the firſt Solution ſerved only as an intermedium to keep the particles of that ſalt aſunder, ſerve as well to that purpoſe, now they are impregnated with this new ſalt, as they did before.

It is well known that ſalt of tartar does not ferment with ſaltpetre, nor does it take any thing from this ſalt, or at all alter by being mixed with it, which is quite different from the effect on mixing it, as before obſerved, with alum, or ſaccharum ſaturni; on this principle, and on the known property of ſalt of tartar being diſſolved in a ſmaller quantity of water than any other ſalt; or, in other words, of water's diſſolving more ſalt of tartar than any other ſalt, Mr. Lemery reſolved on the trial, whether water, which had already diſſolved as much nitre as it could contain, would not, on the addition of ſalt of tartar, diſſolve a larger quantity of freſh nitre, than on the addition of ſal armoniac, or any other ſalt: but what appeared very ſtrange was, that after two days ſtanding of a Solution of nitre, with about a fourth part of the quantity of ſalt of tartar added, there was found a white powder at the bottom. The liquor, being examined on this, was found to be a lixivium of ſalt of tartar, and the powder, at the bottom, ſalt-petre.

On adding freſh quantities of ſalt of tartar, new precipitations were afterwards formed, and, in fine, all the ſalt-petre which had been diſſolved was ſeparated. The ſalt-petre being examined, by all trials proved true ſalt-petre, as pure and unmixed as when put in; and the liquor being evaporated, the ſalt of tartar was found equally pure. Salt of tartar tried afterwards in the ſame manner with Solutions of other ſalts, with which it does not raiſe any fermentation, was found to have the ſame effect, precipitating all equally out of the Solution.

In the common precipitations of ſalts, ſuch as alum and ſugar of lead, by means of an alkali, the alkali ſeizes upon the acid of thoſe ſalts, and by that means effects the thing, and therefore itſelf becomes changed into another ſalt, and the precipitate, robbed of that acid, is no longer the ſalt it was, but merely its baſe: but here the ſalts, both alkali and neutral, remain the ſame they were before, both pure and unmixed, and the whole proceſs ſeems only one of them taking the place of the other.

The ſalts which are capable of ſucceſſive Solutions in the ſame water, and of remaining ſuſpended together in it, muſt be all of the neutral kind; that is, they muſt be ſalts compoſed of acids, engaged in ſuch manner in the pores of their baſes, as to fill the whole, and leave no void ſpaces for the penetration of other acids. But this is by no means the caſe with ſalt of tartar, which, being wholly ſpunge-like in its ſtructure, readily admits all ſorts of acids, and ferments with them; and therefore is very capable of diveſting other ſalts of that, on the preſence of which their natural ſtate, as ſalts of a particular kind, depends.

Every alkali ſalt is, as it were, an eſſential ſalt, in part decompounded; that is, it is the earthy part of ſuch ſalt, the acid parts of which have been driven off by fire, and when there is only ſo much left, as may give the whole a ſaline form; for, if all the acids were to be driven off, the remainder would not be an alkali, nor yet a ſalt, but a mere ſimple earth; as is the caſe in the caput mortuum of ſpirit of nitre diſtilled by a retort, the reſiduum from this diſtillation being a mere dead earth, indiſſoluble in water, and altogether different from the fixed alkali produced by burning the ſame nitre with charcoal. What proves, alſo, that theſe alkalies are only the matrix of the compound ſalts diveſted of their acids, is, that if ſpirit of nitre be poured upon the alkali ſalt of nitre made with charcoal, true nitre is regenerated. *Mem. Acad. Par.* 1724.

SO'NCHUS, *ſowthiſtle.* Theſe are moſt of them weeds in England, and are not planted in gardens; for if their ſeeds are once permitted to ſcatter upon the ground, they will ſoon ſtock it with plants; for which reaſon, they ſhould always be extirpated; not only thoſe in the garden, but alſo thoſe in the parts near it; becauſe their ſeeds being furniſhed with down, are wafted in the air to a conſiderable diſtance, where falling on the ground, they ſoon come up, and prove troubleſome.

SO'PHIST (*Dict.*)—The term Sophiſt, which is now reproachful, was anciently honourable; and carried a very innocent idea. St. Auguſtin obſerves, it ſignified a rhetor, or profeſſor of eloquence: ſuch as were Lucian, Athenæus, Libanius, &c.

Suidas, and after him, Olar, Celſius, in an expreſs diſſertation on the Greek Sophiſts, tells us, that the appellation was applied indifferently to all who excelled in any art or ſcience; whether divines, lawyers, phyſicians, poets, orators, or muſicians.— But this ſeems to be ſtretching the ſenſe of the word without all meaſure: it is poſſible a rhetor might have made verſes, &c. but that it was on account of his poetical talent, that he was denominated Sophiſt, is what we ſee no reaſon to apprehend.— However, Solon is the firſt who appears to have ever bore the appellation; which is given him by Iſocrates: afterwards, it was ſcarce ever given, but to philoſophers and declaimers.

The title ſophiſta was in great credit among the Latins in the XIIth century, and in the time of St. Bernard; but it began to loſe ground in Greece, as early as Plato's time, on account of Protagoras and Gorgias, who made a ſordid traffic thereof, by ſelling eloquence for money.—Hence Seneca calls the Sophiſts, quacks or empirics.

Cicero ſays, that the title ſophiſta was given to ſuch as profeſſed philoſophy with too much oſtentation, in order to make a trade of it, by running from town to town, to retail their deceitful ſcience. — A Sophiſt, therefore, was then, as now, a rhetor, or logician, who makes it his buſineſs to enſnare and perplex people, by frivolous diſtinctions, vain reaſonings, and captious diſcourſes.

Nothing has conduced more to the increaſing of the number of Sophiſts, than the contentious ſchool philoſophy: people are there taught to puzzle and obſcure truth, by barbarous, unintelligible terms; as antipredicaments, great and little logicals, quiddities, &c.

SO'RBUS, *the ſervice-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower and fruit reſemble thoſe of the cratægus, but differing, in that the leaves are winged as thoſe of the aſh.

SORE, among ſportſmen, denotes a buck of the fourth year.

SO'REX, in zoology, the name of a ſpecies of wild or field mouſe, called the dormouſe, or ſleeper. There are two kinds of this creature, a larger and a ſmaller.

The larger dormouſe is nearly of the ſize of the common rat. Its colour is a browniſh grey, like that of the common mouſe, but variegated with ſomewhat of a reddiſh caſt on the ſides, and on the head. The ears are large and ſmooth; the belly is white; and the inner part of the legs, and the lower part of the tail, eſpecially towards the extremity, are of the ſame colour. The noſtrils and the feet are red; the tail is all over hairy, and is terminated by a thick tuft of white fur. The eyes are large and prominent, and of a fine jetty ſhining black. The beard is partly white, and partly black. Round about the eyes, and round the ears, there is a fine blackneſs; the upper part of the tail is alſo black. The ſmell of this creature is the ſame with that of the mouſe, and its dung is of the ſame kind. It lives in caverns under-ground, and ſleeps all the winter, as ſome affirm. It feeds on vegetables, and is particularly fond of hazel nuts, which it uſually hoards up, when ripe, for a ſcarcer ſeaſon.

The ſmaller kind is much more common than the larger one: this is of the ſize of the common mouſe, and in different countries varies much in colour. In Italy, Mr. Ray obſerved it all over of a reddiſh tawny on the upper part, except the end of the tail, and all its under part white, the tail only excepted; the tail covered with long and thick-ſet hairs, and looking ſomewhat like a ſquirrel's. The eyes are very black and prominent. Thoſe which the ſame author obſerved in England were leſs of the reddiſh hue on the back, and were not white under the belly, but only on the throat; neither had they the white tip at the end of the tail. Poſſibly the Italian and Engliſh may be really diſtinct ſpecies. This creature feeds on nuts and other ſuch fruits. It retires into caves in winter, and ſleeps much; but not through the whole winter, as has been ſuppoſed, for it lays up its winter-proviſion in its hole in autumn, and feeds on it at that time. *Ray's Syn. Quad.*

SO'RRANCE-*water*, a name given by our farmers to a ſolution of vitriol and ſome other ingredients in vinegar, a medicine much eſteemed in many of the diſeaſes of horſes: it is prepared in the following manner:

Take Roman vitriol and roach alum, of each an ounce and half, verdigreaſe an ounce, copperas two ounces; reduce all theſe to powder together, and put them into a two-quart bottle, into which pour a quart of the ſtrongeſt and beſt wine-vinegar; this is to be ſet in balneo mariæ. The ſhort way of doing which by the farrier is this: he puts a wiſp of hay into the bottom of a kettle, and then tying ſome pieces of lead or iron about the neck of the bottle, to make it heavy enough to ſink in water, it is ſet upon the hay ſo as to ſtand very upright; then three notches are cut length-wiſe in the cork to give paſſage to ſome of the vapours when the bottle is heated, that it may not burſt. When every thing is thus prepared, ſo much cold water is to be put into the kettle, that the neck of the bottle may ſtand two or three inches above it; the kettle is then to be ſet over the fire, and the water is to be made to boil, and kept boiling about half an hour, the bottle being at times taken out, and thoroughly ſhaken. When the ſalts are thus thoroughly diſſolved in the vinegar, the whole is to be kept for uſe.

The method in which they uſe it is this: take an earthen pan, which will hold about twelve quarts; let this be filled with urine that has been made by ſound, healthy, and young perſons; the ſtaler the urine is, the better it is for uſe, and indeed it ought always to ſtand, at leaſt, three weeks before it is uſed. It is proper for the farrier, therefore, always to keep a quantity of this ready, and, when the water is to be uſed, half a pint of it is to be mixed with a quart of the urine, or, if it be required ſtronger, more of the water is to be added: theſe are to be thoroughly mixed together, and the legs, or other affected part of the horſe, bathed with it with ſoft rags twice a day.

The virtues of this water are highly extolled; it is ſaid to cure the glanders in two, or three times dreſſing; it is alſo a ſovereign remedy for the mange, either dry or wet, and for the rat-tails, ſcratches, gourded or ſwelled legs and heels; and it alſo cures horſes, when the greaſe is fallen into their heels, as the farriers expreſs it. The fancy is alſo ſaid to be often cured by a long continuance in the uſe of it, purging the horſe two or three times, at different diſtances of time, during the time of his being under cure by the water. They alſo find it a good cleanſer and healer of foul ulcers, and that it prevents the breeding of proud-fleſh and worms in wounds, and drives away a flux of humours that were falling upon any part. They uſe it alſo in clefts and cracks of the heels, and in wind-galls, eſpecially in the prevention of the laſt by its repellent qualities. The green water alone is an excellent remedy for fiſtulas, cankers, and the galled backs of horſes; diſpoſing ſuch Sorrances, as they are called, not to feſter, rot, and grow worſe, as all greaſy and oily medicines do, but cleanſing them, and laying the way to a very ſound and ſtanding cure.

SO'RREL, *acetoſa*, the name of a genus of plants, the characters of which are theſe: the flower is of the ſtamineous kind, being compoſed of a number of ſtamina ariſing from a ſix-leaved cup. The piſtil, which is ſurrounded by theſe, finally becomes a triangular ſeed, wrapped round in a cup: this is compoſed of three of the ſix leaves of the cup, the other three withering away.

SORREL-*ſeeds*, are found to contain a vaſtly larger proportion of the active principles this plant abounds with, than either the leaves or the roots. They are eſteemed aſtringent, and good in diarrhœas, dyſenteries, and hæmorrhages.

We much neglect this plant, becauſe it is common; yet, this plant alone has very often proved a remedy for the ſcurvy. Mr. Morin of the Academy of Paris, who in the Hôtel Dieu had many hundred ſcorbutic patients, cured the greater part of them only by Sorrel boiled and eaten with eggs.

Wood-SORREL, *lujula*, in medicine, is a very grateful acid; in fevers it quenches thirſt, and takes off the heat of the ſtomach. It is recommended in fevers of all kinds, and the ſcurvy; alſo in obſtructions of the liver and of the viſcera. It is ſometimes given in decoction in fevers, and the expreſſed juice is mixed with the juices of the other antiſcorbutic plants againſt the ſcurvy. Externally, it is extolled againſt inflammatory eruptions of all kinds in decoction, which is to be uſed by way of fomentation. There uſed to be a ſyrup, but, at preſent, only a conſerve of this plant is retained in the ſhops.

SOUHG, *otherwiſe called an adit*, in minerology, is a paſſage like a vault cut out under the earth, to drain the water from the mines.

SOUL (*Dict.*) — The philoſophers are not at all agreed, as to the manner wherein the ſoul reſides in the body. Some hold it equally diffuſed throughout every part thereof. Others ſay it influences and acts on every part of the body, though it has its principal reſidence in ſome particular part, called the ſenſory. This principal part, Des Cartes maintains, is the pineal gland of the brain, where all the nerves terminate, &c.

Borri, a Milaneſe phyſician, in a letter to Bartholine, de Ortu Cerebri & Uſu medico, aſſerts, that in the brain is found a certain, very ſubtile, fragrant juice, which is the principal ſeat or reſidence of the reaſonable Soul; and adds, that the ſubtility and fineneſs of the Soul depends on the temperature of this liquor, rather than on the ſtructure of the brain, to which it is uſually aſcribed. This liquor, we conceive, muſt be the ſame with what is uſually called the nervous juice, or animal ſpirits. The conſtitution whereof is, doubtleſs, of great importance, with regard to the faculties of the Soul.

Mr. Locke diſtinguiſhes two principal faculties or powers of the rational or human Soul, viz. perception and willing.

To theſe, other philoſophers add others, as ſenſation, liberty memory, imagination, and habit.

The myſtic divines diſtinguiſh two principal parts in the Soul: the ſuperior part, which comprehends the underſtanding and the will; and the inferior part, which comprehends imagination and ſenſation. Thus, ſay they, Jeſus Chriſt was happy on the croſs in his upper part, and ſuffered in his lower part. The lower part did not communicate to the upper either its troubles, or its failings; nor the upper to the lower its peace or beatitude. From this diſtinction, the Quietiſts take in hand to maintain, that whatever paſſes contrary to good morals, in the lower part of the Soul, is not contrary to the purity of the upper part, inaſmuch as the will has no ſhare therein.

As to the Soul of brutes, the Carteſians, and ſome others, deny its exiſtence, in the common ſenſe of the word Soul; that is, they ſtrip it of all the properties or faculties of the human Soul: and the Peripatetics, on the contrary, inveſt it with the greateſt part of them.

In man, a particular agitation of the fibres of the brain is accompanied with a ſenſation of heat; and a certain flux of animal ſpirits towards the heart, and viſcera, is followed by love or hatred.

Now, the Peripatetics maintain, that brutes feel the ſame heat, and the ſame paſſions, on the ſame occaſions: that they have the ſame averſion for what incommodes them, and, in the general, are capable of all the paſſions, and all the ſenſations we feel.

The Carteſians deny they have any perceptions or notices at all; that they feel any pain or pleaſure; or love or hate any thing. The ground of their opinion is, that they allow of nothing in brutes, but what is material, and that they deny ſenſations and paſſions to be any properties of matter. Some of the Peripatetics, on the other hand, maintain matter, when ſubtiliſed, framed, ranged, and moved in a certain manner, to be capable of ſenſation and paſſion; that beaſts may feel and perceive, by means of the animal ſpirits, which are matter thus modified; and that the human Soul itſelf only becomes capable of ſenſation and paſſion, by means of the ſame animal ſpirits.

But we muſt own it very difficult to reconcile the idea we have of matter with what we have of thought; to conceive that matter figured in any manner, whether in a ſquare, a ſphere, or an oval, ſhould be pleaſure, pain, heat, colour or ſmell; or to conceive that matter, however agitated, whether in a circle, a ſpiral, parabola or ellipſis, ſhould be love, hatred, or joy,—ſurpaſſes our endeavours.

The maintainers of the contrary opinion urge that appearance of ſenſe, of fear, caution, love for their young, admirable ſagacity, both for their own preſervation and that of their ſpecies, viſible through the whole brute creation. And, it is true, all the actions of beaſts plainly expreſs an underſtanding; for every thing that is regular, expreſſes it; even a machine or watch expreſſes it: and a plant much more; the radicle of the ſeed turning downwards, and the ſtem upwards, whatever ſituation the ſeed is ſown in: the young plant, knitting from ſpace to ſpace, to ſtrengthen it; its putting forth prickles, &c. to defend it, &c. mark a great underſtanding. All the motions of plants and brutes plainly diſcover an intelligence; but the intelligence does not reſide in the matter thereof: it is as diſtinct from the beaſt or plant, as that which ranged the wheels of the watch, is diſtinct from the watch itſelf.

For, in effect, this intelligence appears infinitely great, infinitely wiſe, infinitely powerful; and the ſame which formed us in our mother's womb, which gave us our growth, &c. Thus, in brutes, there is not either underſtanding or Soul, in the ſenſe we generally uſe the word: they eat without pleaſure, cry without pain, grow without knowing it. They fear nothing; know nothing; and, if they act in ſuch manner, as ſhews underſtanding, it is becauſe God, having made them, to preſerve them, has formed their bodies ſo as to avoid whatever might hurt them, mechanically.

Otherwiſe it might be ſaid, that there is more underſtanding in the vileſt inſect, nay, in the ſmalleſt grain, than in the moſt knowing of men; for it is evident, either of them contains more parts, and produces more regular motions and actions, than we are capable of underſtanding. Thus does the great F. Malebranche argue againſt the Souls of brutes. *Recherche de la Verite, liv.* 6.

SOUR *Land*, in agriculture, a term uſed by the farmers to expreſs a cold and ſomewhat wet clayey ſoil.

This muſt have its tilth according to its ſtate and condition, when they ſet about it. If it have a ſtrong ſwarth upon it, then they give it a fallow, by turning it up, when the ſun is in Cancer; this they call a ſcalding fallow, and eſteem it of great uſe, becauſe it kills the graſs roots, and makes the land fine; but, if it be light, and have but a thin ſwarth, they leave it for a cooler tillage, and plow it early in the year, when their clay is fallowed. Pigeon's dung and malt-duſt are the moſt proper manures for this ſoil. The malt-duſt is to be ſown with the winter-corn, and plowed in with it, for then it lies warm at the roots of the corn all winter. *Plot's Oxfordſhire.*

SOW, in the iron-works, the name of the block, or lump of metal, they work at once in the iron-furnace. The ſize of theſe Sows of iron is very different, even from the ſame workmen, and the ſame furnace. Theſe furnaces having ſandſtone for their hearths and ſides, up to the height of a yard, and the reſt being made of brick, the hearth, by the force of the fire, is continually growing wider; ſo that, if it at firſt contains as much metal as will make a Sow of ſix or ſeven hundred weight, at laſt it will contain as much as will make a Sow of two thouſand weight.

SO'WING. One very great article, in Sowing to advantage, is to know exactly at what depth the ſeed may be planted, without danger of burying it. Seed is ſaid to be buried, when it is laid at a depth below what it is able to come up at. Different ſorts of ſeeds come up at different depths, ſome ſix inches, or more; and others will not bear to be buried at more than half an inch. The way to come at an accurate knowledge of the depth, at which every ſeed will come up beſt from the Sowing, is by making gages in the following manner: ſaw off twelve ſticks of about three inches diameter, bore a hole in the end of each ſtick, and drive into each a taper peg; let the peg in the firſt ſtick be half an inch long, the next an inch, and ſo on, every peg being half an inch longer than the other, till the laſt is ſix inches long: then in that ſort of ground, in which you intend to plant, make a row of twenty holes with the half-inch gage, put therein twenty good ſeeds, cover them up, and then ſtick the gage at the end of that row. Proceed in the ſame manner with the eleven other gages, making the holes in the ſame row all with the ſame gage, and ſticking it at the end of the row: when the ſeeds begin to appear, it will be eaſy to ſee at what depth they come up beſt, by obſerving the moſt flouriſhing row, and taking up the gage at the end, and ſeeing what is its length.

By this means we not only know what is the depth in that ſort of ground, at which this ſort of ſeed will come up beſt, but alſo we are able to judge of the nature of the ſeed; for by obſerving how many of the twenty ſeeds that were ſown come up, and how many fail, it is eaſy to calculate how much bad ſeed there is among any given quantity, and to allow properly for it in the Sowing, that the field may be neither overſtocked with plants, nor too bare of them. The farmer often ſuſtains great loſſes by Sowing bad ſeed, or by burying good ſeed, and both might be effectually prevented, by making theſe eaſy trials. One caution is to be obſerved in this, that it is not proper to ſow the ſeeds of all plants at the greateſt depths at which they will come up, becauſe in wheat, and ſome other grain, a moiſt ground will rot the roots at this depth. Experience alone, added to theſe rules, can perfectly inſtruct the farmer in the certain way of ſucceeding; the nature of the land, the manner how it is laid, either flat or in ridges, and the ſeaſon of planting, muſt all be conſidered.

The quantity of ſeed is to be different alſo, according to the manner of the Sowing. The proper quantity, to be drilled into an acre, is much leſs than muſt be ſown in the common way; not becauſe the hoeing will not maintain as many plants as the other way, for, on the contrary, it will maintain many more; but the difference is upon many other accounts, as that it is impoſſible to ſow it ſo evenly by hand as the drill will do. For let the hand ſpread it never ſo exactly, which yet is difficult enough to do with ſome ſeeds in windy weather, yet the unevenneſs of the ground will alter the ſituation of the ſeeds, the greateſt part of them rebounding in the holes, and the loweſt places, or elſe the harrows, in covering, drawing them down thither; ſo that theſe low places may have ten times too much ſeed, and the higheſt may have much too little, or even none of it; and this inequality leſſens in effect the quantity of the ſeed, becauſe fifty ſeeds, in the room of one, will not produce ſo much as one will do; and where they are too thick, without being in theſe cluſters, they cannot well be nouriſhed, their roots not ſpreading to near their natural extent, for want of hoeing to open the earth, and give them way. In the common way of Sowing, ſome of the ſeeds are buried out of all hope of ever coming up again, and ſome others are left naked upon the ſurface, where they become the food of birds, and of vermin: as ſo many muſt, therefore, periſh in the common way of Sowing, and ſo few can be loſt in the way by drilling, there is plain reaſon why the ſeed, neceſſary to ſow any given quantity of ground, ſhould be much leſs for the drill-way, than for the other. The farmers, in general, know nothing of the proper depth at which they ſhould ſow their ſeed, nor of the difference in quantity that is to be obſerved in different circumſtances; they allow the ſame quantity to an acre of rough ground, as they do to an acre of fine, and forget that what is too little for one, may yet be too much for the other; it is all mere chance-work, and they put their confidence in good ground, and a large quantity of dung to cover their errors. The farmers in Wiltſhire allow more corn for the Sowing, than in any other part of England; they uſe ſometimes eight buſhels of barley to an acre, ſo that, if it produce four quarters for an acre, there is but four grains for one increaſe. This is ſown on land plowed once, and double dunged, the ſeed only harrowed into the hard and ſtale ground, ſo that it is very probable that not ſo much as two buſhels out of the eight take place, or come to any thing. Sometimes, in a very dry ſeaſon, an acre ſcarce produces four buſhels at the harveſt.

Inſtead of all this uncertainty and loſs in the common way, in drilling all the ſeed lies juſt at the ſame depth, not one grain of it being placed deeper or ſhallower than the reſt. As none of the ſeeds, therefore, can be loſt by being buried, or by being expoſed on the ſurface to vermin, no allowance is to be made for theſe accidents; all that is to be allowed for in the Sowing, is the miſchief that may happen from the worm, the froſt, or the like unavoidable accidents, common to all ſeeds.

When a man has (by the uſe of the gages, and the growth of the ſeeds planted in the rows marked by them) proved the goodneſs of the ſeed, and found the depth it is to be planted at, he is to calculate what number of ſeeds a buſhel, or any other weight or meaſure, contains; for one buſhel, or one pound of ſmall ſeed, may contain double the number of ſeeds of a buſhel, or a pound of large ſeed of the ſame ſpecies. This calculation is made by weighing an ounce, and then calculating the number of ſeeds this ounce is compoſed of; then weighing a buſhel, and multiplying the number of ſeeds in an ounce by the number of ounces in the buſhel, and the product will give the number of ſeeds in the buſhel with ſufficient exactneſs. When this is known, the ſeeds are to be proportioned by the rule of three to the ſquare feet in an acre; or elſe it may be done, by dividing the ſeeds of the buſhel by the ſquare feet in an acre, and the quotient will give the number of ſeeds for every foot. Then the farmer is to conſider how near he intends to plant the rows, and whether ſingle, double, treble, or quadruple; for, the more numerous the rows are, the more ſeed will be required. The narrow ſpaces between double, triple, or quadruple rows, ſuppoſe ſeven inches; the double having one, the treble two, and the quadruple three, are called partitions. The wide ſpace, ſuppoſe of five feet, between any two of theſe double, treble, or quadruple rows, is called an interval.

Examine next what is the produce of one middle-ſized plant of the annual, but the produce of the beſt and largeſt of the perennial ſort, becauſe that, by hoeing, will be brought to its utmoſt perfection; proportion the ſeed of both to the reaſonable product, and, when it is worth while, adjuſt the plants to their competent number with the hand-hoe after they are up, and plant perennials generally in ſingle rows. Laſtly, plant ſome rows of the annual thicker than others, which will ſoon give experience, preferable to all the rules in the world, for the quantity of ſeed neceſſary for the drilling.

The diſtances of the rows is one extremely material point in the obtaining a good crop; but as a much larger diſtance is to be allowed in theſe, than common practice has been uſed to, it is very difficult to perſuade the farmer to venture a trial at ſuch diſtances as he may have experience from. There is a method of planting the rows by the drill at very near diſtances, and in this work one horſe may draw a drill with eleven ſhares, making the rows at three inches and a half diſtance from each other, and at the ſame time Sowing in them three different ſorts of ſeeds, which do not mix, and theſe at different depths. Thus the barley-rows may be ſeven inches aſunder; and the barley four inches deep; a little more than three inches above that, in the ſame channels, clover-ſeed; and, between every two of theſe rows, a row of ſaintfoin ſeed covered half an inch deep.

Mr. Tull, who tried this method, obtained the firſt year a very good crop of barley; the next year, two crops of broad clover, where that was ſown; and where the hop-clover was ſown, a mixture of that and ſaintfoin, and every year afterwards a crop of ſaintfoin. But the ſame gentleman was afterwards ſo fully convinced of the folly of theſe, or any other mixed crops, and of Sowing with theſe narrow, that he never practiſed it afterwards.

Every row of vegetables, to be horſe-hoed, ought to have an empty ſpace, or interval of thirty inches, on one ſide of it at leaſt, and of near five feet in all ſorts of corn: this will ſeem a monſtrous allowance to thoſe who have not experienced the good effects of it, but all who have will readily come into the practice of it ever afterwards. The line of corn is called one row, though it be double, triple, or quadruple, becauſe, when four of theſe rows grow up in the ſpring, they unite, and ſeem to be all one row. Wide intervals are neceſſary for perfect horſe-hoeing, and the largeſt vegetables have generally the greateſt benefit by them, though ſmall plants may have conſiderable benefit from much narrower intervals than thoſe of five feet.

In hand-hoeing there is always leſs ſeed, fewer plants, and a greater crop, cæteris paribus, than in the common Sowing; yet, there the rows muſt be much nearer than in horſe-hoeing, becauſe, as the hand moves many times leſs earth than the horſe, the roots will be ſent out in a like ſmaller proportion; and, if the ſpaces, or intervals, where the broad hoe only ſcratches a little of the ſurface, ſhould be wide, they would be ſo hard and ſtale underneath, that the roots of the perennial plants would be a great while in running through them, and the roots of annual plants would not be able to do it at all.

The advantage of the horſe-hoeing is principally owing to the depth to which it ſtirs the ground, and familiar inſtances have proved, that the ſtirring it to a like depth, by whatever inſtrument, is of the utmoſt advantage to whatever plants are ſet in the place.

A poor fellow in Wiltſhire was obſerved to have always his cabbages much larger and finer than his neighbours, though his ground was no better, and he could afford leſs dung; but the reaſon was, that, inſtead of clearing away the weeds between them with a hand-hoe, he uſed to dig between them with a ſpade, which goes as deep as a horſe-hoe, and comes the neareſt anſwering its purpoſes of any inſtrument whatever. *Tull's Horſe-hoeing Huſbandry.*

SPA-*water*.—The contents of this water, by means of which it is able to do ſuch great things in many chronical caſes, are underſtood by the following experiments and obſervations.

Firſt, when the Spá-water is carried to any diſtant place, tho' ever ſo well ſtopped down, they always, after a time, will precipitate a ſmall quantity of a yellow ochreous earth.

Secondly, if a ſingle grain of galls be put into an ounce of Spa-water, it tinges the whole with a beautiful purple; but, if the water be heated before the galls are put in, there will not be the leaſt change of colour produced in it.

Thirdly, mixed with milk, they do not coagulate it; but when mixed with wine, they make a great ebullition, and throw up a large quantity of air-bubbles with a peculiarly pleaſing ſmell.

Fourthly, the waters drank at the ſpring cauſe a ſort of drunkenneſs, but it does not laſt above a quarter of an hour.

Fifthly, a ſmall phial, being filled up to a certain height with Spa-water, and afterwards exactly to the ſame height with pure diſtilled water, and weighed, when filled with each, in a nice balance, was found, when the Spa-water was in it, to weigh three ounces, four drachms, and forty grains; and with the other three ounces four drachms and forty-one grains; ſo that the Spa-water, notwithſtanding its mineral particles, is ſomewhat lighter than the pureſt common water.

Sixthly, and finally, a pint of the Spa-water, evaporated over a very gentle fire, leaves behind only a grain and half of a white powder.

Hence, it appears, that the Spa-waters are the lighteſt and moſt ſubtile of all the mineral waters; and the ſmall quantity of earth, and large portion of ſubtile mineral ſpirit they contain, be ſpeak their poſſeſſing the moſt exalted virtues of all the mineral waters.

One very remarkable virtue of this water is, that it greatly relieves in all diſorders of the kidnies, ureters, and bladder, whether occaſioned by ſtone, gravel, or ulcerations. It poſſeſſes, beſides, all the virtues of the other mineral waters, and is of the greateſt ſervice in edulcorating ſharp, and dividing viſcous humours, and removing all diſeaſes ariſing from theſe cauſes, by diſpoſing them to paſs off by the proper emunctories.

SPAR (*Dict.*)—Spars are defined to be foſſils not inflammable, nor ſoluble in water. When pure, pellucid and colourleſs, and emulating the appearance of cryſtal, but wanting its diſtinguiſhing characters; compoſed of plane and equable plates, not flexile nor elaſtic; not giving fire with ſteel, readily calcining in a ſmall fire, and fermenting violently with acids, and wholly ſoluble in them.

The obſervation, that Spar is continually formed at this time in caves and grottoes under ground, has given birth to many different conjectures, as to the origin of that ſubſtance. We have accounts from Swiſſerland, and other places, that the ſnow, by long lying on the earth, and being ſubject to repeated freezing, is at length hardened into Spar: this is much of the nature of that opinion of the ancients concerning cryſtal, that it was water frozen by ſevere colds to a ſort of ice, much harder than the common kind; both are equally erroneous and abſurd. But more rational conjectures, as to its origin, are, that it is produced either by effluvia alone, or by the joint force of effluvia iſſuing up from the depths of the earth, and mixing with water ouzing out of the rocks into their cracks and cavities, or by the ſame water or effluvia paſſing through beds of this ſparry matter contained in clay. In the firſt place we are to obſerve, that Spar is capable of being diſſolved either by water or vapour, and ſuſpended imperceptibly in either; and that, though it remains ſuſpended a long time, yet there are occaſions of its ſeparating itſelf from either of theſe vehicles; ſuch are long ſtanding ſtill and evaporation. What is called the growth and formation of Spar, therefore, is properly perhaps only the change of place in this ſubſtance, and all that theſe agents, water and vapours, do, is only to waſh it out of the ſtrata of earth or ſtone, in which it lay in ſcattered particles, and bring it together into the cracks and crevices of ſtones, where it may again ſeparate itſelf, and become more pure and perfect. The operation of nature, in this caſe, is very like that of art in the extracting of ſalts from the various bodies they are mixed with; and Spar, in its two ſtates, when blended in the ſtrata of ſtone, &c. and when pure, and in form of cryſtals in the cracks, may be compared to alum, for inſtance, in its bed and when purified. The alum in the common ſtones, from which it is made, is not perceptible to the eye, but lies in ſcattered particles; water being added to this takes up the ſalt, and, when it has been managed by evaporation and reſt, yields it again purified and alone, and it forms ſuch cryſtals on the ſides of the veſſel, as the other does on the ſides of the fiſſures of ſtone, which are the veſſels where the water, out of which it was formed, was ſet to evaporate, and to reſt a proper time. That ſome Spars grow from vapours alone, is evident from the ſtalactitæ, or ſtony icicles, hanging down from the roofs of our caverns, which, though they grow downwards, yet have many times little plants of the ſame ſubſtance growing out at their ſides, and ſtanding upwards, contrary to the growth of the other, and evidently formed of the matter ſeparated from the vapours in their aſcent, as the ſtalactitæ themſelves are from ſuch as have aſcended to the roof and there been condenſed into water, and ſent down again in drops. Nor is the ſparry matter alone thus raiſed in vapour, for even the metals, and other bodies, as little likely as thoſe to be thus raiſed, yet are found to form ſtalactitæ. The mundics, in general, though they never form regular ſtalactitæ, yet, often are found adhering to the ſides of them, and the metals, particularly iron and lead, form regular ſtalactitæ; the iron ones very common, and very perfect; the lead leſs perfect, and more rare; and Dr. Brown gives us abundant inſtances of Spars growing entirely from vapours in the baths of Buda in Hungary. *Philoſ. Tranſ.* N°. 129.

SPA'RUS, in the Artedian ſyſtem of ichthyology, a genus of fiſhes, the characters of which are theſe: the coverings of the gills are ſcaly. The teeth are covered with lips as in quadrupeds. The teeth in the jaws reſemble the dentes canini of men. The molares, or grinders, are like thoſe of quadrupeds. The teeth are placed only in the jaws and fauces, their palate and tongue being ſmooth. There is but one back fin. The eyes are covered with a lax ſkin, and the tail in moſt of the ſpecies is forked. The inteſtines are long, and they are twiſted in ſpiral forms, and often fixed to the meſentery. The appendices to the pylorus are large, and few in number, from three to ſeven being the uſual numbers.

SPA'THA, is a word uſed by different authors in various ſenſes; ſome expreſs by it a rib; others the inſtrument called by ſurgeons a ſpatula, and uſed for ſpreading ointments and plaſters; and Celſus calls a ſort of inciſion-knife by this name. It is alſo uſed for the external covering of the fruit of the palm-tree, and by others for a ſword. This laſt is indeed its proper ſignification, and all the others are only metaphorical applications of it to different things, which bear reſemblance to a ſword.

SPATHA, among botaniſts, expreſſes that ſort of cup which conſiſts of a ſimple membrane growing from the ſtalk. This kind of cup is of various figures; often diphyllous, or divided into two parts; often ſimple; ſometimes more divided: it incloſes ſometimes a ſingle flower, ſometimes ſeveral flowers together, and theſe have often no perianthium. The Spatha is of very different texture and conſiſtence, in different plants.

SPEAR-*wort*, in botany, a ſpecies of the Ranunculus. See RANUNCLUS.

SPE'CIES (*Dict.*)—What the accurate Artedi has given, as the definition of the Species in ichthyology, is not confined to fiſhes alone, but, with proper regulations, may be made the baſis of real diſtinctions of Species in all other natural bodies. Every fiſh, which differs from all the other fiſhes of the ſame genus in ſome external part, whether that difference be in exceſs or defect, in number or in proportion, or even in colour, provided that the difference be fixed and invariable, is properly to be called a diſtinct Species.

The ſpecific differences of fiſhes are to be drawn from theſe circumſtances; but it is not to be ſuppoſed that every Species differs in all of them; ſometimes only one, ſometimes more, occaſion the variation.

If any one fiſh, in regard to all the others of the ſame genus, is found to be poſſeſſed of ſome external part which they all want; as, for example, if it have cirri, tubercles in the ſhape of horns on the head, ſpines or prickles in the head, or on any other part of the body, the fiſh is then to be eſteemed a diſtinct Species. If one fiſh differs from the others of the ſame genus in the number of any parts, as fins, ſpines, or tubercles, it is then alſo a diſtinct Species. If one fiſh differs from another in the proportion of any eſſential part, as in the having longer jaws, longer teeth, or the like, it is alſo to be eſteemed a truly different Species. If one fiſh differs from another in the figure of ſome eſſential part, as of the ſnout, the back, the teeth, or the tail, or the lineæ laterales, it is to be eſteemed a diſtinct Species. If one fiſh differs from another of the ſame genus in the exceſs of parts, having ſome part that is deficient in the other; or, if in number, proportion, or figure of ſome of the eſſential parts; the diſtinction will be the more evident as the greater number of parts differ, and the Species will eaſily be found to be truly diſtinct. *Artedi's Ichthyology.*

Change of SPECIES. — The change of Species is a term uſed in huſbandry to expreſs an expedient the farmer often has recourſe to, in order to procure good crops: this is the ſowing firſt one kind of plant, then another, and then a third, and ſo on, upon the ſame land: by this means the moſt is made of the ſoil; and it is found, when it will no longer give a good crop of the firſt corn planted on it, it will ſtill give a good one of ſome other Species; and, finally, of peaſe after all. After this laſt change of Species, it is found neceſſary, in the common method of huſbandry, to renew the land with fallowing and manure, in order to its producing any thing again. See SOIL.

This change of Species has been a practice of the farmers of all times, and is recommended, and judged neceſſary, by moſt of the writers on this ſubject; but Tull, in his New Syſtem of Horſe-hoeing Huſbandry, proves, that it is not neceſſary, and that the land only wants proper tillage, when exhauſted by one ſort of corn, to enable it to produce as good crops of the ſame corn again. The three fundamental propoſitions he lays down to prove this, are, firſt, that plants of the moſt different nature feed on the ſame ſorts of food. Secondly, that there is no plant but what muſt rob every other plant, within its reach, of a part of its nouriſhment. And, thirdly, that a ſoil, which is once proper for any kind of vegetable, will continue to be always proper for it, in reſpect to the ſort of food it gives. If only any one of theſe propoſitions were true, it would follow, that there is no need of a change of Species from year to year; and as they are all ſo, this truth is yet the more inconteſtable; and experience proves it yet more evidently, for the ſame land will produce crops of wheat every year, without any change, only by the practice of the horſe-hoeing huſbandry, inſtead of the common. *Tull's Huſbandry.*

SPI'DER, *araneus*, in zoology, the name of a well-known inſect, of which we have a great number of ſpecies.

The Spider affords to the ſagacious obſerver, as well without, as with the aſſiſtance of glaſſes, a great many extremely curious particulars. As the fly (which is the Spider's natural prey) is an animal extremely cautious and nimble, and uſually comes from above, it was neceſſary the Spider ſhould be furniſhed with a quick ſight, and an ability of looking upwards, forwards, and ſideways, at the ſame time; and the microſcope ſhews, that the number, ſtructure, and diſpoſition of its eyes, are wonderfully adapted to the ſerving all theſe purpoſes.

Moſt Spiders have eight eyes: two on the top of the head or body, for there is no diviſion between them, the Spider having no neck; theſe look directly upwards: there are two more in front, placed a little below theſe, and diſcovering all that paſſes forwards, and on each ſide: a couple more, one whereof points ſideways forwards, and the other ſideways backward; ſo that it can ſee almoſt quite round it. All kinds of Spiders have not, however, this exact proviſion; for in ſome we find ten, and in others only ſix, or four. The eyes of the Spider are not pearled; and the field-Spiders, or long-legs, have no more than two eyes.

Whatever be the number of the Spider's eyes, they are however all immoveable and tranſparent, and are ſituated in a moſt curious manner. The beſt way of viewing them with the microſcope, is to cut off the legs and tail, and leave only the head for examination.

All Spiders have eight legs, which they employ in walking; and two ſhorter, called arms, which they uſe in ſeizing their prey. All the legs are thickly beſet with hairs; each has ſix joints, and ends with two hooked claws, which are ſerrated on their inſide; by means of theſe teeth, or jags in their claws, they ſeize very faſt hold of any thing, and behind theſe there is a ſort of ſpur, which is perfectly ſmooth. Beſides theſe, nature has allotted this creature, for the ſeizing its prey, a pair of ſharp crooked claws, or forceps, in the forepart of its head. Theſe ſtand horizontally, and, when not exerted for uſe, are concealed in two caſes contrived for their reception, in which they fold like a claſp-knife, and there lie between two rows of teeth, which are likewiſe employed to hold faſt the prey.

Each of theſe claws, or pincers, has a ſmall ſlit near its point, according to Lewenhoeck, like that in a viper's tooth, through which he ſuppoſes that a poiſonous juice is, in like manner, thrown out. But Dr. Mead, in his eſſay on Poiſons, diſſents wholly from this opinion, having never been able, on repeated examinations, to diſcover any ſuch opening, not even in the claws of the great American Spider; which, being above fifty times bigger than any of the European Spiders, would more eaſily have diſcovered this opening, if nature had allotted any to this part of the animal. Beſides, repeated obſervations alſo convinced him that nothing dropped out of the claws, which were always dry, while the Spider bit any thing, but that a ſhort white proboſcis was, at the ſame inſtant, thruſt out of the mouth, which inſtilled a liquor into the wound. And the ſame author obſerves, that the quantity of liquor, emitted by our common Spiders when they kill their prey, is viſibly ſo great, and the wounding weapons ſo minute, that they contain but a very inconſiderable portion thereof, if it were to be diſcharged that way. *Baker's Microſcope.*

Spiders frequently caſt their ſkins, which may be found in their webs perfectly dry and tranſparent; and from ſuch ſkins the forceps, or claws, for they are always ſhed with the ſkins, may eaſier be ſeparated, and examined with much greater exactneſs, than in the common Spider while living.

The Spider's manner of weaving its web is very wonderful. The creature has five little teats, or nipples, near the extremity of the tail; from theſe there proceeds a gummy liquor, which adheres to every thing it is preſſed againſt, and, being drawn out, hardens inſtantly in the air, and becomes a ſtring, or thread, ſtrong enough to bear five or ſix times the weight of the Spider's body. This thread is compoſed of ſeveral finer ones, which are drawn out ſeparately, but unite together at two or three hairs breadth diſtance from the creature's body. Theſe threads are finer or coarſer, according to the bigneſs of the Spider that ſpins them. Mr. Lewenhoeck has computed, that a hundred of the ſingle threads of a full-grown Spider are not equal to the diameter of the hair of his beard; and conſequently, if the threads and hair be both round, ten thouſand ſuch threads are not bigger than ſuch a hair. He calculates farther, that, when young Spiders firſt begin to ſpin, four hundred of them are not larger than one which is of full growth: allowing which, four millions of a young Spider's threads are not ſo big as the ſingle hair of a man's beard.

The eggs of ſome Spiders are a very pleaſing microſcopic object; they are round at one end, and flattiſh at the other, with a depreſſion in the center of the flattiſh end, and a yellowiſh circle round it. The colour of theſe eggs is a pearly or bluiſh white, and, when the young Spiders hatch, they come out in their perfect form, and run about very nimbly. The female Spider depoſits her eggs, to the number of five or ſix hundred, in a bag compoſed of her own web, which ſhe either carries under her belly, or hides in ſome very ſafe receſs. *Philoſ. Tranſ.* N°. 272.

SPIEI, in glaſs-making, the name of an iron inſtrument, hooked at the end and pointed, with which the workmen take the metal out of the melting-pots for proofs or eſſays, to to ſee whether it be fit to work. *Neri's Art of Glaſs.*

SPIKES, *or Oil of* SPIKE, a name given by our druggiſts to an eſſential oil, much uſed by the varniſh-makers and the painters in enamel; and of ſome uſe in medicine.

This oil, when genuine, is brought from Provence, and ſome other parts of France, and is there made of lavender. This plant is called in Provence aſpic, and thence came the name oil of aſpic, which afterwards degenerated into oil of Spike.

The manner of making the oil upon the ſpot is this: when the flowers are perfectly ripe, they put them into an alembic with a great quantity of water, and this they diſtil after ſeveral days maceration: there ariſes with the water a large quantity of an oil of a fine pale amber colour, and this, ſeparated from the water, is the true and genuine oil of Spike.

The flower of this plant is the part which yields the largeſt quantity of oil; as is the caſe with all the plants with galeated flowers, of which the huſk or flower-cup uſually contains almoſt all the oil of the plant. The aromatic plants, in general, yield indeed but a ſmall quantity of oil, but the vaſt abundance of this plant, in theſe places, makes the expence of gathering it ſo ſmall, that the oil is very cheap. The quantity required on ſeveral occaſions is, however, much greater than what all the lavender of the country can yield; and the price it is expected to be ſold at is ſo ſmall, that it is not to be wondered that there are ſeveral common adulterations of it. The moſt uſual ways of ſophiſticating it, however, are two; the one with the ſpirit of wine, which is eſteemed the leaſt hurtful, and the oil thus ſophiſticated is often called the very beſt of the country. The method Mr. Geoffroy took to diſcover the cheat was this: he procured a long and narrow phial, of an equal diameter all the way up; into this he firſt put an ounce of fair water, and to this he added an ounce of the oil; he marked the height of the water in the phial, then ſhook the two liquors together, and they became milky, and heated on the mixture, which alone would have been a ſufficient proof that there was ſpirit of wine in the oil. After ſome ſtanding the liquor became clear, and the oil floated at the top, but in a much ſmaller quantity than might have been expected, there being not more than a quarter of an ounce of it, the reſt having been ſpirit of wine, which mixed with the water, and thus left all the true oil, which was only one fourth of the quantity, to float alone on the water, which was greatly increaſed in height in the phial. A pint of this oil of Spike, therefore, contains only four ounces of the genuine oil, and twelve ounces of plain ſpirit of wine.

The ſecond method of adulterating this oil, which the ſame gentleman had ſuſpected, was eaſily diſcovered next: for, on mixing this quarter of an ounce of pure oil of Spike with three quarters of an ounce of oil of turpentine, there was produced an ounce of a liquor, which appeared wholly the ſame with the oil of Spike commonly ſold in the druggiſts ſhops. And indeed, much of what is uſually ſold is worſe than this, being no other than oil of turpentine ſcented with a ſmall quantity of the true oil of Spike.

The ready way of diſcovering the oil, counterfeited with oil of turpentine, is to wet a paper in it, and ſet it on fire; the turpentine will here be diſcovered by the thick ſmoke it yields, it being, of all vegetable oils, that which yields greatly the thickeſt cloud in burning: and, on the contrary, that which has been adulterated with ſpirit of wine, will be diſtinguiſhed by the ſame trial, by its yielding a much finer and thinner ſmoke, and burning with a bright blue flame. If they be tried by firing them in a ſpoon, that which is adulterated with ſpirit of wine will burn very bright, and yield no fume at firſt; but, as it grows near the bottom, it will ſmoak a little, and finally will leave no reſiduum, except that it varniſhes over the inſide of the ſpoon: that adulterated with the oil of turpentine will burn more vehemently, ſmoak more, and leave a coarſer varniſh upon the ſpoon; and if it be of the coarſeſt kind, that is, if it have been adulterated with badly rectified oil of turpentine, the fume will be the more abundant, and there will be left in the ſpoon a fetid matter, reſembling melted pitch.

Mr. Geoffroy tried whether, in the buſineſs of varniſhing, the oil of turpentine alone might not do as well as the oil of Spike; he found that it dried perfectly well, but that it left a ſtinking ſmell upon the work, which never went off; whereas the mixture of this oil, with that of Spike, makes a ſmell like neither, and which ſoon goes off.

An ounce of oil of turpentine, with only twenty drops, either of our common oil of lavender, or the pure oil of Spike, makes a liquor tolerably well ſcented, and which ſerves for the purpoſes of oil of Spike. If two drachms of our oil of lavender be added to ſix drachms of ſpirit of wine, they immediately mix, and this, afterwards mixed in a ſmall proportion with oil of turpentine, makes a ſort of oil of Spike. The moſt regular method, however, that the artificer can uſe, if he can get the genuine oil of Spike, is to mix one ounce of it with three of oil of turpentine, which perfectly fits it for his purpoſe, and makes it the ſame with that in common uſe. The method of making this perfectly pure, is to rediſtil it in a balneum mariæ; there will thus be procured an oil highly rectified, and pellucid as water, which will dry away, as ſoon as touched on any thing. *Mem. de l'Acad. Roy.*

SPINA'CHIA, *ſpinach, or ſpinage*, in botany, a genus of plants, whoſe characters are: it hath an apetalous flower, conſiſting of many ſtamina included in the flower-cup, which are produced in ſpikes upon the male plants, which are barren; but the embryoes are produced from the wings of the leaves on the female plants, which afterwards becomes a roundiſh or angular ſeed, which in ſome ſorts has thorns adhering to it.

Winter ſpinage ſhould be ſown upon an open ſpot of ground towards the latter end of July, obſerving, if poſſible, to do it when there is an appearance of rain: for, if the ſeaſon ſhould prove dry for a long time after the ſeed is ſown, the plants will not come up regularly; and many times there will not be half a crop. When the ſpinage is come up, the ground ſhould be hoed to deſtroy the weeds, and alſo to cut up the plants where they are too cloſe, leaving the remaining plants about three or four inches aſunder; but this ſhould always be done in dry weather, that the weeds may be deſtroyed ſoon after they are cut.

About a month or five weeks after the firſt hoeing, the weeds will begin to grow again; therefore the ground ſhould be then hoed again the ſecond time, obſerving, as before, to do it in dry weather. But, if the ſeaſon ſhould prove moiſt, it will be proper to gather the weeds up after they are cut, and carry them off the ground; for, if the ſpinage is not cleaned from weeds before winter, they will grow up, and ſtifle it ſo, that in wet weather the ſpinage will rot away.

In October, the ſpinage will be fit for uſe; when you ſhould only crop off the largeſt leaves, leaving thoſe in the center of the plants to grow bigger; and thus you may continue cropping it all the winter and ſpring, until the young ſpinage, ſowed in the ſpring, is large enough for uſe, which is commonly in April; at which time the ſpring advancing, the winter Spinage will run up to ſeed; ſo that you will cut it up, leaving only a ſmall parcel to produce ſeeds.

The two ſorts with ſmooth ſeeds produce much larger and thicker round leaves than the former; but, being ſomewhat tenderer, are always ſown in the ſpring.

Theſe are either ſown upon an open ſpot of ground, by themſelves, or elſe mixed with radiſh-ſeed, as is the common practice of the London gardeners, who always endeavour to have as many crops from their land in a ſeaſon as poſſible; but, where land is cheap in the country, it will be the better method to ſow it alone without any other ſort of ſeed mixed with it; and, when the plants are come up, the ground ſhould be hoed to deſtroy the weeds, and cut out the plants where they are too cloſe, leaving the remaining about three inches aſunder; and, when they are grown ſo large as to meet, you may then cut off a part of it for uſe, thinning the plants that they may have room to ſpread; and this thinning may be twice performed, as there is occaſion for the ſpinage; at the laſt of which, the roots ſhould be left eight or ten inches aſunder. If then you hoe the ground over again, to deſtroy the weeds, it will be of great ſervice to the ſpinage; for, if the land is good upon which it was ſown, the third ſort, with this management, will many times produce leaves as large as the broad-leaved dock, and be extremely fine.

But, in order to have a ſucceſſion of ſpinage through the ſeaſon, it will be proper to ſow the ſeed at three different times in the ſpring; the firſt, early in January, which muſt be on a dry ſoil; the ſecond, the beginning of February, upon a moiſter ſoil; and the third, the beginning of March, which ſhould be on a very moiſt ſoil: and this third ſowing ſhould be hoed out thinner at the firſt time of hoeing it, than either of the ſowings; for there will be no neceſſity to leave it for cutting out thin for uſe, becauſe the former ſowings will be ſufficient to ſupply the table till this third ſowing is full grown; beſides, by leaving it thin at firſt, it will not be apt to run up to ſeed ſo ſoon as it would if the plants were cloſe. *Miller's Gard. Dict.*

SPINES *of echini*, in natural hiſtory. Theſe in their foſſil ſtate make a great appearance in the cabinets of the curious, and in the works of the learned, and are of an almoſt infinite variety of kinds; and many of them are of the ſame figures and dimenſions with thoſe of the echini now living in our own and other ſeas, as well known to us. But beſides theſe there are an almoſt infinite variety of others, which, though allowed on all hands to be truly Spines of ſome echini or other, yet evidently differ from thoſe of all the known recent fiſh of that name, and have certainly belonged to ſpecies of it which we have not yet the leaſt knowledge of.

SPINOZISM *(Dict.)*—Benedict Spinoza, or Eſpinoza, was a man well known in Holland. He was born a Jew at Amſterdam, but did not make profeſſion of any religion, either the Jewiſh or Chriſtian. — He compoſed ſeveral books in Latin; the moſt celebrated whereof is his Tractatus Theologico-Politicus, wherein he endeavours to overturn the foundation of all religion: the book, accordingly, was condemned by a public decree of the ſtates; though it has ſince been ſold publicly, and even reprinted, both in Latin and French, in that country, and lately in Engliſh at London.

Spinoza, here, inſinuates, that all religions are only political engines, calculated for the public good; to render the people obedient to magiſtrates, and to make them practiſe virtue and morality.

He does not here lay down his notion of the Deity openly, but contents himſelf with ſuggeſting it.—In his Ethics, publiſhed among his poſthumous works, he is more open and expreſs; maintaining, that God is not, as we imagine him, an infinite, intelligent, happy, and perfect being; nor any thing, but that natural virtue, or faculty, which is diffuſed throughout all creatures.

Spinoza, in his Tractatus above-mentioned, is very full on the ſubject of the authors of the ſcriptures; and endeavours to ſhew, that the Pentateuch is not the work of Moſes, contrary to the common opinion, both of the Jews and Chriſtians. He has alſo his particular ſentiments, as to the authors of the other books.—This part of the work has been anſwered by M. Huet, in his Demonſtratio Evangelica; and by M. Simon, in his Hiſt. Crit. du Vieux Teſt.

Spinoziſm is a ſpecies of naturaliſm, or pantheiſm, or hylotheiſm, as it is ſometimes called, i. e. of the dogma which allows of no other God but nature, or the univerſe; and, therefore, makes matter to be God.—Accordingly, Buddeus, in a diſſertation de Spinoziſmo ante Spinozam, proves at large, that Spinoza's doctrine of God and the world is far from being his own invention, but that it had been held by many philoſophers of different ſects, both among the Chaldeans and Greeks.—It is certain, the opinion of the Stoics, and thoſe who held an anima mundi, was not far from it. Lucan introduces Cato diſcourſing thus:

> Eſtne Dei ſedes niſi terra, & pontus, & aër,
> Et cœlum, & virtus? ſuperos quid quærimus ultra!
> Jupiter eſt quodcunq; vides, quocunq; moveris.
> *Luc. Pharſ.* lib. ix. v. 578.

Strato likewiſe, and others among the Peripatetics, maintained ſomething very like it; and what is more, though no ancient ſect ſeems farther removed from Spinoziſm than the Platonic, as they attributed the greateſt freedom to God, and carefully diſtinguiſhed him from matter; yet Gundlingius has proved at large, that Plato gave matter much the ſame origin with Spinoza.—But the ſect that approached neareſt to Spinoziſm, was that which taught that all things were one, as Xenophanes the Colophonian, Parmenides Meliſſus, and eſpecially Zeno Eleates, whence it obtained the name of the Eleatic ſyſtem of atheiſm.—To the ſame may alſo be reduced the opinion of thoſe, who held the firſt matter for God, as Almaricus and David of Dinantum. Add that the ſect of Foe in China and Japan, that of the Soufi in Perſia, and that of the Zindikites in Turkey, are found to philoſophiſe much after the manner of Spinoza.

The chief articles in Spinoza's ſyſtem are reducible to theſe:—That there is but one ſubſtance in nature; and that this only ſubſtance is endued with an infinite number of attributes, among which are extenſion and cogitation.—That all the bodies in the univerſe are modifications of this ſubſtance, conſidered as it is extended; and that all the ſouls of men are modifications of the ſame ſubſtance, conſidered as cogitative.—That God is a neceſſary and infinitely perfect being, and is the cauſe of all things that exiſt, but is not a different being from them.—That there is but one being and one nature; and that this nature produces, within itſelf, by an immanent act, all thoſe which we call creatures.—And that this being is at the ſame time both agent and patient, efficient cauſe and ſubject; but that he produces nothing but modifications of himſelf.

Thus is the Deity made the ſole agent as well as patient in all evil, both phyſical and moral; that called malum pœnæ, as well as malum culpæ: a doctrine fraught with more impieties than all the heathen poets have publiſhed concerning their Jupiter, Venus, Bacchus, &c.—What ſeems to have led Spinoza to frame this ſyſtem, was the difficulty of conceiving either that matter is eternal, and different from God, or that it could be produced from nothing, or that an infinite and free being could have made a world ſuch as this is.—A matter that exiſts neceſſarily, and which nevertheleſs is void of activity, and ſubject to the power of another principle, is an object that ſtartles our underſtanding; as there ſeems no agreement between the three conditions.—A matter created out of nothing is no leſs inconceivable, whatever efforts we make to form an idea of an act of the will that can change what before was nothing into real ſubſtance. Beſides its being contrary to that known maxim of philoſophers, Ex nihilo nihil fit.—In fine, that an infinitely good, holy, free being, who could have made his creatures good and happy, ſhould rather chuſe to have them wicked, and eternally miſerable, is no leſs incomprehenſible; and the rather, as it ſeems difficult to reconcile the freedom of man with the quality of a being made out of nothing.

Theſe appear to have been the difficulties which led Spinoza to ſearch for a new ſyſtem, wherein God ſhould not be diſtinct from matter, and wherein he ſhould act neceſſarily, and to the extent of all his power, not out of himſelf (ad extra) but within himſelf.—But it is certain, if the new ſyſtem reſcue us from ſome difficulties, it involves us in others much greater.—For,

1. It is impoſſible the univerſe ſhould be but one ſubſtance; ſince every thing that is extended muſt neceſſarily have parts; and what has parts muſt be compounded. And, as the parts of extenſion do not ſubſiſt in each other, it follows, either that extenſion in the general is not ſubſtance, or that every part of extenſion is a different ſubſtance. Now, according to Spinoza, extenſion in general is an attribute of ſubſtance. And he allows, with other philoſophers, that the attributes of ſubſtance do not differ really from the ſubſtance itſelf. He muſt therefore allow, that extenſion in general is ſubſtance: whence it will follow, that every part of extenſion is a particular ſubſtance: which overturns the whole ſyſtem.

If it be objected, that Spinoza does not conſider different bodies, as different parts of extenſion, but as different modifications of it: the diſtinction between part and modification, we doubt, will hardly ſave him. For let him avoid the word part as much as he pleaſe, and ſubſtitute that of modality or modification for it, the doctrine will amount to much the ſame: the characters of diverſity are not leſs real and evident, when matter is divided into modifications, than when it is divided into parts. The idea of the univerſe will ſtill be that of a compound being, or an aggregate of ſeveral ſubſtances.

For proof of this, it may be obſerved, that modalities are beings which cannot exiſt without the ſubſtance which modifies them; whence it follows, that the ſubſtance muſt be found where-ever its modalities are found; and even that the ſubſtance muſt be multiplied in proportion as the number of incompatible modifications is multiplied: ſo that, where-ever there are five or ſix of theſe modifications, there muſt be five or ſix ſubſtances. It is evident, that a ſquare figure and a circular figure are incompatible in the ſame piece of wax. Whence it follows, that the ſubſtance modified by the ſquare figure cannot be the ſame ſubſtance with that modified by the round figure. So, when I ſee a round and a ſquare table in a room, I may ſafely aſſert, that the extenſion which makes the ſubject of the round table is a diſtinct ſubſtance from the extenſion which is the ſubject of the ſquare table: ſince otherwiſe it would follow, that the ſquare and round figures might be found in the ſame ſubject at the ſame time.— The ſubject, therefore, that is modified by two figures, muſt be two ſubſtances.

2. If it be abſurd to make God extended, as this robs him of his ſimplicity, and makes him be compoſed of parts; it is ſtill worſe to reduce him to the condition of matter, the loweſt of all beings, and that which moſt of the ancient philoſophers ranked immediately above nothing: matter! the theatre of all ſorts of changes, the field of battle of contrary cauſes, the ſubject of all corruptions and generations; in a word, the being moſt incompatible with the immutability of the Deity!

The Spinoziſts, indeed, maintain, that it is not ſuſceptible of any diviſion; but the argument they alledge, in proof of it, we have elſewhere ſhewn to be falſe: it is, that for matter to be divided, it is neceſſary that one of the parts be ſeparated from the other by a void ſpace, which is impoſſible: ſince there is no vacuum in nature.

3. If Spinoziſm appear extravagant, when we conſider God as the ſubject of all the mutations, corruptions, and generations in bodies; it will be found ſtill worſe, when we conſider him as the ſubject of all the modifications of thinking. It is no ſmall difficulty to unite extenſion and thinking in the ſame ſubſtance; ſince it is not an union like that of two metals, or of water and wine, that will ſerve the purpoſe: theſe laſt require only juxta-poſition; whereas to combine thinking and extenſion requires an identity; thinking and extended are two attributes identified with the ſubſtance; and conſequently are identified with each other, by the fundamental rule of all logic.

Again, when we ſay, that a man denies this, affirms that, likes that, &c. we make all thoſe attributes fall on the ſubſtance of his mind, not on his thoughts, which are only accidents or modifications of it. If therefore what Spinoza advances be true, that men are modalities of God; it would be falſe to ſay, ‘ Peter denies, likes, wills’, &c. ſince, in reality, on this ſyſtem, it is God that denies, wills, &c. and conſequently all the denominations which ariſe from the thoughts, deſires, &c. of men, fall properly and phyſically on the ſubſtance of God. From whence it alſo follows, that God affirms and denies, loves and hates, wills and not wills the ſame thing, at the ſame time, and under the ſame conditions, contrary to the great principle of reaſoning: ‘ Oppoſita ſunt quæ & neq; de ſe invicem, neq; de œdem tertio ſecundum idem, ad idem, eodem modo atq; tempore verè affirmari poſſunt’; which muſt be falſe, if Spinoziſm be true: ſince it cannot be denied but ſome men love and affirm what others hate and deny, under all the conditions expreſſed in the rules.

4. But, if it be phyſically abſurd to ſay the ſame ſubject is modified at the ſame time with all the different thoughts of all men, it is horrible when we conſider it in a moral light. Since it will follow, that the infinite, the all-perfect Being is not conſtant, is not the ſame one moment, but is eternally poſſeſſed even with contrary paſſions; all the uniformity in him, in this reſpect, will be, that for one good and wiſe thought he will have twenty fooliſh and wicked ones. He will not only be the efficient cauſe of all the errors, iniquities, and impurities of men, but alſo the paſſive ſubject of them, the ſubjectum inhæſionis. He muſt be united with them in the cloſeſt manner that can be conceived, even by a penetrative union, or rather an identity, ſince the mode is not really diſtinct from the ſubſtance modified.

Several have undertaken to refute Spinoza's doctrine, particularly the learned Dr. Clarke; we have alſo an examination of Spinoziſm, and Mr. Bayle's objections againſt this ſyſtem, by Monſ. de Jariges, in the Mem. de l'Acad. de Berlin. Wolfius has alſo given a refutation of Spinoza, in his *Theol. Nat. Part* 2.

SPIPOLE'TTA, in zoology, the name of a ſmall bird of the lark kind, called tordino by the Venetians, and ſeeming to be the ſtopparola, as alſo the griſola and ſpipola of Aldrovandus.

SPIRÆ'A *Frutex*, *vulgo*, in botany, a genus of plants, whoſe characters are:

The flower is compoſed of many leaves, which are placed in a circular order, and expand in form of a roſe: out of whoſe flower-cup riſes the pointal, which afterwards becomes a fruit compoſed of ſeveral pods, in which are contained ſeveral oblong ſeeds.

Theſe ſhrubs are very common in the nurſeries near London, where it is ſold with other flowering ſhrubs at a certain price by the hundred. This ſhrub ſeldom riſes above five feet high; ſo, is proper to intermix with other ſhrubs of the ſame growth, in ſmall wilderneſs quarters, and other plantations of flowering trees.

This plant may be propagated from ſuckers, which are ſent forth in plenty from the ſtems of the old plants, or by laying down the tender branches; which, when rooted, ſhould be tranſplanted out in rows at three feet diſtance, and the plants a foot aſunder in the rows. In this nurſery they may remain two years, obſerving to keep the ground clear from weeds, and, in the ſpring, to dig up the ground between the rows, ſo that the roots may the more eaſily extend themſelves; and, if they ſhoot out many ſide-branches, they ſhould be pruned off, ſo as to reduce the ſhrubs to a regular figure; and afterwards they may be tranſplanted where they are to remain, either in ſmall wilderneſs-quarters, or in clumps of flowering ſhrubs, obſerving to place them amongſt other ſorts of equal growth. *Miller's Gard. Dict.*

Convertibility of SPI'RITS. This is a doctrine that has obtained among many of the moſt curious experimenters, and indeed the moſt intelligent of our chemiſts have always allowed, that provided proper care were taken in the getting together the materials, one Spirit may always be changed into another, as brandy into rum, malt Spirit into brandy, and brandy into malt Spirit. The principles on which this is believed are theſe: all ſimple Spirits, as they are called, conſiſt of four parts, water, oil, phlegm, and alcohol: the laſt of theſe is the eſſential part, and is what conſtitutes the whole a Spirit. In reducing Spirits, therefore, to their utmoſt degree of ſimplicity and purity, it is evident that the three ſuperfluous parts are to be got rid of, and the fourth left alone; by this means the alcohol is procured diſtinct, and is a liquor ſui generis of many peculiar qualities, not to be found in any other fluid.

Among others, it has theſe remarkable properties. 1. When abſolutely purified, it is an uniform homogene liquor, capable of no farther ſeparation, without loſs or deſtruction of ſome of its homogeneous parts. 2. It is totally inflammable, having no ſoot, nor any moiſture behind. 3. It has no peculiar taſte or flavour, any more than pure water, except what is owing to its nature, as alcohol, or perfectly pure Spirit. 4. It is an unctuous and criſpy fluid, running veiny in the diſtillation, and its drops rolling on the ſurface of any other fluid, like peaſe upon a table, before they unite. 5. It appears to be the eſſential oil of the body it is obtained from, broken very fine, and intimately and ſtrongly mixed with an aqueous fluid, which is aſſimilated or changed in its nature in the operation. 6. And, laſtly, it ſeems to be a kind of univerſal fluid, producible with the ſame properties from every vegetable ſubject; but, to produce it thus, requires ſome care in the operation.

On theſe principles, is founded the opinion, that all Spirits may be reduced to a perfect ſimilarity, or ſameneſs, from whatever ſubject they are procured, and on this depends their convertibility into one another; for, when once they are brought to this ſtandard of ſimplicity, there needs nothing more than to add the oil of ſuch of the finer Spirits as is required to convert the Spirit into that particular kind. By this means the ſame taſteleſs ſpirit, whether obtained from malt, ſugar, or grapes, may be made into either malt-ſpirit, brandy, or rum, by adding the eſſential oil of the grape, ſugar, or malt; and thus what was once malt Spirit, ſhall become brandy, or whatever elſe the operator pleaſes.

Many methods have been attempted to obtain the firſt point, that is, the reducing the Spirit to perfect and pure alcohol. The moſt practicable means ſeem to be long digeſtion, and the repeated diſtillation from water into water, where the eſſential oil will at once be left upon two ſurfaces, and the acid imbibed. The ſhorter ways are thoſe by rectifying from neutral abſorbent ſalts and earths; ſuch are ſugar, chalk, and the like. And, laſtly, the uſe of fixed alkalies may be tried, for theſe very forcibly keep down both the phlegm and oil; inſomuch that this laſt method promiſes to be the ſhorteſt of all, if the art were known of utterly aboliſhing the alkaline ſavour, which the alcohol is apt to acquire in this operation, and, which, for this purpoſe, is by no means ſuitable, as abſolutely deſtroying all vinoſity, which univerſally conſiſts in a fine volatile pungent acidity. The diſtillers are the only people, whoſe buſineſs would lead them to make the experiment. This method of converting one Spirit into another would be of immenſe profit to them, if they could perfectly ſucceed in it; but, as it would require time and ſlow proceſſes to bring it about, there is but little hope of its ever being brought to bear among them, while they are in their preſent ſcheme of doing every thing with diſpatch and hurry.

Dr. Shaw has ſaid a vaſt deal in the praiſe of a taſteleſs Spirit, which is producible from a vegetable ſubſtance, only overlooked, as he tells us, becauſe it is too common, with which all the foreign Spirits might be imitated to the utmoſt perfection

tion by means of their eſſential oils, all thin fine wines raiſed to any due degree of ſtrength, without giving them the brandy flavour, and many other things of great uſe are performed; but he has not told us what the vegetable ſubſtance is from which we are to obtain this. *Shaw's Eſſay on Diſtillery.*

SPI′SSUM, in the ancient muſic, was uſed to ſignify thoſe two ſmaller conjunct intervals of a tetrachord, which taken together were leſs than the third. The term for this was *πύκον*.

SPRI′NGES, among ſportſmen, a ſort of horſehair nooſes, made ſo as to run very eaſy, and planted in places where birds run into one particular path, to take them as they paſs.

SPU′RRY, *ſpergula*, is ſown in the Low-countries twice in a ſummer. The firſt ſowing is in May; theſe plants flower in June and July, and the ſeed is ripe in Auguſt. The ſecond time of ſowing it is after the rye-harveſt; they uſually plow up the rye grounds, and ſow them with this ſeed, to ſerve the cows in winter, when the other ſorts of graſs are low or dead. The cows that feed on this plant are found to yield better milk, and finer butter is made from it, than from that of cows feeding on any other paſture. Poultry alſo are very fond of eating this plant, and the farmers in ſome places have an opinion, that it makes them lay the more eggs. *Mortimer's Huſbandry.*

SQUA′LUS, in the Linnæan ſyſtem of zoology, the name of a diſtinct genus of fiſhes, of the general order of the chondropterygii. The characters of this are, that the body is oblong, and the apertures of the gills are five on each ſide.— Of this genus are the galeus, lamia, zygæna, &c. *Linnæi Syſt. Nat.*

The characters of this genus, according to Artedi, are theſe: the foramina, or apertures of the bronchia, are five on each ſide, and they are placed longitudinally from the head to the pectoral fins; the head is depreſſed, the body oblong, and either rounded, or longiſh and angular; the ſkin is rough; the eyes are placed at the ſides of the head; and the upper part of the tail is longer than the under. The mouth in moſt of the ſpecies is placed in the under part of the head, and opens tranſverſely.

SQUA′TINA, the *monk-fiſh*, called alſo in Italian the peſce angelo, and thence in Engliſh angel-fiſh.

It is of a middle ſhape, between the long and flat cartilagineous fiſhes, being much broader than the galei, and rounder than the rays. It grows to a very large ſize, ſometimes to four, five, or ſix feet long. It is covered all over with a mucous ſubſtance, but under it the ſkin is harſh, and rough enough to ſerve for the poliſhing wood and ivory. It is of a browniſh grey on the back and ſides, and white under the belly. The head is flatted and roundiſh, and the mouth large, and opening at the extremity of the ſnout, not, as in other of the fiſhes of this claſs, under the head. It has three rows of teeth, eighteen in a row. Its eyes are large, and placed near its mouth, and ſeem as if meant for looking ſideways, rather than up or down. Its upper pair of fins very much reſemble wings, from whence it has its name of the angel-fiſh, and at the extremities of theſe are a number of ſharp hooked thorns. It has alſo a row of ſhort prickles on its back.

It is common in the Engliſh ſeas, and is not unfrequently caught in Cornwall.

SQUATT, in minerology, a term given by the Engliſh miners to a peculiar ſort of bed of ore, leſs valuable than a load or vein, becauſe of its reaching but a little way.

Though the ore of the Squatts is generally very rich and good, not inferior in quality to the beſt vein ore, the miners are often terribly diſappointed, on finding theſe Squatts inſtead of the right veins, after a long ſearch. In the tin countries, the way of ſearching for mines is by looking after the ſhoad-ſtones; that is, certain metalline ſtones which contain ſome ore, and which have originally made the upper part of the vein of ore, reaching up to the day, or ſurface of the earth.

SQU′ILLA *aquæ dulcis*, the freſh-water ſhrimp. Few people are aware of the vaſt deſtruction made by this little inſect among the ſmall fry of fiſhes. This inſect is commonly very plentiful in ſtanding waters, and particularly in breeding ponds, where they always have their prey in plenty before them; and often ſuffer none, or ſcarce any of the numerous young fry, hatched from the ſpawn of carp and tench, to live to grow up. They may be obſerved following the ſhoals of the young fry and ſeizing multitudes one after another; and at other times lurking among the weeds, to ſeize ſuch as ſtraggle by themſelves: If one of theſe inſects be put into a baſon of water with a dozen or two of theſe young fiſh, though as big as himſelf, he will very ſoon deſtroy them all. They kill numbers that they cannot eat, but leave them to rot.

STA′BILES, in the ancient muſic, a name given to the extreme chords of a tetrachord; becauſe they remained the ſame throughout all the genera and ſpecies of muſic.

STA′BLE.— Nothing conduces more to the health of a horſe, than the having a good and wholſome Stable. The ſituation of a Stable ſhould always be in a good air, and on a firm, dry, and hard ground, that in winter the horſe may come in and go out clean. It ſhould always be built ſomewhat on an aſcent, that the urine, and other foulneſſes, may be eaſily conveyed away by means of drains or ſinks cut for that purpoſe.

As there is no animal that delights more in cleanlineſs than the horſe, or that more abominates bad ſmells, care ſhould be taken that there be no hog-ſty, hen-rooſt, or neceſſary-houſe near the place where the Stable is to be built; for the ſwallowing of feathers, which is very apt to happen when hen-rooſts are near, often proves mortal to horſes; and the ſteams of a bog-houſe, or hog's dung, will breed many diſtempers; and, particularly, they will bring on the farcy and blindneſs in many horſes. It is much better to build the walls of a Stable of brick than of ſtone, for the former is always dry, the other often ſweats, and is very apt to be damp, and to cauſe rheums and catarrhs to horſes that are ſet in the Stable in damp weather.

The walls ought therefore to be of brick, and to be made of a moderate thickneſs, two bricks, or a brick and half at the leaſt, both for the ſake of ſafety and warmth in winter, and to keep off the heat of the ſun in the midſt of ſummer, which would ſpoil the horſe's appetite, and ſink his ſpirits. The windows ſhould be made on the eaſt and north ſides of the building, that the north air may be let in to cool the Stables in ſummer, and the riſing ſun all the year round, eſpecially in winter.

The windows ſhould either be ſaſhed, or have large caſements, for the ſake of letting in air enough; and there ſhould always be cloſe wooden ſhutters, that the light may be ſhut out at pleaſure; by which means the horſe will be brought to ſleep in the middle of the day, as well as in the night, when it is judged proper that he ſhould do ſo.

Many pave the whole Stable with ſtone, but it is much better to have that part, which the horſe is to lie upon, boarded with oak planks; for it will be not only eaſier, but more warm and comfortable to the creature.

The boards muſt be laid as even as poſſible, for this is the way to make the creature lie moſt at his eaſe, and in the moſt healthful poſture. The dealers in horſes generally indeed make the boards be laid higher towards the top, and ſlanting down: this ſhews a horſe to more advantage as he lies, but it is very uncomfortable to the creature, and his hinder parts are always ſlipping down, and the hind legs are often made ſubject to ſwellings by it.

The planks ſhould be laid croſswiſe, not lengthwiſe, and there are to be ſeveral holes bored through them to receive the urine, and carry it off underneath the floor into ſome drain, or common receptacle. The ground behind ſhould be raiſed to a level with the planks, that the horſe may always ſtand even; and the floor behind ſhould be paved with ſmall pebbles, and the place where the rack ſtands ſhould be well wainſcotted. There are to be two rings placed on each ſide of the ſtall, for the horſe's halter to run through, and a logger is to be fixed to the end of this, ſufficient to poiſe it perpendicularly, but not ſo heavy as to tire the horſe, or to hinder him from eating. The beſt place for him to eat his corn in is a drawer or locker made in the wainſcot partition; this need not be large, and conſequently need not take up much room, ſo that it may be eaſily fixed, and taken out to clean at pleaſure: by this means, the common dirtineſs of a fixed manger is to be avoided.

Many people are againſt having a rack in their Stables; they give the horſe his hay ſprinkled upon his litter, and if they think he treads it too much, or too ſoon, they only nail up three or four boards, by way of a trough, to give it to him in. The reaſon of this is, that the continual lifting up the head to feed out of the rack is an unnatural poſture for a horſe, which was intended to take his food up from the ground, and makes him, as they expreſs it, withy-cragged. In the way of ſprinkling the hay on the litter, or laying it in a trough even with the ground, he not only takes it up as if from the earth in a natural way, but can eat as he lies, which is a piece of indulgence that a horſe takes great pleaſure in.

When there is Stable-room enough, partitions are to be made for ſeveral horſes to ſtand in; theſe ſhould always allow room enough for the horſe to turn about, and lie down conveniently in; and they ſhould be boarded up ſo high towards the head, that the horſes placed in ſeparate ſtalls may not be able to ſmell at one another, nor moleſt each other any way. One of theſe ſtalls ought to be covered in, and made convenient for the groom to lie in, in caſe of a great match, or the ſickneſs of a valuable horſe. Behind the horſes there ſhould be a row of pegs, to hang up ſaddles, bridles, and other neceſſary utenſils; and ſome ſhelves for the hanging up bruſhes, &c. and the ſtanding of pots of ointment and other preparations.

The Stables of the nobility are often incommoded by bins for oats placed in them, which take up a great deal of room with very little advantage. Dr. Plot has given us, in his Hiſtory of Oxfordſhire, a very convenient method, uſed by a gentleman of that county, to prevent this. It is done by making a conveniency to let the oats down from above, out of a veſſel like the hopper of a mill, whence they fall into a ſquare pipe of about four inches diameter, let into the wall, which comes down into a cupboard alſo let into the wall, but with its mouth ſo near the bottom, that there ſhall never be more than about a gallon in the cupboard at a time; which being taken out, and given to the horſes, another gallon immediately ſucceeds it from above, without any trouble to the groom or any body elſe. By this means there is not an inch of room loſt in the lower part of the Stable where the horſes ſtand; and there is this great conveniency beſides, that the oats are always kept ſweet by it; for every gallon that is taken away puts the whole quantity above in motion, by the running down of the gallon that ſupplies its place, and no muſtineſs ever comes, where there is this continual airing and motion. There may eaſily be contrived two of theſe, the one for the oats, the other for ſplit beans; and both of theſe may be let into the range of preſſes, the oats and beans being ſeparated above by partitions. The other requiſites for a Stable are a dung-yard, a pump, and a conduit; and, if ſome pond or running river be near, it is greatly the better.

STA'CHYS, *baſe horſehound*, in botany, a genus of plants, whoſe characters are:

It hath a labiated flower, conſiſting of one leaf, whoſe upper lip is ſomewhat arched and erect, and the under lip is cut into three ſegments, the middle one being larger than the other two: out of the flower-cup riſes the pointal, attended by four embryoes; which afterwards become ſo many ſeeds, which are roundiſh, and incloſed in an huſk, which before was the flower-cup: to theſe marks may be added downy hoary leaves.

STAG-*worms*, in natural hiſtory, a name given to a ſpecies of worms produced of the eggs of a fly, and lodged in a very ſtrange place behind, and under the palate of the ſtag or deer's mouth.

STA'INING, or *colouring of porcelain*.— The Chineſe, for a great many ages, uſed only white porcelain. The firſt colour they employed was blue, and after that they came into the uſe of all the reſt. Their ancient blues were prepared by themſelves from a kind of a lapis lazuli; but we now ſupply them with the ſmalt ſo much cheaper, that it is no longer worth their while to make it themſelves. They uſed to prepare this only by giving a gentle calcination to the ſtone, and then beating it to powder, and grinding it to the utmoſt fineneſs in mortars of unglazed porcelain-ware, with peſtles of the ſame. The red, which the Chineſe uſe, is made of our green vitriol, or common copperas. They put about a pound of this into a crucible, and lute on this another crucible inverted: this laſt has a hole cut in the top, which they keep covered or open at pleaſure. They ſet this crucible in a furnace of bricks, ſo contrived, as to throw all the flame upon the lower veſſel, in the way of our chemiſts reverberatory furnaces. They make a large fire of charcoal all round it, and obſerve the hole at the top; for, ſo long as there aſcend thick black fumes through that, the matter is not ſufficiently calcined. They watch the going off of this fume, and, when there appears in the place a fine and thin cloud, they take away the crucible, the matter being then ſufficiently burnt. They try this, however, by taking a little out, and examining the colour; if it be not ſufficiently red, they let it remain longer in the fire. When they find that it is of a good colour, they take away the fire, and leave the veſſels to cool; this done, they find a cake of red matter at the bottom of the crucible, and a quantity of a finer powder about its ſides. They keep theſe ſeparate, the latter being the pureſt, the fineſt, and the brighteſt colour.

One pound of copperas affords about four ounces of this colour, and this is the red which they manage in different ſhades, and vary ſo much.

The Chineſe have alſo a white colour, which they uſe in their figures painted on the China: the ware itſelf is naturally white, and the varniſh, or oil of ſtone, is a great addition to its whiteneſs all over. But they have yet a way of making a much brighter and finer than theſe, as may be ſeen in moſt of the fine China-ware where there is any white in the figures. This white is made in the following manner: they collect on the ſhores of their rivers a ſort of agate, which is of a whitiſh hue without veins, and tolerably tranſparent. It approaches very much to the nature of cryſtal, and probably cryſtal may be found to ſupply its place with us. They calcine this ſtone to a white powder, and to every ounce of this, when ground in their porcelain mortars to an impalpable fineneſs, they add two ounces of ceruſs in fine powder: this they mix with the varniſh, and lay on in the common way of other colours.

This white mixture ſerves not only for the colouring white, but it is the baſis of ſeveral other of thoſe beautiful colours which we ſee on the China-ware, and which our manufacturers have been often perplexed what to make of. Their green colour is made of copper ruſted with acid; and their fine deep violet colour is made of this green, by adding to it a due proportion of this white. It is not to be ſuppoſed that this effect is produced according to the common laws of mixing colours among our painters, for then the white and green would only make a paler green. But, copper being a metal that as well gives a fine blue, as a fine green, according to the nature of the ſubſtances it is mixed with, the white in this caſe alters the very nature of the green, and converts it into that fine and deep violet blue, which we may draw from copper by means of any of the volatile alkalies; ſuch as ſpirit of ſal armoniac, ſpirit of harſhorn, ſpirit of urine, or any the like liquor. The workmen know how to bring this blue to any degree, by putting in different proportions of the two colours. There is not any admixture of them, that will not produce a blue of ſome kind; but always, the more of the green colour is uſed, the deeper the blue will be, and the leſs, the paler. The yellow is made by an admixture of ſeven drachms of this white, and three drachms of copperas, or more, if they deſire the colour to be deeper.

Theſe colours are laid on upon the veſſels when they have been once baked, but they do not appear till the ſecond baking is over in their proper ſhades or tinges, and ſometimes ſcarce at all.

The black China is much eſteemed in the Eaſt, and particularly when it is ornamented with gold; this colour looking better with that ornament than any other. The black is always laid on when the porcelain is firſt dried, and is prepared by mixing three ounces of the fine deep blue with ſeven ounces of that fine varniſh which they call oil of ſtones. This admixture gives a fine deep black. When the colour is thoroughly dry, the veſſels are baked, and, when this is done, the gold is laid on, and the whole is baked again in a particular furnace made for this purpoſe. If they would have the black degenerate into blue, they need only add leſs of the blue, and a little of the ceruſs and agate white before deſcribed.

They have two peculiar ways of applying the red, beſides the common one, both which require a nice workman, and make the ware come very dear. They call the one of theſe oils red, and the other blown red.

There are many things practiſed by the Chineſe in their colouring and forming the ſeveral kinds of porcelain, which may be well brought into uſe among us, and give a new value to our own wares, even though we ſhould never arrive at their art of making the thing itſelf. One kind of colouring, eaſily introduced among us, would be what they call hoan ton hoan. This produces veſſels of great beauty and price, and is done in this manner: the matter, of which the veſſels are made, for this purpoſe, need not be fine; they uſually take any of the common veſſels baked, without having been varniſhed, and conſequently ſimply white, and without luſtre. When theſe are intended to be of one ſimple colour, they need only be plunged into a liquid varniſh or oil, as the workmen there call it, coloured with ſuch ingredients as will ſtrike the moſt lively tinges: but, if it is to be coloured in compartments, as is uſually the cuſtom with this ſort of China, it is to be done by the pencil. The uſual way is to paint theſe in pannels, one green, another blue, and ſo on, and they make a very agreeable appearance. There requires no more to this, than the laying on the colours tolerably thick with a large pencil; but, if the pictures of animals and plants are to be given, they are to be done with the moſt permanent colours, and the veſſel being again well baked, becomes very beautiful.

The Chineſe, who are deceivers in every thing, find the way of cheating very much in regard to this ſort of China-ware. They paint the flowers of plants, and ſome parts of the birds, &c. in very bright colours, after the veſſel has been baked. Vermilion is a fine colour, which they often add on this occaſion; but they cannot uſe this before the baking, becauſe it would be deſtroyed by the fire. Theſe colours which are laid on afterwards cannot laſt, but ſoon rub off in the wiping, or uſing the things; the others laſt for ever; for they are laid on with the greateſt heat of all, the veſſels being put into the ſame furnaces to lay on theſe, as the other things are baked in for the firſt time.

Salt-petre, and powder of flints, are generally the things added to the colours thus laid on, to make them penetrate, and run properly. Thus for the fine deep violet colour, which makes the greateſt figure of all others on this ware, they mix together equal quantities of the fine azure, the powder of flints and ſalt-petre, all firſt powdered ſeparately till perfectly fine; this is tempered with water, and then laid on with the pencil, and though it looks rough at firſt, it comes out of the furnace of as beautiful a gloſſy hue as any thing can be conceived. The yellow is made by mixing together three ounces of ceruſs, and three ounces of powdered flints, and adding three, four, or more drachms of the red copperas, till the whole is of the proper degree of colour. The white is compoſed only of powder of flints and ceruſs, with a ſmall admixture of the ſalt-petre, or it will ſucceed tolerably well without. Theſe are all the particulars neceſſary to be obſerved for the making a ſort of porcelain of great beauty, in which the nature of the ware itſelf is not concerned; ſo that it ſeems eaſy to imitate it with any of our own wares.

In the baking of this, or any other kind of coloured China, the ſecond time, there is, however, ſome caution to be uſed in the placing the pieces. The Chineſe are very artful in their diſpoſition of theſe, arranging them in the moſt compact manner, and putting the little ones within the great ones; but great care is alſo neceſſary, that the veſſels do not touch one another in the parts where they are painted, for the conſequence of that would be the ſpoiling of both veſſels, as the colours would run together. The bottom of one veſſel may generally be placed on the bottom of another, though both are painted, becauſe the rims are not painted, and they keep the painted parts from touching one another. High and narrow veſſels, ſuch as chocolate-cups, and the like, are very troubleſome on this occaſion. The method the Chineſe workmen take with them, is this: they place a range of them, ſo as to cover the whole bottom of the furnace, and they cover this with a thin bed of broken China-ware, over which they place another row of the cups, and ſo on to the top, where they lay on no covering: they never bake any thing elſe with theſe cups, when they are of this kind of twice-baked porcelain. *Obſervat. ſur les Coutumes de l'Aſie.*

STA'JOLUS, among the Romans, a meaſure of length uſed in ſurveying land; it was equal to five palms and three fourths of a palm.

STAKE, the name of a ſmall anvil uſed by ſmiths; ſometimes it ſtands on a broad iron foot, on the work-bench, to be moved up and down occaſionally; and ſometimes it hath a ſtrong iron ſpike at the bottom, by which it is fixed to ſome place on the work-bench. Its uſe is to ſet ſmall and cold work ſtraight, by hammering it on the Stake, or to cut or punch upon with the cold chiſſel, or cold punch. *Moxon's Mech. Exer.*

STAKE *of a plough.* The Stake is an upright piece of wood, paſſing at its bottom through that link of the tow-chain which paſſes through the box of the plough, and at its upper end receiving the end of what is called the bridle-chain, which ties it to the crow-ſtaff, or, if it be not long enough, a wyth, or cord, is uſed to tie it: it is alſo tied to it again, a little below the pillow of the plough, by another wyth or cord. *Tull's Husbandry.*

STALACTA'GNIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek σταλακτὸς, ſtillatitious, or formed by dropping, and αγνὸς, pure.

The bodies of this genus are formed by the dropping of water from the roofs of ſubterranean caverns, and are the purer ſort of what are called by authors ſtalactitæ. They are cryſtalline ſparry bodies, formed into oblong conical figures, compoſed of various cruſts, and uſually found in form of icicles.

STALACTOCI'BDELA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek σταλακτὸς, ſtillatitious, and κιβδήλος, impure.

The bodies of this genus are formed by the dropping of water from the roofs of ſubterranean caverns, and are the coarſer kinds of what authors have called ſtalactitæ. They are cryſtallino-terrene ſpars, formed into oblong bodies, and found hanging from the roofs of caverns and grottoes.

STALAGMODIAU'GIA *, in natural hiſtory, the name of a genus of ſpars, the bodies of which are the purer kinds of what authors call ſtalagmoſcieria.

* The word is derived from the Greek, σταλαγμὸς, a drop, and διαυγὴς, pellucid.

Theſe ſpars are found in form of ſmall bells, each compoſed of numerous cruſts, and conſiderably pellucid and cryſtalline.

STALAGMOSCIE'RIA *, in natural hiſtory, the name of a genus of ſpars, formed by the dropping of waters. They are compoſed of numerous and thin cruſts, and of an opaque and coarſe ſtructure.

* The word is derived from the Greek σταλαγμὸς, a drop, and σκιερὸς, opaque.

STAMPS, in metallurgy, a kind of large peſtles, lifted up by water-wheels; ſerving to pour the ores, and ſlags of metals.

STA'NCHIONS, in ſhip-building, thoſe pillars which are placed perpendicularly between a ſhip's deck, to ſupport the weight of the guns, &c.

STA'NDING *Rigging of a ſhip*, thoſe ropes which do not run in blocks; as the ſhrouds, ſtays, backſtays, &c.

STAR *of the earth*, a name given by the country people to the coronopus, or buckſhorn-plantane, from its leaves being always diſpoſed on the earth, in the form of the rays of a Star.

It is famous for its virtues in curing the bite of a mad-dog. The counteſs of Suffolk's powder, ſo much celebrated in many places for that terrible diſorder, is principally compoſed of this plant.

STAR-*fiſh.*—There are many ſpecies of the Star-fiſh, and thoſe extremely different one from another: they have different numbers of rays, but the moſt common kind has five. Their upper ſurface, or that to which the legs are not faſtened, is covered with a firm and hard ſkin, which is full of little eminences of a harder matter, approaching to the nature of that of the ſhells of the echini marini, and the like. This ſkin is of different colours in the different ſpecies; moſt uſually it is red, ſometimes it is green, in ſome blue, and in others yellow, and of all the degrees of theſe colours, or the mixtures that may be produced from them. This colour does not extend to the under ſurface, that is coloured all over with legs and with points, like the eminences of the upper ſide, only longer; theſe are all either whitiſh, or yellowiſh. In the center of the fiſh there may be ſeen a mouth or ſucker, by means of which the creature draws its nouriſhment from the ſhell-fiſh, on which it feeds. There are five teeth placed round this ſucker, or perhaps they may be more properly called five bony forceps; by means of which it ſeizes and holds faſt the creature, while the ſucker does its office in draining out the juices; and probably it is by means of theſe that they open the bivalve ſhells, when they feed on the fiſh in them.

The amazing property of reproducing the eſſential parts, when loſt, is not confined to the polype, and ſome few others of the inſect world, but it is extended to the Star-fiſh, and to the urticæ marinæ of various kinds, and probably to many others, in which we at preſent have no expectation of finding it. Mr. Reaumur, on the diſcovery of this property in the polype, obſerved theſe other animals, as they lay on the ſhores of Poictou, and other places, and often found that ſpecies of Star-fiſh, which is very commonly known, and which has naturally five rays or arms, with only three or four, one or two being wanting; and, on taking up and examining theſe mutilated ones, nature was always found reproducing the limb that was wanting; and, on cutting or breaking other Star-fiſh into ſeveral parts, it was but a very little while before the broken parts cicatriſed, and every part remained alive; and by the appearances of things there remained no doubt, but that theſe living pieces will all, in time, reproduce their wanting parts.

Mr. Reaumur could not ſtay long enough on the ſpot to ſee this; but Mr. de Villars, on the coaſt of Rochelle, ſaw the whole proceſs very frequently in the urticæ marinæ which he cut to pieces on purpoſe for the experiment, and which always reproduced the parts he had cut off; and the common fiſhermen of the coaſts, where Mr. Reaumur was in company with Mr. Juſſieu, ſeeing them making their experiments on the Star-fiſhes, appeared to be well acquainted with their nature, and told them that they might cut and tear them as much as they pleaſed, but they would not be able to kill them: ſo familiarly was this piece of natural hiſtory known among theſe people, though unknown to thoſe who had employed their lives in the ſearches after ſuch things.

Mr. Reaumur was very ſenſible of the advantages that water inſects, and animals, have over others, as to the healing of their wounds, but was reſolved to try the experiment on ſome land animals. The creature he firſt choſe for theſe experiments was the earth-worm; and on cutting theſe creatures aſunder, though many of the pieces dried, yet he had the pleaſure of ſeeing ſome ſucceed ſo perfectly, that the tail part, which wanted not only the head, but alſo the organs of generation of both ſexes (which in theſe animals are always both contained in the ſame individual) has been ſeen to reproduce both theſe organs and the head, and become as perfect a worm as the whole was. *Philoſ. Tranſ.* N°. 464.

STAR-*wort, aſter*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind. Its diſk is compoſed of floſcules, and its border of ſemifloſcules: theſe all ſtand on the embryo ſeeds, and are contained in one common ſquammoſe cup. The embryoes finally ripen into ſeeds, which are winged with down, and fixed to the thalamus of the flower.

All the ſpecies of this plant are propagated by parting their roots early in the ſpring, and they will grow in almoſt any ſoil or ſituation; and the larger ſorts increaſe ſo faſt, that, if not prevented, they will, in a little time, over-run a lage ſpace of ground. They grow beſt in the ſhade. But the lower kinds do not run ſo much at the root, but ſhould be taken up and tranſplanted every other year, which will make them produce much fairer flowers. *Miller's Gard. Dict.*

STAR *of Bethlehem.* See ORNITHOGALUM.

STA'TICE, *thrift, or ſea-pink*, in botany, a genus of plants, whoſe characters are: it is a plant with a flower gathered into an almoſt ſpheric head, furniſhed with a common ſcaly empalement: this head is compoſed of ſeveral clove-gilly-flower-flowers, conſiſting of ſeveral leaves in a proper empalement, ſhaped like a funnel: in like manner, the pointal riſes out of the ſame empalement, and afterwards turns to an oblong ſeed, wrapped up in the empalement as in an huſk.

STA'TUARY *Marble*, a name given by our preſent artiſts to the ſofter white marble, generally formed into ſtatues; it is the ſame which the ancients called Parian marble.

STA'TURE (*Dict.*)—The Stature, or pitch of a man, is found admirably well adapted to the circumſtances of his exiſtence. Had man, obſerves Dr. Grew, been a dwarf, he could ſcarce have been a reaſonable creature: for, to that end, he muſt have had a jolt-head; and then he would not have had body and blood to ſupply his brain with ſpirits: or, if he had had a ſmall, proportional head, there would not have been brain enough for his buſineſs.—Again, had man been a giant, he could not have been ſo commodiouſly ſupplied with food: for there would hot have been fleſh enough of the beſt edible beaſts to ſupply his turn; or, if the beaſts had been made proportionably bigger, there would not have been graſs enough, &c.

It is a common opinion, however, and has been ſo ever ſince Homer's time, that people, in the earlieſt ages of the world, much ſurpaſſed the moderns in Stature; and it is true, we read of men, both in ſacred and profane hiſtory, whoſe pitch appears ſurpriſing: but then it is as true, that they were eſteemed giants.

The ordinary Stature of men, Mr. Derham obſerves, is, in all probability, the ſame now, as at the beginning ; as may be gathered from the monuments, mummies, &c. ſtill remaining. The oldeſt monument in the world is that of Cheops, in the firſt pyramid of Egypt, which, Mr. Greaves obſerves, ſcarce exceeds the meaſure of our ordinary coffins. The cavity, he ſays, is only 6.488 feet long, 2.218 feet wide, and 2.160 deep : from which dimenſions, and thoſe of ſeveral embalmed bodies, taken by him in Egypt, that accurate writer concludes, there is no decay in nature ; but that the men of this age are of the ſame Stature as thoſe three thouſand years ago.

To theſe we have other and later inſtances to add from Hakewell : the tombs at Piſa, which are ſome thouſands of years old, are no longer than ours. The ſame may be ſaid of Athelſtan's in Malmſbury church ; Sheba's in Paul's, of the year 693, &c.

The like evidence we have from the ancient armour, ſhields, veſſels, &c. dug up at this day ; for inſtance, the braſs helmet dug up at Metaurum, fits one of our men ; yet it is allowed to have been left there at the overthrow of Aſdrubal. Add, that Auguſtus was five feet nine inches, which was the meaſure of our queen Eliſabeth ; only the queen exceeded the emperor by two inches, allowance being made for the difference between the Roman and our foot.

STA'VERS (*Dict.*)— The moſt approved remedy for this diſtemper, which ſhews itſelf in horſes in a giddineſs, and reeling about, in waterineſs of the eyes, and a variety of odd motions of the head, is the following method : the creature is firſt to be blooded largely, then a glyſter is to be given him, compoſed of two quarts of emetic wine, and four ounces of the unguentum populneum. When he has repoſed an hour or two after voiding his glyſter, let another be given him, made of two ounces of the ſcoriæ of the liver of antimony finely powdered, boiled a little while in five pints of beer, and with the addition of four ounces of the ſame ointment, or of ointment of roſes. This laſt glyſter is to be frequently repeated, and his legs are to be all the while rubbed ſtrongly with wiſps of hay, wetted in warm water, to make a revulſion. His food ſhould be bran and white-bread, and he ſhould be walked from time to time in ſome temperate place. If theſe methods do not ſucceed, let an ounce of Venice treacle be diſſolved in a quart of ſome cordial waters, and given him ; and, after this, let the following glyſter be given warm : take Venice treacle and ſal polychreſtum, of each two ounces ; diſſolve them in two quarts of a decoction of mallows and camomile flowers ; add a quarter of a pint of oil of rue. This repeated two or three times after bleeding, and the other methods, will often cure the worſt ſtages of this diſeaſe.

STEA'TITES. See SOAP-*earth*.

STEEL (*Dict.*)—The manner of making iron into Steel had remained very long a ſecret, but many authors of late date have given the proceſs, though it does not appear the ſame in all, and in many is encumbered with circumſtances, intended only to diſguiſe it. Mr. Reaumur has taken greater pains, than almoſt any man, to come at the truth ; but, to be rightly informed of his reaſons, we ought to begin where he did, that is, at the origin of the iron in its pure metallic ſtate.

The ores of this metal are mixed bodies, compoſed of ſome particles truly metallic, and of others ſulphureous, ſaline, and terrene ; this compound maſs is put in fuſion by the fire, and on this operation the metallic parts, being heavieſt, ſubſide to the bottom of the veſſel, or furnace, and are then eaſily ſeparated from the lighter ſubſtances which float at the top. This ſeparation, however, is not ſuppoſed to be perfect, but the metal, after this its firſt fuſion, retains many heterogene particles, which prevent it from being malleable. It is after this to be refined, that is, to be melted again, and, that ever ſo often performed, the metal becomes yet more and more pure and perfect, ſome heterogene matter being every time depoſited, or thrown off, and this is uſually much leſs after every fuſion.

The metal, when thus purified by melting, yet remains hard and brittle : theſe are two qualities which we do not want in iron, and this hardneſs and friability are no incompatible qualities, ſince their origin is this, that the iron in this ſtate is compoſed of a multitude of ſmall granules, every one of which is very firm and compact in its own texture, though they cohere but ſlightly one with another. The knife, or the file, cannot eaſily cut any one of theſe granules, but a blow of a hammer eaſily ſeparates large parcels of them from thoſe to which they were joined : this caſt iron is therefore uſed only for ſuch purpoſes as requires a ſubſtance poſſeſſed of theſe qualities ; purpoſes where hardneſs is required, and where no blows are to be met with. Thus, backs of grates, iron pots, and the like, are made of it.

One of the general properties of metals is, that they are malleable ; that is, their ſeveral particles cohere ſo well together, that they are ductile and extenſible under the hammer, and will ſuffer the whole maſs to bend any way without breaking, that is, without their ſeparating from one another. In the works of the artizans, ſuch ſuppleneſs and pliability is called body in a metal, and the caſt iron, which wants this, is ſaid to have no body, and is what they call no ſoft metal. It is therefore no way fit for ſuch works as require faſhioning by the hammer or the file, nor of ſuch as are to ſtand any violent blows ; but, as it is eaſily fuſible, it ſerves for the caſt works where there is no great delicacy in the figuring, ſince it does not run ſo thin as to adapt itſelf to every lineament of a fine figure, nor is qualified to be repaired by inſtruments.

The ill qualities of caſt iron are, in a great degree, remedied in the forged or wrought iron, taken from the ſame quantity, and the ſame fuſion. The forging of iron is only the placing it over the fire till heated to a certain degree, and then beating it out with large hammers till it becomes ſoft. When it has been ſufficiently forged, it becomes ſoft and malleable, even when cold, and, when heated, is eaſily wrought into any figures, which it retains afterwards ; and it is eaſily cut by the file when cold, and is not brittle on being ſtruck, as is the caſt iron.

While it gains theſe properties by the forging, it loſes, however, another by the ſame means, which is its fuſibility. It will no longer melt in the fire, but when the workmen give it the ſtrongeſt heat they can, it is only reduced to a ſort of ſoft paſte, and ſweats a little, as they expreſs it ; that is, ſome few drops of truly melted iron fall from it.

It is very certain, that both the caſt and the forged iron are mixtures of metalline, ſaline, and ſulphureous particles, and the different arrangement of theſe, in their mere ſimple running together in the fuſion, and their being driven intimately into, and among one another, by the hammering, makes the fuſibility different in the two ſtates.

If the forged iron differ greatly from the caſt, there is however a third ſtate into which it is reducible by art, which is yet different from both ; this is what we call Steel ; and the quality of iron on receiving this change is not one of its leaſt valuable ones, ſince from this we have all our inſtruments for cutting, ſawing, boring, and the like purpoſes, the value of which to us is almoſt infinite. The German Steel has always been in great repute, and, though ſeveral other nations have made it, yet the Germans have kept their method a ſacred myſtery, to keep up their trade in it.

Steel is conſiderably harder than forged iron, and ſo it is neceſſary that it ſhould be, in order to many of the purpoſes it is imployed in. Shears of Steel, which are intended to cut iron, muſt be harder than iron, otherwiſe their edge will turn, and they will not cut ; whereas, if the metal is too hard, then the granules will fly off, and the edge break away in ſmall fragments. This is the caſe with all edged tools ; and hence it is, that good Steel is ſo nice and difficult a thing to make, ſince there is required ſuch a degree of hardneſs, and no more.

It is very well known, that Steel acquires its hardneſs from the plunging it into water ; it is to be heated to a certain degree, and then immediately plunged, while the fiery particles yet remain in it, into water perfectly cold ; it is then to be ſpeedily drawn out of the water, and thus the whole operation is finiſhed. It acquires its hardneſs in degrees, proportionate to its heat when plunged into the water ; and this hardneſs, or temper, remains with it only till it is heated as high again ; for, after that, if left to cool leiſurely, and not thrown into water, it is loſt. All the maſſes of Steel which are ſold are thus tempered ; nevertheleſs, when they are wrought into tools, their temper is loſt, and is to be renewed by plunging them again into cold water, when they have been forged into the ſhape of which they are to be.

Mr. Reaumur affirms, that Steel differs in nothing from forged iron, except that it contains more ſulphurs, and more ſalts. Hence, it follows, that caſt iron ſhould be Steel, ſince it evidently differs from forged iron in the ſame manner, and by the ſame properties ; and, in effect, caſt iron is Steel, ſuch as it is, eſpecially the white ſort, which is more pure, and more perfectly diveſted of its earth, than the browner ſorts ; and this white kind may be accordingly brought to all the hardneſs of Steel, by repeated heating and quenching in cold water. It follows alſo, that, in order to convert iron into Steel, we are to give it new ſalts and new ſulphurs. It may be aſked, where is the neceſſity of giving again that which the mere caſt iron poſſeſſes ? To which the anſwer is, that Steel is required to be malleable in ſome degree, which the mere caſt iron is not ; and it is to be added to this, that it may be poſſible for us to give to forged iron ſuch ſalts and ſulphurs as are more proper for the Steel, than thoſe which the caſt iron naturally poſſeſſes.

We have great variety of ſalts and ſulphurs, out of which to chuſe for this purpoſe, and Mr. Reaumur made many trials to find which would ſucceed beſt ; and the reſult of all was, that, for ſulphurs, powdered charcoal and common ſoot ; and, for ſalts, ſea ſalt alone ſucceeded beſt ; and that theſe were properly to be mixed with aſhes, by way of an intermediate ſubſtance. Theſe ſubſtances muſt alſo have their allotted doſe ; that is, there muſt not only be a certain proportion of the ſeveral ingredients one to another, which, however, need not be very preciſe and exact, but there muſt alſo be a proportional quantity of the whole employed to the quantity of iron that is to be wrought upon ; and in this alſo regard muſt be had to the ſeveral ſorts of ores from which the iron was obtained, ſince the iron of ſome ores is much ſooner convertible into Steel than that of others, and makes alſo a better Steel.

The manner of beſt introducing theſe ſalts and ſulphurs into the body of the iron was found by this author a matter of great difficulty to determine. He ſoon perceived, that fire was the only agent that could convey theſe bodies into the metal; and in contriving how this might be done moſt eaſily, and with leaſt expence, he found out, after many trials, a new ſort of furnace, which effected this purpoſe with great eaſe, and which was not ſubject to the inconveniencies of other furnaces.

As Steel is iron with an admixture of heterogene particles, it follows that it muſt be leſs metallic, that is, leſs malleable, or more brittle; it is alſo neceſſary that it muſt be, in ſome degree, malleable for the purpoſe it is required for; and it is eaſy to conceive that theſe properties cannot be given it, in a proper degree, but by means of a very accurate operation; and, even when all the parts of the proceſs are the ſame, there is yet much depending on the iron itſelf, which can never be perfectly known but by trial. Something, however, may be judged of the iron by breaking bars of it: the ſeveral ſorts of iron, when broken, ſhew ſome of them only granules, others flakes, and others fibres; ſome alſo ſhew all three of theſe moleculæ at once, and others two of them; but it is eaſy, in either of theſe caſes, to ſee which ſort is in the greateſt number. The laminated and the fibrous iron are the two extremes; the firſt is very brittle, the latter very malleable. The laminated iron is ever the worſt of all kinds for making into Steel; and of this kind ſuch pieces are worſt of all, the laminæ of which are very white and ſhining, and are large and irregularly diſpoſed, and arranged in different inclinations. Mr. Reaumur began to reckon from theſe an arrangement of all the kinds of iron, which coming, each by degrees, to have the laminæ ſtill ſmaller and ſmaller, and at the ſame time leſs glittering, and placed more evenly together, ſunk at laſt into the irons of the granulated kind. It is eaſy to conceive how many differences there muſt be between theſe; and from theſe the fibroſe ones may be deduced, owing their texture merely to the granulæ, which in theſe are diſpoſed into long ſtrings or ſtreaks. Though, in this arrangement of the irons, the firſt are, of all others, the leaſt proper for making Steel, it does not follow that the laſt are the moſt ſo; theſe indeed uſually make a very ſoft and pliant ſort of Steel, which has what the workmen call the greateſt body of all the kinds of Steel, and is therefore moſt proper of all for certain purpoſes, as the making of watch ſprings, and the like; but the want of hardneſs makes it very unfit for cutting tools of all kinds, from the razor to the ax. The granulated iron always makes the fineſt and hardeſt Steel; and of theſe ſuch ſucceed beſt, whoſe granules are ſmalleſt.

One thing remarkable is, that all Steel, though made of iron of the granulated or ſtriated kind, yet is, before it has been hammered, of a flaky, or a ſort of laminated ſtructure; but this ſeems owing to the fire's having melted ſome of the granules in the operation, and run great numbers of them together into theſe plates. The ſmallneſs of theſe flakes in Steel, which has not been worked, are a proof of its being a bad kind.

A bar of iron, when converted into Steel, is not equally ſo converted in all its parts; the fire has always acted more ſtrongly on its ſurface than on its central parts, and it is therefore more perfectly Steel there than in its inner parts; but a perfection in the operation is not neceſſary to the Steel's being good and uſeful, and the whole bar is often very good Steel, as are alſo many bars made at the ſame time, yet, all perhaps, ſomewhat differently affected.

If the compoſition, which is to convert the iron into Steel, be too ſtrong, or if the fire be too violent, or the matter contained too long in it, in all theſe caſes the Steel will be over made; that is, there will be an over proportion of ſaline and ſulphureous parts added to the iron: theſe will therefore too far ſeparate the particles of the metal aſunder, and the conſequence will be, that the Steel will be too brittle to bear hammering, and will be of great loſs to the proprietor in the great quantities that will be broken, beſides the loſs he will have from the abundance of ſcales which will fly off in the working. The way to meliorate ſuch Steel as this muſt be to diveſt it of a part of its ſalts and ſulphurs, but particularly of the laſt; and Mr. Reaumur found, that by the burying the bars of ſuch Steel in lime, or any other alkaline ſubſtance that would readily abſorb the ſulphurs, and placing it for a proper time in the fire, it would be in a manner decompoſed again, and come out a very good and perfect Steel; and this is no trivial proof, that the account given of the manner of iron's becoming Steel is the true one.

By this management Steel may again be converted, or reduced to its primitive iron, and a body of any middle degree, between Steel and iron, may be produced, by ſtopping this proceſs at different points of time, or continuing it till all the adventitious ſalts and ſulphurs are drawn off or abſorbed. Hardneſs and flexibility are the two great points of this operation, and what the metal gets of the one of theſe, it aſſuredly loſes of the other. The greater hardneſs is from the greater quantity of the adventitious ſalts and ſulphurs; and the greater flexibility, or, as the workmen call it, the greater body, is from the greater quantity of the metallic; and he who is able to calculate properly the quantities of his ſalt, charcoal, and ſoot, and to regulate exactly the degree of fire, is capable to make Steel of what degree of temper or perfection he pleaſes.

Iron, impregnated with new ſalts and new ſulphurs, is not however perfectly reduced to the ſtate of what the workmen expect in Steel; there wants yet the quenching it while hot in cold water, to compleat the operation. The Steel, penetrated every way by the particles of fire, and at that inſtant plunged into water, is by that quenching ſtopped in the very ſtate in which it was, and is not ſuffered to exhale the igneous bodies, as it would otherwiſe have done. It was, while in the fire, rarified and dilated, and this quenching continues it in that ſtate, and it is found, on meaſuring, conſiderably thicker and larger than it was while unheated. It might be ſuppoſed from hence, that the particles of fire, which were lodged in the Steel while red-hot, were thus detained and impriſoned in it, and ſo wrought the change, as they are known to remain in many calcined bodies, though they have not been ſo ſuddenly quenched; but, if this were the caſe, the Steel muſt be increaſed in weight as well as bigneſs, as many calcined bodies are; but this is not found to be ſo in fact.

Recourſe muſt be had therefore to ſome other operation on the Steel, and this appears, in reality, to be no other than the change of its texture, or internal ſtructure. If a body be naturally compoſed of a number of particles, which are in themſelves hard and compact, but between which there are certain ſpaces; if one takes from theſe hard and compact particles ſomewhat to fill up theſe voids, it muſt appear very evidently, that, though by this the proper particles are rendered leſs hard, yet the whole body muſt be made harder than it was before. In the converting of iron into Steel, Mr. Reaumur conceives that the particles of iron, being naturally very covetous of ſalts and ſulphurs, have imbibed great quantities of theſe adventitious bodies, while the ſpaces between them have been able to retain very few. This being then the firſt ſtate of the Steel, when it is afterwards heated, in order to its being tempered by quenching, the fire drives theſe ſulphureous and ſaline particles, ſo abundant in the iron, out of its granules, and diſperſes them throughout the ſpaces between theſe granules; and that it is to this equal and regular diſtribution of theſe ſalts and ſulphurs, fixed in this ſtate by the immediate quenching, that the hardneſs and other qualities of Steel are owing.

To the advantage the metal gets by this means, there is however always joined a diſadvantage, which is, that its grain naturally and neceſſarily becomes coarſer by it, and the Steel has the leſs body. The hardeſt Steel always muſt neceſſarily have the leaſt body; but, according to the rules laid down by Mr. Reamur, one may diſpoſe the hardneſs in what degree one pleaſes, and conſequently all the other properties are in the direction of the ſame laws.

If the oppoſition of the qualities of Steel be nicely conſidered, we ſhall find, that, inſtead of being hurtful, they are truly what ſhould be moſt wiſhed for, and are productive of the moſt deſireable conſequences. It may appear ſomewhat ſtrange, that hardneſs and flexibility in Steel ſhould be ſuch directly oppoſite and contradictory principles, and that the quenching, which makes Steel more powerful to reſiſt preſſure or rubbing, ſhould, at the ſame time, make it more feeble in action; but this is plainly the caſe, and a piece of Steel wire, which, before it is tempered by quenching, will, when hung vertically, ſuſpend a certain weight, will not ſuſtain the ſame weight when tempered, but will be broken even by a leſs; and that if the trial be made by tempering it up to one certain part, and no farther, the wire will aſſuredly break at that very part where the tempered and nontempered portions meet. The increaſe of ſize in every grain of Steel, from the quenching, gives the plain ſolution of this phænomenon. The rupture of any body whatever, that is, the ſeparation of its parts, by whatever means it is done, muſt be more difficult, the more intimately thoſe parts touch, or the more points they touch in. The granules of Steel are thoſe touching parts, and it is very evident that theſe granules, becoming larger on the quenching, muſt after this touch in fewer points, in the whole combination of the maſs; and, on the other hand, as they are larger, they alſo muſt mutually touch each other in a larger ſpace. Here are two contrary principles, which conſtitute the facility and the difficulty of the rupture by different means; and it cannot be, but that the one of theſe conſtrictions muſt give the greater force to reſiſt preſſure or friction, and the other to reſiſt drawing or traction.

It has been already obſerved that Steel is the harder, according as it was more or leſs hot at the time when it was plunged into the water; and it muſt be added to this, that it alſo is the more ſo, the more cold the water is into which it is plunged. The degree of heat in the Steel is eaſily known by its colour, and the diſtinctions in it are familiar to the workmen. Several perſons have thought there was great virtue to be communicated to the water by means of different ingredients: this Mr. Reaumur carefully tried, and the reſult was, that he found common cold water the beſt and moſt uſeful of all liquors: it is true, that vinegar and verjuice harden the Steel ſomewhat more, and aqua fortis greatly ſo; but the latter of theſe renders it too hard for ſervice, and repeated trials have evinced, that common water alone will give Steel all the hardneſs it can be wiſhed to have, provided only that it be plunged into it at a time when it is ſufficiently hot. If Steel, after tempering, be found too hard, there is a very familiar way of bringing it back to what ſtate one pleaſes, between that and iron, which is only the heating it in the fire; for it may be kept in the fire ſo long, as to be reduced wholly to iron again. It is eaſy to infer from hence, what was before obſerved, that caſt iron is Steel of a peculiar kind; its properties plainly evince, that it is Steel with an over proportion of all that makes it ſo, and conſequently of all its properties. It is not malleable, is very brittle, and too hard for the file, or any other tool, to cut. Theſe are the qualities of Steel which is over tempered, or, as it may be called, too much Steel: it owes theſe qualities to its being overcharged with thoſe ſulphurs and ſalts, which in a due proportion make Steel of iron. The method of reducing this to the ſtate of wrought iron is the ſame that we have before obſerved is to be uſed to untemper too high tempered Steel, that is, keeping it in the fire till part of its ſalts and ſulphurs are driven off; and, if the fire alone be thought too difficult or too tedious a method, Mr. Reaumur has found that thoſe alkaline ſubſtances, which naturally abſorb ſulphurs, will aſſiſt the reducing this to the ſtate of wrought iron, as they do to the untempering of Steel; and that the very ſame ſubſtances of this kind, which have been found beſt in the untempering Steel, ſucceed beſt in the rendering this malleable; ſuch are lime, chalk, and the like.

Caſt iron may be taken for theſe operations in two ſtates; the one that of ſimply melted iron in its firſt fuſion, the other that of the irón which has been run into the mould. When a caſt piece of iron, in a certain form, is heated again with the calx of animal bones, which is one common way, this being a ſubſtance extremely diveſted of ſalts and ſulphurs, it abſorbs thoſe of the metal too greedily, and diveſts it of too great a quantity of them; ſo that, when the piece comes afterwards to be filed, the fragments fly off in large ſcales, and the beauty of the caſt figure muſt be loſt: to remedy this difficulty, ſome powdered ſulphur is to be added in the heating; for this, being a ſulphureous and ſaline body, checks and moderates the effect of the calx of bone.

Chalk in the ſame manner can only be employed with certain regulations; it ſucceeds very well, if the fire be not too violent, or too long continued; but, if it be exceſſive in either of theſe particulars, the chalk throws into the body of the iron ſalts and ſulphurs of its own, which lay hid in its ſtructure, and which would not have been diſlodged by a ſmaller fire; but which being diſlodged, and thrown into the iron, act upon it, and render the ſucceſs of the operation quite different from what was intended, the iron becoming more hard and more brittle by it.

One great nicety, in all theſe operations, is the underſtanding the ſigns by which it is known at what time caſt iron is ſufficiently ſoftened, or overtempered Steel is ſufficiently reduced towards the ſtate of iron again; but this is only to be acquired by nice obſervation, and on this depends the whole certainty of the proceſſes, ſince every minute's continuance in the fire gives the operation a different turn in degree.

Mr. Reaumur, in one of his experiments in the ſoftening a piece of caſt iron of a beautiful figure, found, on taking it out, that it had loſt prodigiouſly of its weight; and, coming to a nicer examination, he found that it was hollow, its outer cruſt having been ſooner converted into malleable, that is, into fuſible iron, than the reſt, and the violence of the fire afterwards having melted away the inner part, which was not yet ſo changed. This accident led him to experiments, by which he found that he could, at any time, melt out the central part of a thick ſquare bar of caſt iron, the outer part changing firſt into the condition of malleable iron, and ſerving as a crucible for the fuſion of the yet unaltered fuſible iron within. By a proper management of this diſcovery, it will be eaſy to take off the unweildy weight of many works of caſt iron, which do not require ſo much ſtrength as that of the ſolid contained in their circumference. *Mem. de l'Acad. des Scien.* 1722.

Mr. Cramer obſerves, that the method of making Steel out of iron, is either by fuſion, or byce mentation. That by cementation may be performed in the following manner: chuſe ſome bars of pure iron, not too thick; prepare a cement of charcoal duſt, moderately pulveriſed, one part, and wood aſhes half a part; or of charcoal duſt two parts, bones, horns, leather, or hair of animals, burnt to a blackneſs in a cloſe veſſel, and in a gentle fire, and afterwards reduced to a powder, one part, wood aſhes half a part; mix them together. Prepare a cylindrical earthen veſſel, two or three inches higher than the bars are long; put into the bottom of this veſſel the cement, prepared as before directed, ſo that, being gently preſſed down, it may cover the bottom of the veſſel an inch and a half deep; place then the iron bars perpendicularly, ſo that they may be every-where an inch diſtant from the ſides of the veſſels, and from each other; fill the interſtices with the cement, and cover the bars with it, that the veſſel may be quite full; cover it with a tile, and ſtop the joints with a lute; put this veſſel into a furnace, and keep it moderately, but equally red-hot, for ſix or ten hours. When this is over, take the red-hot bars out, and dip them in cold water; they will then be brittle, and turned to Steel.

The method of making Steel by fuſion is this: take of iron ore, or of unmalleable iron of the firſt fuſion; divide it into ſmall parcels, and put them into a bed made of charcoal duſt in a ſmith's forge; let the quantity of the iron be but ſmall for the experiment; put to it, as a deſenſive menſtruum, ſome of the vitreſcent ſcoriæ of ſand, or ſtones of the ſame nature; then put upon them a quantity of charcoal, light this, and admit only a ſmall blaſt of the bellows, that the ſcoriæ and metal may both melt regularly: when this has been ſome time kept in fuſion, take it out, divide it into two parts, which make red-hot, and hammer into long bars; finally, heat them red-hot, and plunge them into cold water, and they will then be found to be Steel, ſo very hard, as not to be filable; and ſo brittle, as to break aſunder, when ſtruck with a conſiderable force. *Cramer's Art of Aſſaying.*

Mr. Lemery ſhews a ſimple method of reducing Steel to a very fine powder, without ruſting it: pour water on filings of Steel in an earthen veſſel, till it is four inches above the filings; ſtir it well every day, ſupplying more water, as that in the veſſel ſubſides, ſo that the Steel is always covered; continue this operation till the Steel falls into an impalpable black powder; then dry it for uſe. *Mem. de l'Acad. des Scien.* 1736.

Mr. Boyle tells us of his having opened the body of Steel, by a highly rectified ſpirit of urine made per ſe, and poured upon new filings of the Steel. This being put into a warm place, the menſtruum diſſolved a conſiderable part of the metal. *Mem. de l'Acad. des Sciences*, 1736.

Annealing of STEEL, is by ſome uſed for the ſoftening it, in order to make it work eaſier; which is uſually done by giving it a blood-red heat in the fire, and then taking it out, and letting it cool of itſelf.

Steel may indeed be made a little ſofter than in the common way, by covering it with a coarſe powder of cow-horn, or hoofs; thus incloſing it in a loam, heating the whole in a wood fire till it be red-hot, and then leaving the fire to go out of itſelf, and then the Steel to cool. *Mox. Mechan. Exerciſes.*

STEE′LING, in cutlery, the laying on a piece of Steel upon a larger maſs of iron, to make that part which is to receive the edge harder than the reſt. The body of an axe may very well be of iron, as it never comes in uſe to cut with, and perhaps is ſtronger, and leſs liable to break than if of Steel; but it muſt have a quantity of Steel at that part where the edge is to be made.

STE′MPLES, in mining, croſs bars of wood in the ſhafts which are ſunk to mines. In many places the way is to ſink a perpendicular hole, or ſhaft, the ſides of which they ſtrengthen from top to bottom with wood-work, to prevent the earth from falling in: the tranſverſes pieces of wood, uſed to this purpoſe, they call Stemples, and by means of theſe the miners in ſome places deſcend, without uſing any rope, catching hold of theſe with their hands and feet. *Ray's Engl. Words.*

STE′NO's *Duct*, a name given from its diſcoverer to the ſuperior ſalival duct.

STEP, in a ſhip; that piece of timber whereon the maſts or capſtans do ſtand at bottom, is called the Step of the maſt or capſtan.

STEREO-*ſtatics*, is uſed by ſome for the ſtatics or ſcience of the equilibrium of ſolid bodies. *Curtel. Math. Univ.*

STERN-*poſts*, in a ſhip, a great timber let into the keel at the ſtern of a ſhip, ſomewhat ſloping, into which are faſtened the after-planks; and on this poſt, by its pintle and gudgeons, hangs the rudder. See SHIP *Building*.

STIL *de grain*, in the colour trade, the name of a compoſition uſed for painting in oil or water, and is made of a decoction of the lycium or Avignon berry, in alum-water, which is mixed with whiting into a paſte, and formed into twiſted ſticks. It ought to be choſen of a fine gold yellow, very fine, tender, and friable, and free from dirt. *Pomet's Hiſt. of Drugs.*

STILE, or STYLE, in a philoſophical Stile, the only end of which is accurately to explain our thoughts to others; thence the particular rules to be obſerved by a philoſopher in delivering his doctrines, naturally follow: ſuch as,

1. Not to deviate from the received ſignification of terms.
2. That the ſame terms be always taken in the ſame ſenſe.
3. To fix the meaning of ſuch words as have only a vague ſenſe.
4. To ſignify objects, eſſentially different, by different names.

From theſe rules, the uſe and neceſſity of terms of art appear, and ſhews with how little reaſon they are vulgarly condemned.

5. The philoſopher ought always to make uſe of proper expreſſions, and uſe no more words than what are preciſely neceſſary to eſtabliſh the truth of his doctrines. *Wolf. Diſc. Prælim. Logic.* See STYLE, in the Dictionary.

STILL-*bottoms*, in the diſtillery, a name given by the traders to what remains in the ſtill after working the waſh into low wines.

Theſe bottoms are procured in the greateſt quantity from the malt waſh, and are of ſo much value to the diſtiller in the fattening of hogs, &c. that he often finds them one of the moſt valuable articles of the buſineſs.

The liquor left behind in the Still, after the rectifying the low wines into proof-ſpirit, is alſo called by ſome by the name of Still-bottoms; but this is little more than mere phlegm, or water impregnated with a few acid and oily parts, not worth ſeparating, unleſs for curioſity. The liquor left in the Still, after the rectifying the proof-ſpirit into alcohol, is alſo of the ſame kind.

The bottoms of melaſſes ſpirits ſeem calculated for many uſes. It is very probable that the vinegar-makers would find their account in the trying them; and the ſtrong and laſting yellow colour, with which they tinge the hands, may recommend them to the dyers. A ſmall proportion of them, added to the new treacle to be fermented, greatly promotes the operation, and increaſes the quantity of ſpirit.

The bottoms of the wine ſpirit, that is, the remainder, after diſtilling the ſpirituous part from damaged wines, or wine lees, may be brought to afford Mr. Boyle's acid ſpirit of wine, and that ſubſtance called by Becher the media ſubſtantia vini. A parcel of tartar may alſo be procured in very great perfection; and the laſt remainder may be converted into excellent and genuine ſalt of tartar. The liquor may otherwiſe be ſerviceable in making vinegar and white lead. *Shaw's Eſſay on Diſtillery.*

Still *houſe.* The Dutch have much the advantage of us in the ſtructure of their Still-houſes, and have every thing in great readineſs and neatneſs. The general rules in building theſe houſes ſhould be theſe.

The firſt caution is to lay the floor aſlope, not flat, where any wet work is to be performed; it ſhould alſo be well flagged with broad ſtones, ſo that no wet be detained in the crevices, but all may run off, and be let out at the drains made at the bottom and ſides.

The Stills ſhould be placed abreaſt on that ſide of the Still-houſe to which the floor has its current. The largeſt Stills in Holland, for their greateſt works, are never of that monſtrous ſize that we ſee them of in England, but much more manageable and handy, as ſeldom containing more than ſix or eight hogſheads; and, with ſuch Stills, a ſingle hand will perform much more buſineſs than ten with one of a much larger ſize. Fronting the Stills, and adjoining to the back-wall, ſhould be a ſtage for holding the fermenting backs, and theſe, being placed at a proper height, may empty themſelves, by means of a cock and a canal, into the Stills, which are thus charged with very little trouble.

Near this ſet of fermenting backs ſhould be placed a pump or two, that may readily ſupply them with water by means of a trunk or canal, leading to each back. Under the pavement, adjoining to the Stills, ſhould be a kind of cellar, wherein to lodge the receivers, each of which ſhould be furniſhed with its pump, to raiſe the low wines into the Still for rectification; and through this cellar the refuſe waſh, or Still-bottoms, ſhould be diſcharged by means of a hoſe, or other contrivance. Theſe are the principal things to be regarded in the erecting a Still-houſe for the original production of ſpirits, and, if theſe rules are well obſerved, malt-ſpirit will be made with little more trouble than melaſſes; for by this means the buſineſs of brewing and cooling the waſh, which, according to the method generally practiſed in England, takes up ſo much time and trouble, is entirely ſaved, fermentation is carried on to a much greater advantage, and the quantity of ſpirit increaſed. *Shaw's Eſſay on Diſtillery.* See the article Malt *Diſtillery.*

STOCCA'TO, in the Italian muſic, ſignifies that every note muſt be divided and ſeparated from the next in a very plain and diſtinct manner. *Boſſard's Muſical Dict.*

STOCKS, among ſhip-carpenters, a frame of timber and great poſts, made aſhore to build pinnaces, ketches, boats, and ſuch ſmall craft, and ſometimes ſmall frigates. Hence we ſay, a ſhip is on the Stocks, when ſhe is a building.

STŒ'CHAS, *French lavender*, in botany, a genus of plants, whoſe characters are: it hath a labiated flower, conſiſting of one leaf; whoſe upper lip is upright, and cut in two; but the under lip, or beard, is cut into three parts; but both are ſo divided, as at firſt to appear like a flower cut into five ſegments; out of whoſe flower-cup riſes the pointal, attended by four embryo's, which afterwards become ſo many roundiſh ſeeds incloſed in the flower-cup: to theſe marks muſt be added, that the flowers are ranged in a various ſeries into ſcaly heads; out of the top of which peep ſome ſmall leaves, which look very beautifully.

The flowers of the Stœchas are much uſed in medicine, in diſeaſes of the head and nerves, eſpecially ſuch as are ſuppoſed to ariſe from cold cauſes. They alſo promote the evacuation by urine, and by the menſes, and in ſome places are eſteemed one of the greateſt antidotes, and given in large doſes againſt the effect of poiſons, and the bites of venomous animals. Meſue, and the Arabians in general, ſpeak of it as a purge, and particularly as good in caſes where phlegm was to be evacuated; though they ſay it did this but ſlowly and weakly. At preſent we do not acknowledge any purging quality in it. There is a very fragrant oil drawn from the flowers and tops of this plant, in the ſame manner as that from lavender; but it is not much in uſe with us. The flowers are an ingredient in the Venice treacle, mithridate, and ſome other of the officinal compoſitions.

It is to be obſerved that there is another plant, called Stœchas, in the ſhops; and, by the writers on the Materia Medica, this has the epithet citrina, for its diſtinction from the Stœchas we have been treating of, which is either called Stœchas without any addition, or Stœchas Arabica. The citrine Stœchas has none of the virtues of this kind, nor is it of the ſame genus of plants.

Theſe plants may be cultivated by ſowing their ſeeds upon a bed of light dry ſoil in March; and, when the plants are come up, they ſhould be carefully cleared from weeds until they are two inches high; at which time they ſhould be removed; therefore there muſt be a ſpot of light dry ground prepared, and laid level, which muſt be trodden out in beds; into which the plants ſhould be planted at about five or ſix inches diſtance each way, obſerving to water and ſhade them until they have taken root; after which they will require no further care, but to keep them clear from weeds the following ſummer; but, if the winter ſhould prove very ſevere, it will be proper to cover them with mats, peaſe-haulm, or ſome other light covering, to guard them againſt the froſt, which otherwiſe would be apt to injure them while they are ſo young: but in March, or the beginning of April, the following ſpring, they muſt be removed in the places where they are to remain; obſerving, if poſſible, to tranſplant them in a warm moiſt ſeaſon, and not to let them remain long above-ground; for if their roots are dried they ſeldom grow well after. The ſoil in which theſe are planted ſhould be a dry warm ſand or gravel; and, the poorer the ſoil is in which they are planted, the better they will endure the cold of the winter, provided the ground be dry; though, indeed, the plants will thrive better in ſummer upon a rich moiſt mould; but then they will not produce ſo many flowers, nor will the plant afford near ſo ſtrong an aromatic ſcent; as is the caſe with moſt ſorts of aromatic plants.

Theſe plants may alſo be propagated by planting ſlips or cuttings of any of the kinds in the ſpring, obſerving to refreſh them with water until they have taken root; after which, they may be managed as hath been directed for the ſeedling-plants; but as thoſe plants, raiſed from ſeeds, are much better than theſe; it is hardly worth while to propagate them this way, eſpecially ſince their ſeeds ripen ſo well in this country.

STONE-*braſh*, in agriculture, is a light lean ſoil, full of larger and ſmaller maſſes of rubble-ſtones.

Theſe are to be tilled according to the condition in which they are found, for if they are graſſy they fallow them pretty late; but, if they have no graſs upon them, they fold them in winter, when the ſheep's dung, with the help of ſome hay-ſeed, will furniſh them with graſs: or elſe, early in the ſpring, they lay upon them old thatch or ſtraw, or the ſtrawy part of old dung-hills, earth out of ditches, or the like, which will all, more or leſs, help forward a coat of graſs upon the land; for it is a rule, in regard to theſe lands, that they muſt have a covering of graſs before they are fallowed, elſe they will yield but a poor crop. *Plot's Oxfordſhire.*

STO'NY *land.* The farmers expreſs by this term two ſorts of land, the one full of large flints and pebbles, and the other full of fragments of free-ſtone, and other coarſe ſtones. Theſe lands in many places yield good crops, and the general rule is, that in ſtiff and cold lands the ſtones ſhould be as carefully picked out as may be, but in light and dry grounds they ſhould be left. In Oxfordſhire they have great quantities of a lean earth, and a ſmall rubble-ſtone, or a ſowre ſort of land mixed with it; this is ſometimes very full of weeds, and ſometimes very clear of them: if they are weedy, they fallow them late; but if they be ſeary, as they expreſs it, that is, if they have ſwerd upon them, they either fold them in winter, and add ſome hay-ſeed to the Sheep's dung, to bring up graſs; or elſe they lay old thatch, or ſtraw, and dung upon it; for they reckon, that, if theſe lands have no ſwerd upon them before they are fallowed, they will by no means be brought to bear a good crop, but a great deal of May-weed, and other unprofitable herbs. In September, November, and December, they fallow as the ſwerd directs them: if this is done in either of the two laſt months, they call it a winter fallowing, and never ſtir it again till they plow it, and ſow it with barley; and theſe lands are reckoned to do better than if finely tilled. They will bear wheat and meſlin in a kindly year, and large crops of barley, if they are well managed, and kept in good heart.

They always fallow theſe lands every other year, unleſs they ſow peaſe upon them; ſometimes they ſow them with lentils; and, when they are quite worn out, they lay them down for clover, or rye-graſs. *Mortimer's Huſbandry.*

STOOL, in mining, is uſed when the miners leave digging deeper, and work in the ends forward. The end before them is called the Stool. *Houghton's Compl. Miner.*

STO'PPER, in a ſhip, a piece of rope having a wale-knot at one end, with a lannier ſpliced into it; and at the other end made faſt in the place where it is to be uſed. Its uſe is to ſtop the main-halliards, or the cable.

STOVES, are contrivances for the preſerving ſuch tender exotic plants, which will not live in theſe northern countries, without artificial warmth in winter. Theſe are built in different methods, according to the ingenuity of the artiſt, or the different purpoſes for which they are intended; but in England they are at preſent reducible to two.

The firſt is called a dry Stove, being ſo contrived, that the flues through which the ſmoke paſſes are either carried under the pavement of the floor, or elſe are erected in the back-part of the houſe, over each other, and are returned ſix or eight times the whole length of the Stove. In theſe Stoves the plants are placed on ſhelves of boards laid on a ſcaffold above each other, for the greater advantage of their ſtanding in ſight, and enjoying an equal ſhare of light and air. In theſe Stoves are commonly placed the tender ſorts of aloes, cereus's, euphorbiums, tithymals, and other ſucculent plants, which are impatient of moiſture in winter; and therefore require, for the moſt part, to be kept in a ſeparate Stove, and not placed among trees, or herbaceous plants, which perſpire freely, and thereby often cauſe a damp air in the houſe, which is imbibed by the ſucculent plants, to their no ſmall prejudice. Theſe Stoves may be regulated by a thermometer, ſo as not to overheat them, nor to let the plants ſuffer by cold; in order to which, all ſuch plants, as require nearly the ſame degree of heat, ſhould be placed by themſelves in a ſeparate houſe; for, if in the ſame Stove there are plants placed of many different countries, which require as many different heats, by making the houſe warm enough for ſome plants; others, by having too much heat, are drawn and ſpoiled.

The other ſorts of Stoves are commonly called bark Stoves, to diſtinguiſh them from the dry Stoves already mentioned. Theſe have a large pit, nearly the length of the houſe, three feet deep, and ſix or ſeven feet wide, according to the breadth of the houſe; which pit is filled with freſh tanners bark, to make an hot-bed; and in this bed the pots of the moſt tender exotic trees, and herbaceous plants, are plunged: the heat of this bed being moderate, the roots of the plants are always kept in action; and the moiſture, detained by the bark, keeps the fibres of their roots in a ductile ſtate, which, in the dry Stove, where they are placed on ſhelves, are ſubject to dry too faſt, to the great injury of the plants. In theſe Stoves, if they are rightly contrived, may be preſerved the moſt tender exotic trees and plants, which, before the uſe of the bark was introduced, were thought impoſſible to be kept in England; but, as there is ſome ſkill required in the ſtructure of both theſe Stoves, we ſhall deſcribe them as intelligibly as poſſible, particularly the bark Stove; by which it is hoped every curious perſon will be capable of directing his workmen in their ſtructure.

The dimenſion of this Stove ſhould be proportioned to the number of plants intended to be preſerved, or the particular fancy of the owner; but their length ſhould not exceed forty feet, unleſs there are two fire-places; and, in that caſe, it will be proper to make a partition of glaſs in the middle, and to have two tan-pits, that there may be two different heats for plants from different countries, for the reaſons before given in the account of dry Stoves; and were I to erect a range of Stoves, they ſhould be all built in one, and only divided with glaſs partitions, at leaſt, the half way towards the front; which will be of great advantage to the plants, becauſe they may have the air in each diviſion ſhifted by ſliding the glaſſes of the partitions, or by opening the glaſs-door, which ſhould be made between each diviſion, for the more eaſy paſſage from one to the other.

This Stove ſhould be raiſed above the level of the ground, in proportion to the drineſs of the place; for, if it be built on a moiſt ſituation, the whole ſhould be placed upon the top of the ground; ſo that the brick-work in the front muſt be raiſed three feet above the ſurface, which is the depth of the bark-bed, whereby none of the bark will be in danger of lying in water; but, if the ſoil be dry, the brick-work in front need not be more than one foot above-ground, and the pit may be ſunk two feet below the ſurface. Upon the top of this brick-work, in front, muſt be laid the plate of timber, into which the wood-work of the frame is to be mortiſed; and the upper timber in front muſt be placed four feet aſunder, or ſomewhat more, which is the proportion of the width of the glaſs-doors or ſaſhes: theſe ſhould be about ſix feet and an half, or ſeven feet long, and placed upright; but from the top of theſe ſhould be ſloping glaſſes, which ſhould reach within three feet of the back of the Stove, where there ſhould be a ſtrong crown-piece of timber placed, in which there ſhould be a groove made for the glaſſes to ſlide into. The wall in the back-part of the Stove ſhould be at leaſt thirteen inches thick; but eighteen inches is ſtill better; becauſe, the thicker the outſide wall is built, the more the heat of the flues will be kept in the houſe; and carried up, about nine feet above the ſurface of the bark-bed; and, from the top of this wall, there ſhould be a ſloping roof to the crown-piece where the glaſſes ſlide in. This crown-piece ſhould be about ſixteen feet high from the ſurface of the bark-bed or floor, which will give a ſufficient declivity to the ſloping glaſſes to carry off the wet, and be of a reaſonable height for containing many tall plants. The back-roof may be ſlated, covered with lead, or tiled, according to the fancy of the owner: for the manner of this outſide building is often very various, and differently built.

In the front of the houſe there ſhould be a walk, about eighteen or twenty inches wide, for the conveniency of walking; next to which the bark pit muſt be placed, which ſhould be in width proportionable to the breadth of the houſe: if the houſe is twelve feet wide, which is a due proportion, the pit may be ſeven feet wide; and behind the pit ſhould be a walk eighteen inches wide, to paſs in order to water the plants, &c. then there will be twenty-two inches left next the back-wall, to erect the flues, which muſt be all raiſed above the top of the bark-bed: theſe flues ought to be one foot wide in the clear, that they may not be too ſoon ſtopped with the ſoot; and the lower flue, into which the ſmoke firſt enters from the fire, ſhould be two feet deep in the clear; and this may be covered either with caſt iron plates, or broad tiles; over this the ſecond flue muſt be returned back again; which may be eighteen inches deep, and covered on the top as before; and ſo, in like manner, the flues may be returned over each other three or four times, that the heat may be ſpent before the ſmoke paſſes off. The thickneſs of the wall in front of theſe flues need not be more than four inches; but it muſt be well jointed with mortar, and plaiſtered withinſide to prevent the ſmoke from getting into the houſe; and the outſide ſhould be faced with mortar, and covered with a coarſe cloth, to keep the mortar from cracking, as is practiſed in ſetting up coppers. If this be carefully done, there will be no danger of the ſmoke entering the houſe, which cannot be too carefully avoided; for there is nothing more injurious to plants than ſmoke, which will cauſe them to drop their leaves; and, if it continue long in the houſe, will intirely deſtroy them.

The fire-place may be made either at one end, or in the middle, according as there is moſt conveniency; for, where-ever it is placed, it ſhould have a ſhed over it, and not be expoſed to the open air; for it will be impoſſible to make the fire burn equally, where the wind has full ingreſs to it; and it will be troubleſome to attend the fire in wet weather, where it is expoſed to the rain.

The contrivance of the furnace muſt be according to the fuel which is deſigned to burn: but, as turf is the beſt firing for Stoves, where it can be had, becauſe it burns more moderately, and laſts longer, than any other ſort of fuel, and ſo requires leſs attendance, I ſhall deſcribe a proper ſort of furnace for that purpoſe.

The whole of this furnace ſhould be erected within the houſe, which will be a great addition to the heat; and the front wall on the outſide of the fire-place, next the ſhed, ſhould be three bricks thick, the better to prevent the heat from coming out that way. The door of the furnace, at which the fuel is put in, muſt be as ſmall as conveniently may be to admit of the fuel; and this door ſhould be placed near the upper part of the furnace, and made to ſhut as cloſe as poſſible; ſo that there may but little of the heat paſs off through it. This furnace ſhould be about twenty inches deep, and ſixteen inches ſquare at bottom; but may be ſloped off on every ſide, ſo as to be two feet ſquare at the top; and under this furnace ſhould be a place for the aſhes to fall into, which ſhould be about a foot deep, and as wide as the bottom of the furnace: this ſhould alſo have an iron door to ſhut as cloſe as poſſible; but juſt over the aſh-hole, above the bars which ſupport the fuel, ſhould be a ſquare hole about four inches wide, to let in air to make the fire burn: this muſt alſo have an iron frame, and a door to ſhut cloſe when the fire is perfectly lighted, which will make the fuel laſt the longer, and the heat will be more moderate.

The top of this furnace ſhould be nearly equal to the top of the bark-bed, that the loweſt flue may be above the fire; ſo that there may be a greater draught for the ſmoke; and the furnace ſhould be covered with a large iron plate, cloſely cemented to the brick-work, to prevent the ſmoke from getting out; or it may be arched over with bricks: but you ſhould be very careful, where-ever the fire is placed, that it be not too near the bark-bed; for the heat of the fire will, by its long continuance, dry the bark, ſo that it will loſe its virtue, and be in danger of taking fire; to prevent which, it will be the beſt method to continue an hollow between the brick-work of the fire and that of the pit, about eight inches wide; which will effectually prevent any damage ariſing from the heat of the fire; and there ſhould be no wood-work placed any where near the flues, or the fire-place, becauſe the continual heat of the Stove may in time dry it ſo much, as to cauſe it to take fire; which ought to be very carefully guarded againſt.

The entrance into this Stove ſhould be either from a greenhouſe, the dry Stove, or elſe through the ſhed where the fire is made, becauſe, in cold weather, the front-glaſſes muſt not be opened.

The other ſort of Stove, which is commonly called the dry Stove, as was before ſaid, may be either built with upright and ſloping glaſſes at the top, in the ſame manner, and after the ſame model of the bark Stove; or elſe the front-glaſſes, which ſhould run from the floor to the cieling, may be laid ſloping, to an angle of forty-five degrees, the better to admit the rays of the ſun in ſpring and autumn: the latter method has been chiefly followed by moſt perſons who have built this ſort of Stoves: but, were I to have the contrivance of a Stove of this kind, I would have it built after the model of the bark Stove, with upright glaſſes in front, and ſloping glaſſes over them, becauſe this will more eaſily admit the ſun at all the different ſeaſons; for, in ſummer, when the ſun is high, the top glaſſes will admit the rays to ſhine almoſt all over the houſe; and, in winter, when the ſun is low, the front glaſſes will admit its rays; whereas, when the glaſſes are laid to any declivity in one direction, the rays of the ſun will not fall directly thereon above a fortnight in autumn, and about the ſame time in ſpring; and, during the other parts of the year, they will fall obliquely thereon; and, in ſummer, when the ſun is high, the rays will not reach above five or ſix feet from the glaſſes.

Beſides, the plants placed towards the back-part of the houſe will not thrive int he ſummer-ſeaſon for want of air; whereas, when there are ſloping glaſſes at the top, which run within four feet of the back of the houſe; theſe, by being drawn down in hot weather, will let in perpendicular air to all the plants; and, of how much ſervice this is to all ſort of plants, every one who has had opportunity of obſerving the growth of plants in a Stove, will eaſily judge: for, when plants are placed under cover of a cieling, they always turn themſelves towards the air and light, and thereby grow crooked; and if, in order to preſerve them ſtraight, they are turned every week, they will nevertheleſs grow weak, and look pale and ſickly, like a perſon ſhut up in a dungeon; for which reaſons, I am ſure, whoever has made trial of both ſorts of Stoves, will readily join with me to recommend the model of the bark Stove for every purpoſe. *Miller's Gard. Dict.*

STOWS, in mining, are ſeven pieces of wood, ſet upon the ſurface of the earth, faſtened together with pins of wood.

STRAIKS, in the military art, are ſtrong plates of iron, ſix in number, fixed with large nails, called Straik-nails, on the circumference of a cannon-wheel, over the joints of the fellows, both to ſtrengthen the wheel, and to ſave the fellows from wearing on hard ways or ſtreets.

STRAKE, in the ſea phraſe, a ſeam between two planks; as the garboard Strake is the firſt ſeam next the keel. They ſay alſo a ſhip heels a Strake; that is, hangs or inclines to one ſide the quantity of a whole plank's breadth.

STRA'WBERRY, *fragaria*, in botany.—The common Strawberry is frequent in the woods of England, and is thence tranſplanted into gardens. The beſt ſeaſon for this is in September, that the plants may be rooted before the froſts. They may alſo be tranſplanted in February; but then, if the ſpring ſhould prove dry, they will require a great deal of watering to keep them alive.

The proper ſoil for Strawberries is a light hazely loam, not over rich; the ground muſt be well dug, and very carefully cleared of all noxious weeds; and, when it is levelled even, it ſhould be marked out into beds about three feet and a half wide, leaving a path-way between each bed of two feet broad. In each of theſe beds ſhould be planted four rows of plants, ſo that they may ſtand about a foot diſtance from each other in the rows, and they ſhould be planted at about eight inches plant from plant in each. This is the proper diſtance for the wood Strawberry, which is of the leaſt growth of any; but the ſcarlet Strawberry muſt be planted at a foot diſtance every way, and the hautboy ſixteen inches; and, finally, the large Chili Strawberry, which is the largeſt grower of all, muſt be ſet at twenty-two inches diſtance plant from plant.

In the ſpring, when the Strawberries begin to flower, if the ſeaſon is dry, they muſt be very plentifully watered, and they muſt be kept very carefully cleared from weeds. At Michaelmas the beds ſhould be dreſſed, the weeds all very carefully taken up, all the ſtrings or runners muſt be taken from the roots, and the weak plants, which ſtand too cloſe, muſt be pulled up; throwing a little fine earth, at the ſame time, over the plants, alſo greatly ſtrengthens their roots. Theſe beds, however, well managed, will not continue good above three years; and, the beds of the firſt year bearing but few fruit, it is neceſſary to new-plant ſome freſh ground every third year, and deſtroy the old beds; but the new ones muſt be firſt of one year's growth.

Different palates prefer different ſpecies of Strawberries, but the white-fruited one is, of all others, the beſt flavoured; though it is but a very bad bearer. The great Chili Strawberry is cultivated in the fields in that country; it is a much ſtronger and larger plant than any of our kinds, and its fruit is as large as a walnut, but not ſo well taſted as our own Strawberries. Mr. Frezier brought them ſome years ago to Paris, and, ſince that, they have been ſpread over the ſeveral parts of Europe. They grow beſt in a loamy ſoil under the ſhade of trees. *Miller's Gard. Dict.*

STREAK-*fallowing*, in huſbandry, a particular ſort of tillage. The way of doing it, is to plow one furrow, and leave one, ſo that but half the land is plowed, each furrow that is ſo lying on that which is not: when this is ſtirred, it is then clean plowed, and laid ſo ſmooth, that it will come, at ſowing time, to be as plain as before. This is done, when lean and poor lands are not ſwardy enough to bear clean tillage, nor light enough to lie to get ſward. The intent of this tillage is to keep the ſun from ſcorching them too much; but in many places they think this wears their land too faſt, and therefore are not fond of having recourſe to it. *Plot's Oxfordſhire.*

STRI'KING-*wheel*, in a clock, the ſame with that which by ſome is called the pin-wheel, becauſe of the pins which are placed on the round or rim, which in number are the quotient of the pinion divided by the pinion of the detent-wheel. In ſixteen-days clocks, the firſt, or great wheel, is uſually the pin-wheel: but, in ſuch as go eight days, the ſecond wheel is the pin-wheel, or ſtriking-wheel.

STRINGS *of metal*, a term uſed by our miners to expreſs thoſe thin and ſmall veins of ore, into which the beds or veins degenerate towards their terminations.

STRO'BILUS, among botaniſts, a kind of pericarpium, formed of a number of vaginæ with contorted points applied cloſe to one another.

STRO'CAL, in glaſs-making, a long iron inſtrument like a fire-ſhovel, uſed to empty the metals out of a broken pot into a whole one. *Neri's Art of Glaſs.*

STROMA'TEUS, in ichthyology, a genus of fiſhes of the malacopterygious, or ſoft-finned kind, the characters of which are theſe: the body is very much compreſſed, and very broad and thin; it has no belly-fins, and has only one back-fin, which is extended over the whole back. The only known ſpecies of this genus is the callichthys of authors, a fiſh called the fiatola at Rome. The tail is very forked; the mouth is very ſmall; the teeth are placed in the jaws and palate; and the tongue is ſmooth and broad. The body is ſtriped croſsways.

STRO'MBUS, in conchyliology, the name of a genus of ſhells, nearly allied to the buccinums, and called by the generality of authors turbo.

STRUT, a term uſed by ſome builders for that brace which is framed into the king-piece and the principal rafters.

STU'DDING-*ſail*, in a ſhip, the ſame with what is called a gooſe-wing.

STUM, in the wine-trade, a term for the unfermented juice of the grape, when it has been ſeveral times racked off, and ſeparated from its ſediment. The caſks are for this purpoſe well matched, or fumigated with brimſtone every time, to prevent the liquor from fermenting, as it would otherwiſe readily do, and become wine.

It is this fume of the ſulphur from the match that prevents, in this caſe, all tendency to fermentation, and continues the natural juice of the grape in a ſweet taſte, fit to be readily mixed with wines inſtead of ſugar; for which purpoſe it is very much uſed in Holland, and ſome other countries, as alſo for giving a new fret or briſkneſs to decayed wines. So that very large quantities of this Stum are annually imported to all parts along with the foreign wines; and after the ſame manner a Stum is prepared in England from the juice of apples, which ſerves the ordinary purpoſes of the wine-cooper. In the preſerving this liquor in this ſtate, we ſee the vaſt uſe of brimſtone, for it could never be done otherwiſe than by the matching the caſks. *Shaw's Lectures.*

Artificial STUM.— An artificial muſt, or Stum, as good as the natural, and as fit for the refermenting, fretting, improving, or making of wines, vinegars, or ſpirits, may be prepared in the following manner:

Take three pounds of fine lump ſugar, or ſuch as has been well refined from its treacle; melt it in three quarts of water, and add in the boiling of Rheniſh tartar, finely powdered, half an ounce; this diſſolves with a remarkable ebullition, and gives a grateful acidity to the liquor; take the veſſel from the fire, and ſuffer it to cool, and you have an artificial muſt, which, in all reſpects, reſembles the natural taſte and ſweet juice of a white flavourleſs grape, when well purified, and racked off from its ſediment, in order to make Stum. If this artificial muſt be ſtummed, that is, well fumigated, with burning brimſtone, it becomes a perfect Stum, and may be made of any flavour, at the diſcretion of the artiſt. *Shaw's Lectures.*

STU'RIO, *the ſturgeon*, a very well known large and finetaſted fiſh, caught in many places, and ſometimes in the river Thames, being one of theſe fiſhes called anadromi by authors, which ſpend a part of their time in the ſea, and a part in rivers.

It never goes into the ſea to any great diſtance, and never is caught there of any very great ſize. The ſea ſerves for its production, but it is only in large rivers that it grows to its uſual ſize. *Ray's Ichthyogr.*

STYE, or STITHE, the Engliſh name for a diſorder on the eye-lids, called by the phyſicians hordeolum, and by ſome crithe, chalazium, or grando.

It is a ſmall encyſted tumor, uſually about the bigneſs of a barley-corn, which ſometimes degenerates into matter, and occaſions great pain and uneaſineſs.

When they are ſmall, it is beſt to let them take their own courſe; but if ſo large as to occaſion deformity, or danger of hurting the ſight, the way to extirpate them is to make a longitudinal inciſion on the part, and carefully take them out whole; or, if it cannot be thus got out clean, it muſt be cut out, as far as may be, with ſciſſors, and dreſſed with Ægyptian ointment, and a little red precipitate; or touched at times with the common cauſtic, till eaten thoroughly away, and then the wound dreſſed and healed in the common manner.

STYLO'BATON, or Stylobata, in architecture, the ſame with the pedeſtal of a column. It is ſometimes taken for the trunk of the pedeſtal, between the cornice and the baſe, and then called truncus. It is alſo called by the name of abacus.

SUBDU'PLICATE ratio of any two qualities, is the ratio of their ſquare roots.

SU'BITO, in the Italian muſic, is uſed to ſignify that a thing is to be performed quickly and haſtily; thus we meet with volti Subito, turn over the leaf quickly.

Blue SUB'LIMATE, a preparation of mercury with ſome other ingredients, yielding a fine blue for painting. The method of making it is this: take quickſilver two parts, flower of brimſtone three parts, ſal ammoniac eight parts; grind theſe upon a porphyry, and with the quickſilver put them into a long-necked glaſs veſſel luted at bottom; place it in a ſand-heat, and when the moiſture is aſcended, you will have a fine blue Sublimate for painting. *Neri's Art of Glaſs.*

SUBSI'STENCE, in the military art, is the money paid to the ſoldiers weekly, not amounting to their full pay, becauſe their cloaths, accoutrements, tents, bread, &c. are to be paid; it is likewiſe the money paid the officers upon accompt, till their accompts be made up, which is generally once a year, and then they are paid their arrears.

SU'BSTANCE (*Dict.*)—Spinoſa maintains, that there is but one only Subſtance in nature, whereof all created things are ſo many different modifications; and thus he makes the ſoul of the ſame Subſtance with the body. The whole univerſe, according to him, is but one Subſtance; which Subſtance he holds endowed with an infinity of attributes, in the number of which are thinking and extenſion. All bodies are modifications of this Subſtance, conſidered as extended; and all ſpirits modifications of the ſame Subſtance, conſidered as thinking.

Mr. Locke's philoſophy of Subſtances is more orthodox: our ideas of Subſtance, that great author obſerves, are only ſuch combinations of ſimple ideas, as are taken to repreſent diſtinct things, ſubſiſting by themſelves; in which the confuſed idea of Subſtance is always the chief. Thus the combination of the ideas of a certain figure, with the powers of motion, thought, and reaſoning, joined to Subſtance, make the ordinary idea of man; and thus the mind obſerving ſeveral ſimple ideas to go conſtantly together, which being preſumed to belong to one thing, or to be united in one ſubject, are called by one name; which we are apt, afterwards, to talk of and conſider as one ſimple idea.

We imagine the ſimple ideas do not ſubſiſt by themſelves; but ſuppoſe ſome ſubſtratum, wherein we ſubſiſt, which we call Subſtance.

The idea of pure Subſtance is nothing but the ſuppoſed, yet unknown ſupport of thoſe qualities which are capable of producing ſimple ideas in us.

The ideas of particular Subſtances are compoſed out of this obſcure and general idea of Subſtance, together with ſuch combinations of ſimple ideas, as are obſerved to exiſt together, and ſuppoſed to flow from the internal conſtitution, and unknown eſſence of that Subſtance.

Thus we come by the ideas of man, horſe, gold, &c. Thus the ſenſible qualities of iron, or a diamond, make the complex idea of thoſe Subſtances, which a ſmith, or a jeweller, commonly knows better than a philoſopher.

The ſame happens concerning the operations of the mind, viz. thinking, reaſoning, &c. which we concluding not to ſubſiſt by themſelves, nor apprehending how they can belong to body, or be produced by it, we think them the actions of ſome other Subſtance, which we call ſpirit; of whoſe Subſtance or nature we have as clear a notion, as of that of body; the one being but the ſuppoſed ſubſtratum of the ſimple ideas we have from without; as the other of thoſe operations, which we experiment in ourſelves within: ſo that the idea of corporeal Subſtance in matter is as remote from our conceptions, as that of ſpiritual Subſtance.

Hence we may conclude, that he has the perfect idea of any particular Subſtance, who has collected moſt of thoſe ſimple ideas which exiſt in it; among which, we are to reckon its active powers and paſſive capacities, though not ſtrictly ſimple ideas.

Subſtances are generally diſtinguiſhed by ſecondary qualities; for our ſenſes fail us in the diſcovery of primary ones, as the bulk, figure, texture, &c. of the minute parts of bodies, on which their real conſtitutions and differences depend.—And ſecondary qualities are nothing but powers, with relation to our ſenſes.

The ideas that make our complex ones of corporeal Subſtances, are of three ſorts: firſt, the ideas of primary qualities of things, which are diſcovered by our ſenſes; ſuch as bulk, figure, motion, &c. Secondly, the ſenſible ſecondary qualities, which are nothing but powers to produce ſeveral ideas in us, by our ſenſes. Thirdly, the aptneſs we conſider in any Subſtance, to cauſe or receive ſuch alterations in its primary qualities, as that the Subſtance ſo altered ſhould produce in us different ideas from what it did before.

Beſides the complex ideas we have of material Subſtances, by the ſimple ideas taken from the operations of our own minds, which we experiment in ourſelves, as thinking, underſtanding, willing, knowing, &c. co-exiſting in the ſame Subſtance; we are able to frame the complex idea of a ſpirit: and this idea of an immaterial Subſtance is as clear, as that we have of a material.

By joining theſe with Subſtance, of which we have no diſtinct idea, we have the idea of ſpirit: and by putting together the ideas of coherent ſolid parts, and a power of being moved, joined with Subſtance, of which likewiſe we have no poſitive idea; we have the idea of matter.

Further, there are other ideas of Subſtances, which may be called collective, which are made up of any particular Subſtance, conſidered as united into one idea; as a troop, army, &c. which the mind does by its power of compoſition. Theſe collective ideas are but the artificial draughts of the mind, bringing things remote, and independent, into one view, the better to contemplate and diſcourſe of them united into one conception, and ſignified by one name. For there are no things ſo remote, which the mind cannot, by this art of compoſition, bring into one idea; as is viſible in that ſignified by the name univerſe.

Such is the generally received doctrine of Subſtance: but Bp. Berkeley, in his Principles of Human Knowledge, and Mr. Collier, in his Clavis Univerſalis, have made great refinements thereon.

SUBSTAN'TIAL, or Substancial, in the ſchools, ſomething belonging to the nature of Subſtance.

It is generally diſputed, whether or no there be ſuch things as Subſtantial forms? i. e. forms independent of all matter; or forms that are ſubſtances themſelves.

Substantial is alſo uſed in the ſame ſenſe with eſſential, in oppoſition to accidental: in which relation it gives room for abundance of diſtinguo's

SU'BSTANTIVE (*Dict.*)—All nouns either ſignify an individual, as Socrates, Alexander, &c. or a ſpecies, as man, horſe, &c. or an eſſential quality, as rational, material, &c. or an accidental one, as black, white, good, fair, &c. or a dignity, office, art, &c. as king, preſident, philoſopher, &c.

Thus have we four kinds of nouns; whereof the firſt is very rarely taken adjectively; for, as they ſignify individuals or particular beings, they can ſcarce be applied to any thing but the thing they properly ſignify: yet we have ſometimes known the name of Cato taken adjectively; as, 'This is to be Cato, indeed.' Nor does Malherbe ſcruple to ſay in French, 'Plus Mars que le Mars de la Thrace.' Add that proper names are ſometimes converted into the name of dignities, &c. as Cæſar, Auguſtus, &c. In which caſe, they may be conſidered, in the ſame light, as nouns of the fourth kind.—Nouns of the ſecond kind are alſo ſometimes taken adjectively, as, 'He is much a man,' &c. The third kind are adjectives of themſelves. For the fourth kind, all grammarians rank them among Subſtantives, excepting F. Buffier who will have them to be adjectives; or, to uſe his own term, modificatives. Be that as it will, they are frequently uſed adjectively: 'He is more a king, and more a philoſopher, than any of his predeceſſors.'

Now for adjectives taken ſubſtantively, 1°, Participles paſſive are very rarely thus taken; though we ſometimes ſay, 'The loved are leſs happy than the lovers; the taught have the advantage of the untaught: the beſieged made a ſalley,' &c. And, 2°, Participles active are taken ſtill more rarely for Subſtantives. We ſcarce ever, e. gr. ſay 'the loving, the reading;' but 'the lover, the reader:' yet we ſay, 'the ſtudent, the proteſtant, the tenant, the appellant, the opponent,' &c. — 3°, For nouns adjectives, thoſe applied to men are not only uſed ſubſtantively, but are even become Subſtantives by uſe; whether they be ſuch as regard religion; as 'Chriſtian, Pagan, Mahometan,' &c. or opinion; as 'Stoic, Peripatetic, Carteſian,' &c. or country; as 'the Engliſh, French, Italians;' or temperament; as 'the melancholic, phlegmatic, choleric,' &c. Under the ſame rule, are likewiſe comprehended abundance of adjectives, ſignifying a number of people agreeing in ſome common attribute; as, 'the learned, the great, the devout, the brave, the diſſolute,' &c. But uſe is here to be regarded; for we do not ſay 'the elegant,' as we ſay 'the learned;' but 'elegant writers,' &c. It is cuſtom, and the ear alone, that are to decide about theſe differences.

Again, adjectives taken Subſtantively, for other things beſides men, are either ſo uſed, to ſignify a number or ſet of things that have ſome common quality; or to expreſs an abſtract quality. In both which, as in thoſe of men, there are ſome authoriſed by cuſtom, and others formed every day on their model.

SVEGLIA'TO, in the Italian muſic, is uſed for a briſk, lively, gay manner of ſinging or playing. Thus they ſay maniera Svegliata.

SU'FFOCA'TIVE *catarrh*, in medicine, the name of a diſeaſe, which conſiſts in a copious eruption of a ſerous and mucous humour into the veſicles of the lungs, which takes its origin from a ſudden congeſtion of humours about the breaſt, and a flaccid and weak ſtate of the breaſt and lungs.

Method of cure. In the time of the fit a ſtimulating clyſter muſt be given, made of a decoction of marjoram and other warm herbs, with colocynth, and a few grains of euphorbium, in order to abate the infarction of the breaſt, and give a new courſe to the matter that might add to it; and, when there appears to be a plethora beſides, a vein muſt be immediately opened after the clyſter. After this, if the ſtomach be nauſeating and uneaſy, let a ſcruple of ſalt of vitriol be given as a vomit, with a large quantity of warm water; and, if the patient is of a very phlegmatic habit, a few grains of gamboge may be added to this, to carry the humour off downwards; or, if the caſe be very preſſing, a draught of a decoction of aſarum, or of tobacco, may be taken, the bad effects of which laſt are taken off by a draught of wine with the ſpices; and all this time there may be frictions and ſinapiſms applied to the lower extremities: and, finally, to attenuate and diſcuſs the mucous ſtaſis, gentle alexipharmics and ſudorifics may be given, ſuch as the eſſence of amber, tincture of ſalt of tartar, and tartariſed tincture of antimony; and all nitrous medicines are alſo of the greateſt uſe, as they partly mitigate the cauſes, and partly prepare the humours for evacuation; and, after all theſe, the cortex eleutheriæ is of great uſe in diſcuſſing and mitigating the pain. As ſoon as the fit is over, the corroborating medicines are to be given, and all things that can reſtore the parts to their due tone; of this number are the milder chalybeates, and the like; and with theſe analeptics are to be given, to recruit the fleſh and ſtrength, ſuch as emulſions, and a proper diet; and, in ſuch as are uſed to wine, the richeſt wines, in moderate quantities, and the higheſt foods will be of ſervice. If there be perceived a fever after the other ſymptoms are gone off, this muſt be cured by the gentle alexipharmics, and by powders of nitre, and the abſorbents; and, if a chronic indiſpoſition ſeems left behind, then the gums, which act as diſcutients, are to be given for ſome time, ſuch as the ammoniacum and ſagapenum, and a warm regimen is to be recommended. And, finally, to prevent a return of the diſeaſe, bleeding is very proper in the ſpring and autumn, and purging medicines taken in the intermediate time; the patient muſt alſo avoid all violent paſſions of the mind, and muſt never ſleep in a damp air. We are not to fear bleeding in the time of the fit, becauſe of the patient's complaining of want of ſtrength; for, as the danger of ſuffocation is ſudden and imminent, it muſt be ſuddenly removed, and, when that is done, the patient's ſtrength will return in good time: the ſame is alſo to be alledged in favour of the violent vomits. In people of very phlegmatic conſtitutions, bleeding is not neceſſary nor proper; but in theſe caſes a vomit is ſafe and right, and uſually gives great relief, eſpecially if the patient have eaten heartily ſome little time before. *Junker's Conſp. Med.*

SU'FFOLK-*powder*, the name of a medicinal powder, good for the bite of a mad dog. It had its name from a counteſs of Suffolk, who uſed to give it with great ſucceſs. It is ſtill kept as a ſecret in ſome private families, but ſeems to be only the ſtar of the earth, or the common buck-thorn plantain dried and powdered, or this powder with ſome very trifling addition. This plant has been famous for its virtues in this caſe a great while among us, and De Grey, in his Complete Farrier, gives the method by which he had cured dogs by it with great ſucceſs. See *Phil. Tranſ.* N°. 450.

SU'GAR-*candy*, *ſaccharum candum*, or *cryſtallinum*, — is Sugar depurated and and cryſtalliſed.

This is better made of earthed Sugar, than refined Sugar, in regard the former is ſweeter.

The Sugar to be uſed herein is firſt diſſolved in a weak lime-water, then clarified, ſcummed, ſtrained through a cloth, and boiled, and put in forms or moulds that are traverſed with little rods, to retain the Sugar, as it cryſtalliſes. Theſe forms are ſuſpended in a hot ſtove, with a pot underneath, to receive the ſyrup that drops out at the hole in the bottom, which is half ſtopped, that the filtration may be the gentler. When the forms are full, the ſtove is ſhut up, and the fire made very vehement.

Upon this the Sugar faſtens to the ſticks that croſs the forms, and there hangs in little ſplinters of cryſtal. When the Sugar is quite dry, the forms are broke and the Sugar taken out, candied. Red Sugar-candy they make, by caſting into the veſſel, where the Sugar is boiling, a little juice of the Indian fig; and, if it is deſired to have it perfumed, they caſt a drop of ſome eſſence in, when the Sugar is putting into the forms.

This method of making Sugar-candy is that of F. Labat, practiſed in the Caribbees: the method in Europe, deſcribed by Pomet, is ſomewhat different.

White SUGAR-*candy* they make of white refined Sugar, boiled with water into a thick ſyrup, in a large pan. It is candied in a ſtove, whither it is carried, incloſed in braſs peels, croſſed with little rods, about which the cryſtals faſten, as they are formed.

The fire of the ſtove is kept equable for fifteen days; after which the Sugar is taken out of the peels to be dried. Red or brown Sugar-candy is made like the white, except that they only uſe brown Sugars and earthen pots.

Barley SUGAR, *ſaccharum hordeatum*, is a Sugar boiled till it be brittle, and then caſt on a ſtone anointed with oil of ſweet almonds, and formed into twiſted ſticks, about the length of the hand, and the thickneſs of a finger.

It ſhould be boiled up with a decoction of barley, whence it takes its name; but in lieu thereof they now generally uſe common water, to make the Sugar the finer.—To give it the brighter amber colour, they ſometimes caſt ſaffron into it.—It is found very good for the cure of colds and rheums.

SUGAR-*ſpirit*, a name given by our diſtillers to a ſpirit made in England, Holland, and other places, from the waſhings, ſcummings, droſs, and waſte of a Sugar-baker's refining-houſe. The manner of preparing it is the ſame with that uſed for the malt and melaſſes ſpirits. The refuſe of the Sugar is fermented with water in the uſual manner, then diſtilled into what is called low wines, and afterwards rectified, without an addition, into proof ſpirit.

When the operation is well performed, and no foul, fœtid, or foreign matter, has got in among the waſh, this is a tolerably clean ſpirit. We uſually make it ſuch, but in Holland it is uſually made very nauſeous and diſagreeable; though capable, by an eaſy rectification familiar with us, though not much known abroad, of being brought to a fine and clean ſpirit. With us this Sugar ſpirit is uſed to mix with and adulterate brandy, rum, and arrac, which will receive a large doſe of it without its being at all diſcoverable; but the Dutch who have it very coarſe, can only adulterate rum with it, and even that will bear but a ſmall proportion, without being trayed by its nauſeouſneſs.

This Sugar ſpirit reduced to alcohol makes one of the pureſt ſpirits we are acquainted with, much ſuperior to that of melaſſes, and much more to that of malt. *Shaw's Eſſay on Diſt.*

Fixed SULPHUR is uſed by the enamellers, and is prepared in the following manner: boil flower of brimſtone in common oil for an hour, take the matter off the fire, and pour on it a quantity of very ſtrong vinegar, the flower of brimſtone will on this ſink to the bottom; pour off the liquors, and repeat the operation to the third time, and the powder then ſeparated is the fixed ſulphur. *Neri's Art of Glaſs.*

SUMP, in metallurgy, a round pit of ſtone lined with clay within, for the receiving the metal on its firſt fuſion from the ore. *Ray's Words.*

SUMP, in the Engliſh ſalt works, where ſea water is boiled into ſalt, is uſed as the name of a ſort of pond which they make at ſome ſmall diſtance from the ſaltern on the ſea ſhore, between full ſea and low water mark. From this pond they lay a pipe, through which, when the ſea is in, the water runs into a well adjoining to the ſaltern; and from this well they pump it into troughs, through which it is carried to their ciſterns, in order to be ready to ſupply the pans.

SUN-*fiſh*, mola, in ichthyology. See the article MOLA.

SUN-*flower*, corona ſolis, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind; its diſk is made up of floſcules, and its outer edge of ſemifloſcules; theſe ſtand upon the embryo ſeeds, and are ſeparated from one another by little leaves of an imbricated figure, and contained in a ſcaly huſk, or cup; the embryo's finally ripen into ſeeds furniſhed with two little leaves.

There are ſeveral different ſpecies of this flower, all which are very beautiful in large gardens. They are moſt of them annual plants, and are to be ſown every ſpring in a bed of good light earth. When the ſhoots are about three inches high, they muſt be tranſplanted into nurſery beds, and ſet at eight inches diſtant every way; they ſhould remain there till they are a foot high, and then be carefully taken up with a ball of earth at their roots, and planted in large borders, or intermixed in the boſquets of large growing plants; they muſt be frequently watered till they have taken root, and after that will require no farther care. In July the flowers appear, and ſtand a conſiderable time: the largeſt of theſe ſhould be left to ſtand for ſeed. The birds are very apt to devour this ſeed, but it ſhould be carefully guarded from them, and the head left on the plant till October, at which time it ſhould be cut off, and hung up to dry in an airy place, and in a month more the ſeeds will be perfectly hardened.

Several ſpecies of this plant alſo are perennial, and increaſe greatly by the root. Among theſe the common ſmaller flowered one is a very valuable plant in gardens, as it requires no culture, will grow in all ſoils and ſituations, and is a very ornamental flower, continuing in bloom from June to October. *Miller's Gard. Dict.*

SUN-*ſcorched*, a term uſed by our gardeners in ſome parts of England to expreſs a diſtemperature of fruit-trees, owing to the ſun's affecting them too forcibly and too ſuddenly; the conſequence of which is the loſs and withering of the fruit. Such trees only are ſubject to this, as are planted in places ſheltered from the ſpring ſun, and only open to the ſummer's; and it may be always cured by proper waterings.

SUPE'RFLUOUS *Interval*, in muſic, is one that exceeds a true diatonic interval by a ſemitone minor. Thus the

SUPERFLUOUS *Second*, or *tone*, contains a ſemitone minor more than a tone, or greater ſecond; and will therefore be expreſſed by $\frac{125}{108}$, or by $\frac{75}{64}$. The firſt of theſe expreſſions is a tone minor, and a ſemitone minor; ſince $\frac{10}{9} \times \frac{25}{24} = \frac{125}{108}$: and the other is a tone major, and a ſemitone minor; for $\frac{9}{8} \times \frac{25}{24} = \frac{75}{64}$. This laſt occurs in practice, and is one of the intervals of the chromaticum toniæum.

In temperate ſcales theſe two Superfluous tones coincide. Thus from B *b* to C ſharp, or from F to G ſharp, are Superfluous tones.

SUPERFLUOUS *Third*, is greater than the third major by a ſemitone minor, and will therefore be expreſſed by $\frac{125}{96} = \frac{5}{4} \times \frac{25}{24}$. It is not in uſe. It ſeems a fourth on our harpſichords. Thus from B *b* to D ſharp is, properly ſpeaking, a Superfluous third; but, D ſharp and E *b* being confounded, it paſſes for a fourth.

SUPERFLUOUS *Fourth*. This interval is expreſſed by $\frac{25}{16} = \frac{4}{3} \times \frac{25}{24}$. It is by practitioners, and in temperate ſcales, confounded with the tritonus.

SUPERFLUOUS *Fifth*, is expreſſed by $\frac{25}{16} = \frac{3}{2} \times \frac{25}{24}$. This is equal to two thirds major, for $\frac{5}{4} \times \frac{5}{4} = \frac{25}{16}$. The Superfluous fifth occurs in practice as from C to G ſharp.

SUPERLUOUS *Sixth*. This interval is of two kinds, being the reſpective complements of the two diminiſhed thirds to the octave. One only, ſtrictly ſpeaking, anſwers to the general definition of a Superfluous interval, which is that interval which exceeds the ſixth major by a ſemitone minor, and is therefore expreſſed by $\frac{125}{72} = \frac{5}{3} \times \frac{25}{24}$. But the other interval, which is a comma more than the former, and is two ſemitones major leſs than the octave, is chiefly uſed in harmony, as between B *b* and A ſharp, where it has a fine effect. It is expreſſed by $\frac{225}{128} = \frac{2}{1} : \frac{16}{15} : \frac{16}{15} = \frac{2}{1} : \frac{256}{225}$.

See the article INTERVAL.

SUPERFLUOUS *Seventh*, is expreſſed by $\frac{15}{8} \times \frac{25}{24} = \frac{125}{64}$. This is a dieſis leſs than the octave.

SUPERFLUOUS *Octave*, is a ſemitone minor more than the octave, as from C to C ſharp. It ſometimes occurs in the baſſes of inſtrumental pieces.

SU'SSEX *Marble*, a name given by many to a peculiar ſpecies of marble found in the county, the name of which it bears, and formerly much uſed in the pillars of churches, and other buildings, but now leſs in eſteem. The ground of this marble is grey, with a faint caſt of green, and it is very thick ſet in all parts with ſhells: theſe are chiefly of the turbinated kind, and they are generally filled with a white ſpar, which adds very greatly to the beauty of the ſtone.

It is plain, from conſidering the whole maſs of this marble, that this ſpar was received into the ſhells before they were depoſited in the marble. This is about the hardneſs of the common white Genoeſe marble, if any thing, ſomewhat more hard. The ſlender round ſcapi of the pillars in Weſtminſter-Abbey, and in many other of our Gothic buildings, are made of this kind of marble. Some people have thought that the ſcapi of pillars of this kind, which occur in moſt of our Gothic buildings, are artificial, and that they are a kind of fuſile marble caſt in cylindric moulds. But any one who will compare the marble, of which thoſe pillars are made, with its ſhells, and the ſpar they are filled with, with the marble of Suſſex quarries, will find both to be the ſame in every particular. *Woodward's Cat. of Foſſ.*

SU'TURE, in chirurgery, denotes a ſeam made to cloſe the lips of a wound, in order to its healing.

The ancients invented a great variety of Sutures, which they reduced to three kinds; incarnatives, reſtrictives, and conſervatives.

Incarnative SUTURE, is thus called, becauſe, by rejoining the edges of a wound, and keeping them together by means of a thread run acroſs them with a needle, they grow together, and incarnate as before.

This they ſubdivided into five kinds, viz. the 'interrupted, intertwiſted, penned, or feathered, with claſps, and the dry Suture.'

Of theſe five, two are perfectly diſuſed, viz. the feathered Suture, and the Suture with claſps, as being too barbarous, and at the ſame time unneceſſary. The firſt was called pinned, when little pins were made uſe of; and feathered, when the barrels of feathers or quills were uſed.

To perform it, two or three needles, threaded with a double thread, were paſſed through the lips of the wound, at a finger's breadth from each other, and a pin or feather put in the ſtitch; and another pin or feather bound with the ends of the ſame thread, and the feathers might keep the lips of the wound cloſe together.

To perform the ſecond, they had large, crooked claſps, pointed at each end; one of which they thruſt into the upper part of the wound, the other into the lower, to bring the lips together. Theſe Sutures, cruel as they were, are yet known to be uſeleſs; for in the only caſes where they ſhould ſeem ſerviceable, viz. in deep wounds, where the contraction of the fleſhy parts keeps the lips far aſunder, and in wounds of tendons; they expoſe the patient to terrible convulſions and ſhudderings, which are avoided, by diminiſhing the dilatation of the wounds, by moderate compreſſions, and waiting till the fibres relax.

Reſtrictive SUTURES, were thoſe wherewith they endeavoured to ſtop the flux of blood from large wounds, where any conſiderable veſſels were cut.

To this end, they invented ſeveral kinds, in the number whereof, were the ſhoe-makers, taylors, ſkinners, and other ſeams, each more impertinent than other. It is evident, the very deſign of ſuch a Suture is blameable: for ſuppoſing the wound ſo exactly ſewed up, that no blood could eſcape thro' the lips thereof; yet will it ſtill flow out of the veſſels, and will thus be forced to make its way between the laminæ of the muſcles, by which means the part will ſwell, rot, and gangrene. Yet, the ſkinners Suture, ſutura pellionum, is ſtill in uſe for wounds of the inteſtines: it is thus called, becauſe the ſkinners uſe the like, in ſewing up the holes made by the butchers, in fleaing off the ſkin.

Conſervative SUTURE, is that kind of ancient Suture, whereby the lips of large wounds, wherein there was a loſs of ſubſtance, were prevented from receding too far. But a bandage, now, ſuffices.

Intertwiſted SUTURE, is thus called, becauſe, the needles being left ſticking in the wound, the thread is wound around them; much after the ſame manner as the taylors do the threaded needles they keep in their ſleeves, &c. This Suture is performed two ways; for either the needles are paſſed a-croſs the wound, or they are ſtuck on the ſides thereof.

All the Sutures, hitherto mentioned, are made with needle and thread: beſides which, there is another kind called dry Sutures, which are performed with glue or ſize, or other proper viſcous matter.

The dry SUTURE, is ordinarily made with ſmall pieces of leather, on linen cloth, indented like a ſaw, ſo that the teeth may fall between each other, and the whole row may be cloſed. The cloth, before it is cut into this form, is ſpread with ſome proper plaiſter, in order to its firm adheſion.

The plaiſters thus prepared, being cut into the form, are applied on the firm fleſh, according to the length of the wound, reaching from it to the diſtance of ſome inches; and after they are dried, or well faſtened to the part, the lips of the wound being approached, they may conveniently be held together by the Suture in that poſture.

This kind of Suture is principally uſed for wounds in the face, to prevent unſightly ſcars: it is likewiſe convenient when the fibres of the muſcles are cut a-croſs, and where it is difficult or impoſſible to apply a bandage.

In the other kinds of Sutures, the ſtitches ought always to be taken of a depth proportionable to that of the wound; care being had to avoid the nerves as much as poſſible. In long wounds they are beſt begun at the ends, but in ſhort ones at the middle.

SWA'LLOW, *hirundo*, in the Linnæan ſyſtem of zoology, makes a diſtinct genus of birds of the order of the paſſeres. The characters of this are, that the beak is extremely ſmall, pointed, and depreſſed at the baſe, and the opening of the mouth larger than the very head of the bird. *Linnæi Syſt. Nat.*

The characters of this genus, according to Ray, are theſe: they have very large heads, and very ſhort beaks, but very wide mouths, adapted to the ſwallowing large inſects, which are their food. Their tails are long and forked, their eggs are white, they are birds of paſſage, and with us are the foretellers of ſummer.

The common houſe Swallow is well known every-where with us, and is ſometimes ſeen all over of a fine white.

The martin, or martlet, has a very broad and flat head, and a very broad beak pointed at the end; its legs are very ſhort, and its claws white; its toes are all covered, to the very claws, with a white downy plumage, by which it is diſtinguiſhed from all the other Swallows.

The ſand martin, or ſhore bird, is the ſmalleſt of all the Swallow kind. Its head, neck, and back, are of a mouſe colour; its breaſt and belly white; it has a ring of brown round the lower part of its throat. It builds in the banks of the rivers, and makes its neſt of ſtraw, the ſtalks of plants, &c. and covers it with feathers. It is not uncommon with us, but is extremely plentiful in Spain, in the ſummer months, where it is eaten, and is called by the common people papilion or montana. *Ray's Ornithology.*

The black martin or ſwift, by ſome called the diveling, is the largeſt of all the Swallow kind: its head is remarkably broad and flat; its beak is very ſmall, ſhort and weak; but its mouth opens to an immenſe width, like that of the goat-ſucker, or churn owl. It is all over of a brown colour, with a ſlight admixture of green, and has no other variegation but a greyiſh white ſpot at the top of its throat. Its legs are extremely ſhort, and its feet remarkably ſmall. It feeds on beetles, and other inſects, and ſeldom alights on the ground, the ſhortneſs of its legs making it not eaſy for it to riſe again. *Ray's Ornithol.*

SWARM. — The ſignal of the going out of a Swarm from a hive is ſometimes only by a humming noiſe made by one ſingle bee, but that a very particularly acute and clear ſound: this ſeems to be the voice of the new queen or female bee, calling together the Swarm that is to follow her out, and animating them with a ſort of martial muſic for the great adventure they are going to engage in.

Some who have pretended to be extremely well verſed in the language of the bees, as Butler, and others, ſay, that this is a voice of intreaty, by which the young queen begs permiſſion of the old queen, or parent of the hive, to take out a Swarm with her to ſome other place: they ſay this noiſe of intreaty uſually laſts about two days, and that, at the end of that time, if the parent grants the requeſt, ſhe is heard to anſwer with a louder and clearer voice of the ſame kind. Theſe noiſes are not to be heard, unleſs the ear be applied cloſe to the place; and they ſay, that when this laſt ſound is made, the new Swarm may be expected certainly to go out the next day, if the weather be proper.

But he ſeems to have taken great pains to diſtinguiſh theſe ſounds; he gives all the modulations of the voice of the young female, and every note that ſhe runs into; and obſerves, that all theſe are notes of ſupplication, and that the ſounds iſſued by the parent, or reigning queen of the hive, have an air of majeſty, and are greatly different; and adds, that, if the young female attempts to make the ſounds of the reigning bee, it is looked upon as a rebellion in the hive: and he pretends to be acquainted with the proceedings againſt her in theſe caſes; he ſays ſhe loſes her head, and that ſeveral of the bees that followed her are treated in the ſame manner for having been ſeduced to a rebellion. *Reaumur's Hiſt. Inſect.*

If a hive has been very well peopled during the winter, the young progeny go out early in the ſpring; and, if it have been very thinly peopled, it is ſometimes as late as the middle of June before they go out, even without any accidental delay from the want of a queen.

The people who manage bees, are informed of the time when they are going to ſend out new Swarms by ſeveral ſigns. One is, when the hive is ſo peopled, that many of the bees cannot find room within, but ſtand in cluſters on the outſide of the hive; another, is the appearance of a large number of drones, or male bees; theſe, however, are not certain ſigns, nor do they point out the very day of the ſwarming; but there is one which declares it very punctually, which is the obſerving, that though the hive be very full, and the day very fine, yet very few bees go out in ſearch of honey; in this caſe it is a certainty that they are aſſembling themſelves in the hive, and preparing to be gone in a very little time. If a perſon go near the hives that are ready to ſend out Swarms, in the evening, or even in the night, he will hear a ſort of a humming noiſe in them, which is not to be heard at ſuch times on any other occaſion: in ſhort, the whole is in agitation on the occaſion, and the tumult never ceaſes till the new colony goes out.

SWEA'TING-*houſe*.— The natives of North-America, when we firſt ſettled among them, had a great many houſes to Sweat in, it being their general remedy for diſeaſes of whatever kind; but at preſent they are leſs uſed among them.

The cave, or Sweating-houſe, was uſually eight feet in diameter, and four feet high, the roof being ſupported by ſticks or boards. They uſually dug theſe caves in the ſide of a hill, and as near as could be to ſome river, or pond. The entrance into the cave was ſmall, and, when any perſon was Sweating in it, the door was covered with a blanket, or ſkin. Near the cave they uſed to make a large fire, and heat in this a quantity of ſtones, perhaps, five hundred weight; theſe they rolled into the cave, and piled up in a heap in the middle. When this is done, the Indians go in naked, as many as pleaſe, and ſit round the heap of ſtones; and as ſoon as they begin to grow faint, which is uſually in a quarter of an hour, they come out, and plunge themſelves all over in the water, remaining in it a minute or two; and, repeating this a ſecond time, they dreſs themſelves, and go about their buſineſs.

This has been uſed for many ages among them with ſucceſs, in caſe of colds, ſurfeits, ſciaticas, and pains fixed in their limbs; and the Engliſh have often uſed the ſame means, and found relief by it. It is practiſed equally at all times of the year, and the Indians do it not only in ſickneſſes, but by way of refreſhment after long journies, and other fatigues, and ſo ſtrengthen themſelves for any expeditions. *Philoſ. Tranſ.* N°. 384.

SWEET *Corn*, a term uſed by the Indians to expreſs a ſort of corn they are very fond of, and generally keep it in their houſes.

While the ear of the maiz, or Indian corn, is yet green, but full, they gather it, and firſt boil, and afterwards dry it, and lay it up for uſe in bags, or baſkets. When they eat it, they boil it again, either whole, or groſly beaten in a mortar; they then mix it with fiſh, or with veniſon, or beaver fleſh, and account it a very fine diſh. The green ears, or freſh Sweet corn, they alſo ſometimes eat as ſoon as it is gathered, roaſting it before the fire, and then picking out the grains. This is a new ſupply of food for them many times, when their winter or laſt harveſt-ſtore is exhauſted. Their ſoldiers alſo commonly go out to war againſt their enemies about this time of the year, and find this ſupply in their enemies fields.

SWEET-*williams*, the Engliſh name of ſeveral ſpecies of cariophyllus, or carnation.

There is a great variety of ſpecies, and very elegant diverſities of colouring in theſe flowers; the principal difference, however, is between the ſingle and double kinds.

The ſingle kinds are to be propagated by ſowing their ſeeds in March, on a bed of light earth; in May, they will be ready to plant out, and muſt then be ſet at ſix inches diſtance in beds of the ſame kind of earth. In theſe beds they ſhould remain till Michaelmas, and then be tranſplanted to the places where they are to remain. They will flower the next year in May, and ripen their ſeeds in Auguſt, when that of the beſt flowers ſhould be ſaved.

The double kinds are propagated by layers in the ſame manner with the carnations; they love a middling ſoil, neither too light, nor too ſtiff; they continue flowering a long time, and are very beautiful, eſpecially the male kind, which produces yearly too full blooms of flowers, the one in May, the other in July. *Miller's Gard. Dict.*

SWINE, *ſus*.—Swine are very profitable creatures to the owner, being kept at ſmall expence, feeding on things that would be otherwiſe thrown away, and producing a very large increaſe. They are apt to dig up the ground, and to break fences; but this may be prevented, by putting rings in their noſes, and yokes about their necks. Leiceſterſhire, Northamptonſhire, and Hampſhire, are famous for theſe animals, which ſeems owing to their being clayey countries, and that more beans and peaſe are ſown there, than in other places. The wild kind never grow ſo large as the tame, but they are much better taſted. The keepers of hogs ſhould always chuſe ſuch boars to breed out of as are long-bodied, and have deep bellies and ſides, ſhort noſes, thick thighs, ſhort legs, high claws, a thick neck, and a thick chine, well ſet with large briſtles. It is not proper to keep too many breeding ſows; for they will produce ſo many young at a time, and this three times a year, that they will not find food enough. They uſually bring thirteen or fourteen young ones in a litter, ſometimes more; but they can bring up no more than they have teats to ſuckle, and they bring forth three times in a year. Young ſhoots, as they are called, that is, Swine of three quarters of a year old, are beſt for pork, and thoſe of a year and half, for bacon. Moiſt and ſedgy grounds are good for Swine, for they eat the roots of many of the plants that grow there; and the fruit of the beech, cheſnut, and hedge buſhes, fatten them well, and make their fleſh much better taſted, than when bred intirely in the ſtye. *Mortimer's Huſbandry.*

SWING-*wheel*, in a royal pendulum, the wheel which drives the pendulum. In a watch or balance clock, it is called the crown-wheel.

SWINGLE, in the wire works in England, the wooden ſpoke which is fixed to the barrel that draws the wire, and which, by its being forced back by the cogs of the wheel, is the occaſion of the force with which the barrel is pulled. *Ray's Engliſh Words.*

SYMBOLO'GICE, is uſed by ſome for that part of the ſcience of medicine which treats of the ſymptoms of diſeaſes.

SYMPLE'XIUM *, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, but not of the determinate and regular figure of moſt of the genera of thoſe bodies; but compoſed of various irregular connections of differently ſhaped, and uſually imperfect bodies.

* The word is derived from the Greek συμπλέκω, to connect or compound a mixed maſs of different things.

SYMPO'SIARCH, in antiquity, the director or manager of an entertainment.

SY'MPTOSIS, a word uſed by the ancients to expreſs a contraction, or ſubſidence of the veſſels, ſuch as happens under evacuations. It alſo is ſometimes uſed to expreſs a remiſſion in a diſeaſe, and the falling away in fleſh of people in ſickneſs.

SYNAGELA'STIC, an epithet uſed to expreſs the fiſhes of the gregarious kind, or which ſwim together in large ſhoals, in oppoſition to the ſolitary kinds.

SY'NCAUSIS, a word uſed by ſome medical writers to expreſs the drying, and, as it were, burning up of the excrements within the body, by a febrile heat.

SY'NCHISIS, a word uſed by the old medical writers to expreſs a confuſion and perturbation of all the humours in concoction, from the imbecillity of the ſtomach. It is alſo uſed to expreſs a diſeaſe of the eye, which conſiſts in a confuſion of the humours: this generally proceeds from a violent blow; ſometimes from an inflammation of the uvea, occaſioning a rupture of the veſſels, and an effuſion of the humours.

SY'NCHYSIS, in rhetoric, a confuſed manner of expreſſion, where the natural order of the words is perverted. Horace affects it much: thus *lib.* i. *ſat.* 5.

Pœne macros arſit dum turdos verſat in igne.

SY'NCRISIS, a word uſed by the chemical writers to expreſs a concretion or coagulation of any thing, effected by a ſpontaneous, or violent reduction of a liquid ſubſtance to a ſolid one, by a privation of the humid.

SYNGENE'SIA *, in botany, a claſs of plants with hermaphrodite flowers, whoſe ſtamina are naturally formed into a ſingle regular congeries.

* The word is derived from the Greek σὺν, together, and γένεσις, formation. The plants comprehended under it are thoſe whoſe ſtamina, by the junction of their apices, are formed into a ſingle regular cylindric body; and among theſe are the lettuce, ſuccory, hawkweed, &c.

The Syngeneſia expreſſes the ſame claſs of plants with the compound flowered plants of Ray, and others. The general characters of the claſs are theſe:

The cup is the crown of the ſeed, and ſtands on the ſummit of the germen. The flower conſiſts of one petal, and has a very narrow and long tube placed upon the germen: this is either tubular, ligulated, or naked.

The tubular flower of the Syngeneſia has, at the ſummit of the tube, a wide campanulated mouth, divided into five ſegments, which are expanded, and ſomewhat bent backward. The ligulated flower is that which has a plain and ſtraight edge turning outwards, with a truncated apex undivided, but furniſhed with three or four teeth. The naked flowers are thoſe which have no mouth at all; and often, in theſe, even the tube is alſo wanting. The ſtamina are five very ſhort and ſlender filaments, inſerted into the tube of the flower. The antheræ are of the ſame number with the ſtamina: they are ſlender, erect, and grow together at their ſides, ſo as to form a tubular cylindric body of the length of the mouth of the flower, and divided into five ſegments at the edge. The germen of the piſtil is oblong, and placed under the receptacle of the flower. The ſtyle is capillary, erect, and of the length of the ſtamina, and goes through the cylinder formed by the antheræ. The ſtigma is divided into two parts, which ſtand open, and bend backwards. Theſe plants have properly no pericarpium, tho' in ſome few ſpecies there is a coriaceous cruſt placed about the ſeed. The ſeed is ſingle and oblong, often of a quadrangular figure, and ſometimes narrower at the baſe than in any other part. *Linnæi Gen. Plant.*

SYNGNA'THUS, in ichthyology, the name of a genus of fiſhes, the characters of which are theſe: the coverings of the gills are on each ſide compoſed of a thin and ſingle bony lamella; the head is oblong and compreſſed; the jaws are cloſed up at the ſides; and the mouth is only capable of opening at the extremity of the ſnout. The body is long and very ſlender; the ſhape is ſometimes roundiſh, but more uſually angular. The fins are in moſt ſpecies four in number, but in ſome only one.

SYNO'NYMISTS, among the botanical writers, ſuch as have employed their care in the collecting the different names or ſynonyma, uſed by different authors, and reducing them to one another.

SYNTE'NOSIS, a word uſed by anatomiſts to expreſs an articulation of the bones when they are connected, as the oſſa ſeſamoidea of the toes only by a tendon.

SY'RINGA, *the pipe-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of ſeveral petals arranged in a circular form. The piſtil ariſes from the cup, and finally becomes a fruit adhering to the cup, of a turbinated form, and divided into four cells, which contain ſmall ſeeds.

The ſeveral ſpecies of this beautiful and ſweet flowering ſhrub are eaſily propagated, by taking off their ſuckers in autumn, of which they always produce great plenty. Theſe ſhould be tranſplanted into the nurſery, where after they have remained two years, they will be fit to be removed to the places where they are to remain. They are very hardy, and may be planted in almoſt any ſoil or ſituation; and require no farther culture, but to take away the ſuckers, and cut out the dead wood every year, and now and then to dig up the earth about their roots. They flower in May and June. *Miller's Gard. Dict.*

SYRINGOI'DES *Lapis*, the pipe-ſtone, in natural hiſtory, the name of a very beautiful foſſil ſubſtance of which there are ſeveral different kinds. The tubuli marini, or caſes of ſea worms, lodged in any ſolid ſubſtance of the foſſil kind, conſtitute what is called the lapis Syringoides.

The moſt frequent kind is made of the common matter of the ludus Helmontii, or ſeptaria, with tubuli of different kinds and dimenſions in it; but the moſt beautiful ſort is that made of the bottoms of ſhips, old boards, or piles of wood; which, having been long in the ſea, have been pierced by the ſea worms, which have made their ſeveral burrows, and left their ſhells behind in them: the whole of theſe ſubſtances, becoming afterwards petrified, is found in a form of wood, with all the knots, veins, and other characters, but wholly of the hardneſs of ſtone. This is uſually of a blackiſh colour, and, the pipes being of a pale yellow, the whole makes a very elegant appearance.

Our clay-pits about London afford alſo a Syringoides of this kind, but, the earth there abounding with the matter of the common vitriolic pyrites, that ſubſtance by degrees gets into the pores of the wood, and the whole ſeems a maſs of pyrites with theſe pipes lodged in it in different directions. This has been called by authors pyrites Syringoides. *Hill's Hiſt. of Foſſ.*

SYSTEMA'TICAL *Qualities*, a term uſed by Mr. Boyle to expreſs ſuch qualities as are alſo called coſmical, and do not depend on the nature and conſtitution of the body itſelf, but on its being a member of this general ſyſtem of the univerſe, in which capacity it is acted upon by agents unperceived by us, which occaſions great changes in it.

SYSTEMA'TISTS, in botany, thoſe authors, whoſe works in this ſcience are principally employed about the arranging plants into certain orders, claſſes, or genera. *Linnæi Fund. Bot.*

T.

TA'BLES (*Dict.*)—*Aſtronomical* TABLES.—The oldeſt aſtronomical Tables are the Ptolemaic, found in Ptolemy's Almageſt; but theſe no longer agree with the heavens.

In 1252, Alphonſo XI, king of Caſtile, undertook the correcting them, chiefly by the aſſiſtance of Iſaac Hazan, a Jew; and ſpent 400 thouſand crowns therein. Thus aroſe the Alphonſine Tables, to which that prince himſelf prefixed a preface. But the deficiency of theſe was ſoon perceived by Purbachius and Regiomontanus; upon which Regiomontanus, and after him Waltherus and Warnerus, applied themſelves to cœleſtial obſervation, for the further amending them: but death prevented any progreſs therein.

Copernicus, in his books of the cœleſtial revolutions, inſtead of the Alphonſine Tables, gives others of his own calculation, from the latter, and partly from his own obſervations.

From Copernicus's obſervations and theories, Eraſ. Reinholdus afterwards compiled the Prutenic Tables, which have been printed ſeveral times, and in ſeveral places.

Tycho de Brahe, even in his youth, became ſenſible of the deficiency of the Prutenic Tables; which was what determined him to apply himſelf with ſo much vigour to cœleſtial obſervation. Yet all he did thereby, was to adjuſt the motions of the ſun and moon; though Longomontanus, from the ſame, to the theories of the ſeveral planets publiſhed in his Aſtronomia Danica, added Tables of their motions, now called the Daniſh Tables; and Kepler likewiſe, from the ſame, in 1627, publiſhed the Rudolphine Tables, which are now much eſteemed. Theſe were afterwards, anno 1650, turned into another form, by Maria Cunitia, whoſe aſtronomical Tables, comprehending the effect of Kepler's phyſical hypotheſis, are exceedingly eaſy, and ſatisfy all the phænomena, without any trouble of calculation, or any mention of logarithms; ſo that the Rudolphine calculus is here greatly improved.

Mercator made a like attempt in his Aſtronomical Inſtitutions, publiſhed in 1676; and the like did J. Bap. Morini, whoſe abridgment of the Rudolphine Tables was prefixed to a Latin verſion of Street's Aſtronomia Carolina, publiſhed in 1705.

Lanſbergius, indeed, endeavoured to diſcredit the Rudolphine Tables, and framed perpetual Tables, as he calls them, of the heavenly motions; but his attempt was never much regarded by the aſtronomers; and our countryman Horrox gave an abundant check to his arrogance, in his defence of the Keplerian aſtronomy.

Nor was the authority of the Rudolphine Tables impaired by the Philolaic Tables of Bullialdus, the Britannic Tables of Vincent Wing, calculated on Bullialdus's hypotheſis; or the Britannic Tables of Newton; or the French ones of the count de Pagan, or the Caroline Tables of Street, all calculated on Dr. Ward's hypotheſis, or the Novalmageſtic Tables of Ricciolus. Among theſe, however, the Philolaic and Caroline Tables are eſteemed the beſt; inſomuch that Mr. Whiſton, by the advice of Mr. Flamſteed (a perſon of undoubted authority in ſuch caſes) thought fit to ſubjoin the Caroline Tables to his aſtronomical lectures.

The Ludovician Tables were publiſhed in 1702, by M. de la Hire, wholly from his own obſervations, and without the aſſiſtance of any hypotheſis; which, before the invention of the micrometer, teleſcope, and the pendulum-clock, was held impoſſible.

But the lateſt, and much the beſt, are thoſe of the celebrated Dr. Halley.

TACO'MAR-*tree*, a name by which ſome authors call the ſugar-cane.

TA'DPOLE.—The animal called by this name is no other than the frog in its firſt ſtate from the ſpawn; and this creature furniſhes the curious in microſcopic obſervations with a beautiful view of the circulation of the blood, eſpecially when the animal is young.

The method of procuring them for this purpoſe in the greateſt perfection is this: let a ſmall quantity of frog's ſpawn be kept ſome days in water, and from this will be produced a vaſt number of young Tadpoles; theſe, while very young, are perfectly tranſparent, and, when placed before the double microſcope, the heart may be eaſily ſeen, and its pulſation regularly obſerved; and the blood protruded thence may be beautifully ſeen circulating through the whole body; but particularly in the tail, where, though ſo very minute, more than fifty veſſels may be ſeen at one view. The young brood grow more and more opake every hour, and in a day or two the circulation of the blood can only be ſeen in their tail, or in the fins near the head. *Baker's Microſcope.*

TA'FFETAS noir luſtré is our Alamode.—Non luſtré is our luſtring.

There are Taffaties of all colours, ſome plain, others ſtriped with gold, ſilver, ſilk, &c. others chequered, others flowered; others in the Chineſe point, others the Hungarian; with various others, to which the mode, or the caprice of the workmen, give ſuch whimſical names, that it would be as difficult, as it is uſeleſs, to rehearſe them; beſides that, they ſeldom hold beyond the year wherein they firſt roſe. The old names of Taffeties, and which ſtill ſubſiſt, are Taffeties of Lyons, of Spain, of England, of Florence, of Avignon, &c. The chief conſumption of Taffeties is in ſummer-dreſſes for women, in linings, ſcarves, window-curtains, &c.

There are three things which contribute chiefly to the perfection of Taffeties, viz. the ſilk, the water, and the fire. The ſilk is not only to be of the fineſt kind, but it muſt be worked a long time, and very much, before it be uſed. The watering, beſides that it is only to be given very lightly, ſeems only intended to give that fine luſtre, by a peculiar property not found in all waters. Laſtly, the fire, which is paſſed under it to dry the water, has its particular manner of application, whereon the perfection of the ſtuff depends very much.

Octavio May, of Lyons, is held the firſt author of the manufacture of gloſſy Taffeties; and tradition tells us the occaſion of it.—Octavio, it ſeems, going backwards in the world, and not able to retrieve himſelf by the manufacture of Taffeties, ſuch as were then made, was one day muſing on his misfortunes, and, in muſing, chanced to chew a few hairs of ſilk which he had in his mouth. His reverie being over, the ſilk he ſpit out ſeemed to ſhine, and on that account engaged his attention. He was ſoon led to reflect on the reaſon; and, after a good deal of thought, concluded, that the luſtre of that ſilk muſt come, firſt, from his having preſſed it between his teeth. Secondly, from his having wet it with his ſaliva, which had ſomething glutinous in it: and, thirdly, from its having been heated by the natural warmth of his mouth. All this he executed upon the next Taffeties he made; and immediately acquired immenſe riches to himſelf, and to the city of Lyons the reputation it ſtill maintains, of giving the gloſs to Taffeties, better than any other city in the world.

It will not, we conceive, be leſs uſeful than curious, to give here the deſcription of the engine contrived by Octavio to give the gloſs to Taffety; to add the manner of applying it, and the compoſition of the water uſed therein.

The machine is much like a ſilk loom, except that, inſtead of iron points, here are uſed a kind of crooked needles, to prevent the Taffety from ſlipping: at the two extremities, are two beams; on one of which is rolled the Taffety, to take the gloſs; and, on the other, the ſame Taffety as faſt as it has received it. The firſt beam is kept firm by a weight of about 200 pounds; and the other turned by means of a little lever paſſing through mortiſes at each end. The more the Taffety is ſtretched, the greater luſtre it takes; care, however, is to be uſed it be not over-ſtretched.

Beſides this inſtrument for keeping the ſtuff ſtretched, there is another to give it the fire: this is a kind of carriage, in form of a long ſquare, and the breadth of the Taffeties. It moves on trundles, and carries a charcoal fire under the Taffety, at the diſtance of about half a foot.

The two machines prepared, and the Taffety mounted, the luſtre is given it by rubbing it gently with a ball, or handful of liſts of fine cloth, as it rolls from one beam to the other; the fire, at the ſame time, being carried underneath it to dry it. As ſoon as the piece has its luſtre, it is put on new beams to be ſtretched, a day or two; and, the oftener this laſt preparation is repeated, the more it increaſes the gloſs.

For black Taffeties, the gloſs is given with double beer, and orange or lemon juice; but this laſt is the leaſt proper, as being

ing apt to whiten. The proportion of the two liquors is a gallon of orange juice to be boiled together to the conſiſtence of a rich broth. For coloured Taffeties they uſe gourd-water, diſtilled in an alembic.

TA'GETES, *African marygold*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind: its diſk is compoſed of floſcules divided into ſeveral ſegments, and its outer edge of ſemi-floſcules; all ſtanding on embryo ſeeds, and contained in a one-leaved cup of a tabulated form. The embryo's finally become ſeeds of an angular form, furniſhed with a foliaceous head, and affixed to the thalamus of the flower. There are alſo ſome ſpecies in which the flower is wholly compoſed of ſemi-floſcules.

We have a great many ſpecies of this plant annually raiſed in our gardens, for the beauty of their flowers. They are propagated by ſowing the ſeeds in ſpring, on a moderately hot bed; when the young plants come up, they muſt have air allowed them; and, when three inches high, they ſhould be removed to another hot-bed, which ſhould be arched over with hoops that it may be ſheltered with mats. They are to be planted here at about eight inches diſtance, and, when they are grown ſtronger, as about the beginning of May, they are to be taken up with a ball of earth about their roots, and placed where they are to remain; or elſe at eighteen inches diſtance in a nurſery, where, when they flower, the fineſt ſorts may be marked and removed, with a large ball of earth to their roots, either into pots, or into the borders of the flower-garden. They are very beautiful; but their ſmell is very offenſive. *Miller's Gard. Dict.*

TAILS *of comets*.— We have an enquiry into the cauſe of the Tails of comets by Mr. Euler in the Mem. de l'Acad. de Berlin. He thinks there is a great affinity between theſe tails, the zodiacal light, and the aurora borealis; and that the common cauſe of them all is the action of the ſun's light on the atmoſpheres of the comets, of the ſun, and of the earth. He ſuppoſes that the impulſe of the rays of light on the atmoſphere of comets may drive ſome of the finer particles of that atmoſphere far beyond its limits; and that this force of impulſe, combined with that of gravity towards the comet, would produce a Tail, which would otherwiſe always be in oppoſition to the ſun, if the comet did not move. But the motion of the comet in its orbit, and about an axis, muſt vary the poſition and figure of the Tail, giving it a curvature, and deviation from a line drawn from the center of the ſun to that of the comet; and that this deviation will be greater, as the orbit of the comet has the greater curvature, and the motion of the comet is more rapid. It may even happen, that the velocity of the comet, in its perihelion, may be ſo great, that the force of the ſun's rays may produce a new Tail before the old one can follow; in which caſe the comet might have two or more tails. The poſſibility of this is confirmed by the comet of 1744, which was obſerved to have ſeveral Tails, while it was in its perihelion. See the article ZODIACAL *Light*.

TA'LED, in the Jewiſh antiquities, a ſort of habit that the Jews wore, chiefly when they repeated their prayers in the ſynagogue.

TA'LPA, *the mole*, in the Linnæan ſyſtem of zoology, makes a diſtinct genus of animals, the characters of which are: that they have feet with five claws on each, as well on thoſe behind as on thoſe before; and have their fore-feet made like hands, and fitted for digging. *Linniæ Syſt. Nat.*

It hath been ſuppoſed by many, that the mole had no eyes; and others have affirmed, that it had eyes, but that they were covered with a membrane; but neither of theſe aſſertions are true. The eyes are ſmall, and have apertures in the ſkin, through which they may eaſily be diſcerned by a curious obſerver; and are very black, about the ſize of a millet ſeed, and faſtened to a nerve.

The reaſon they have not been obſerved by the common people, is, that they are hid by the fur, but, only blowing them away, they always ſhew themſelves. It has no ears.

Its ſkin is extremely firm and tough, ſo that it requires a ſharp knife to pierce it. *Ray's Syn. Quad.*

TA'MARINDS (*Dict.*)— *Plate* XL. *fig.* 8, repreſents the Tamarind tree, where *a* is the flower, *b* the fruit, *c* the ſeed. For a deſcription of both the tree and fruit, conſult this article in the Dictionary.

TAMARI'SCUS, *the tamariſk-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of a number of petals, arranged in a circular form; the piſtil ariſes from the cup, and, finally, becomes a capſule, reſembling that of the willow, of a long figure and membranaceous ſtructure, and containing ſeeds winged with down. *Tourn. Inſt.*

TA'MBOS, in Peruvian antiquity, buildings placed at certain diſtances for the lodgings of the princes of that country, in their travels through their dominions.

TAN (*Dict.*)— Tan is of great uſe in gardening: firſt, by its fermentation, when laid in a body, which is always moderate, and of a long duration, which renders it of great ſervice to hot-beds: and, ſecondly, after it is well rotted, it becomes excellent manure for all ſorts of cold ſtiff land; upon which one load of Tan is better than two of rotten dung, and will continue longer in the ground.

The uſe of Tan for hot-beds has not been many years known in England; the firſt Hot-beds of this ſort, which were made in England, were at Blackheath, in Kent, about fifty-five years ago: theſe were deſigned for raiſing of orange-trees; but, the uſe of theſe hot-beds being but little known at that time, they were made but by two or three perſons, who had learned the uſe of them in Holland and Flanders, where the gardeners ſeldom made any other hot-beds: but in England there were very few hot-beds made of tanner's bark, before the ananas were introduced into this country, which was in 1719. Since which time the uſe of theſe hot-beds have been more general; and are now made in all thoſe gardens, where the ananas plants are cultivated, or where there are collections of tender exotic plants preſerved: and the gardeners here are now better ſkilled in making and managing of theſe hot-beds, than in moſt other countries; which might render it leſs neceſſary to give a full deſcription of them here: but, yet, as there may be ſome perſons in the remote parts of England, who have not had an opportunity of informing themſelves of the uſe of tanners bark for this purpoſe, I ſhall inſert the ſhorteſt and plaineſt method of making and managing theſe hot-beds, as they are practiſed by the moſt knowing perſons, who have long made uſe of theſe hot-beds: and, firſt, I ſhall begin with the choice of the Tan.

The tanners in ſome parts of England do not grind the bark, to reduce it into ſmall pieces, as is commonly practiſed by the tanners near London; where there is great difference in the ſize of the bark, ſome being ground much ſmaller than the other, according to the different purpoſes for which it is intended; but in many places the bark is only chopped into large pieces, which renders it very different for the uſe of hot-beds; for, if the Tan is very coarſe, it will require a longer time to ferment, than the ſmall Tan; but, when it begins to heat, it will require a much greater degree, and will retain the heat a much longer time than the ſmall; therefore, where there is choice, the middling-ſize Tan ſhould be preferred; for it is very difficult to manage an hot-bed when made of the largeſt Tan: the heat of which is often ſo great, as to ſcald the roots of plants, if the pots are fully plunged into the bed; and I have known this violent heat continue upwards of two months; ſo that it has been unſafe to plunge the pots more than half their depth into the Tan, till near three months after the beds have been made: therefore, where the perſons, who have the care of theſe beds, do not diligently obſerve their working, they may in a ſhort time deſtroy the plants which are placed in the beds: on the other hand, if the Tan is very ſmall, it will not retain the heat above a month, or five weeks; and will be rotten and unfit for an hot-bed in a ſhort time; ſo that, where the middle-ſized Tan can be procured, it ſhould always be preferred to any other.

The Tan ſhould be always ſuch as has been newly taken out of the pits; for if it lies long in the tanner's yard, before it is uſed, the beds ſeldom acquire a proper degree of heat; nor do they continue their heat long; ſo that when it has been more than a fortnight or three weeks out of the pit, it is not ſo good for uſe as that which is new. If the Tan is very wet it will be proper to ſpread it abroad for two or three days to drain out the moiſture, eſpecially if it is in the autumn or winter ſeaſon; becauſe, then, as there will be little ſun to draw a warmth into the Tan, the moiſture will prevent the fermentation, and the beds will remain cold: but, in the ſummer-ſeaſon, there is no great danger from the moiſture of the Tan; the heat of the ſun through the glaſſes will be then ſo great, as ſoon to cauſe a fermentation in the Tan.

Theſe Tan-beds ſhould always be made in pits, having brick walls round them, and a brick pavement at the bottom, to prevent the earth from mixing with the Tan; which will prevent the Tan from heating: theſe pits muſt not be leſs than three feet deep, and ſix feet in width: the length muſt be in proportion to the number of plants they are to contain: but, if they are not ten feet in length, they will not retain their heat long: for, where there is not a good body of Tan, the outſide of the bed will ſoon loſe its heat; ſo that the plants which are there plunged, will have no benefit of the heat; nor will the middle of theſe beds retain their heat long; ſo that they will not anſwer the purpoſe for which they are intended.

When the Tan is put into the bed, it muſt not be beaten or trodden down too cloſe; for that will cauſe it to adhere, and form one ſolid lump; ſo that it will not acquire an heat; nor ſhould it be trodden down at the time when the pots are plunged into the beds; to avoid which there ſhould be a board laid croſs the bed, which ſhould be ſupported at each end to prevent its reſting on the Tan; upon which the perſon ſhould ſtand, who plunges the pots; ſo that the Tan will not be preſſed down too cloſe. When the Tan is quite freſh, and has not been out of the pits long enough to acquire an heat, then the beds will require a fortnight or three weeks time, or ſometimes a month, before they will be of a proper temperature of warmth to receive the plants: but, in order to judge of this, there ſhould be three or four ſticks thruſt down into the

Tan, about eighteen inches deep, in different parts of the bed; ſo that by drawing out the ſticks, and feeling them at different depths, it will be eaſy to judge of the temper of the beds; and it will be proper to let a few of theſe ſticks remain in the bed, after the plants are plunged, in order to know the warmth of the Tan; which may be better judged of by feeling theſe ſticks, than by drawing out the pots, or plunging the hand in the Tan.

When the Tan is good, one of theſe beds will retain a proper degree of heat for near three months; and, when the heat declines, if the Tan is forked up, and turned over, and ſome new Tan added to it, the heat will renew again, and will continue two months longer; ſo that by turning over the Tan, and adding ſome new Tan every two months, or thereabout, as the bed is found to decline of its heat, they may be continued one year: but every autumn it will be proper to take out a good quantity of the old Tan, and to add as much new to the bed, that the heat of the bed may be kept up in winter; for, if the heat is ſuffered to decline too much during the cold ſeaſon, the plants will ſuffer greatly: to prevent this, there ſhould always be ſome new Tan added to the bed in winter, when the heat is found to decline; but the Tan ſhould be laid in a dry place a week or ten days, to dry, before it is put into the bed; otherwiſe the moiſture will chill the old Tan in the bed, and prevent the fermentation: ſo that unleſs the Tan is turned over again, there will be little or no heat in the beds; which often proves fatal to the plants which are plunged into them: therefore, whoever has the management of theſe beds, ſhould be very careful to obſerve conſtantly the warmth of the Tan; ſince, upon keeping the beds in a due temperature of warmth, the whole ſucceſs depends; and, where this caution is not taken, it frequently happens, that the ananas plants run into fruit very ſmall, or the plants are infeſted by inſects; both which are occaſioned by the growth of the plants being ſtopped by the decline of the heat of the Tan; therefore great regard muſt be had to that, eſpecially in winter.

The great advantages which theſe Tan-beds have of thoſe which are made of horſe-dung, are the moderate heat which they acquire; for their heat is never ſo violent, as thoſe of horſe-dung; and they continue this heat much longer; and, when the heat declines, it may be renewed, by turning the beds over, and mixing ſome new Tan with the old; which cannot be ſo well done with horſe-dung; and, likewiſe, the beds will not produce ſo great ſteams, which are often injurious to tender plants; ſo that theſe Tan-beds are much preferable to thoſe of horſe-dung for moſt purpoſes.

Tan, when it is well rotted, is alſo an excellent manure for all cold and ſtiff lands; and if it is laid upon graſs-ground in autumn, that the rains in winter may waſh it into the ground, it will greatly improve the graſs; but, when it is uſed new, or in the ſpring of the year, when dry weather comes, it is apt to cauſe the graſs to burn; which has occaſioned the diſuſe of Tan in many places; but, if properly uſed, it will be found an excellent dreſſing for all ſtiff lands.

Flowers of TAN.— Flower of Tan is a name given by the people employed in the tanning-trade to a yellow ſubſtance, often found upon old Tan, or oak bark broken to pieces, which has been uſed as Tan, and is of no farther ſervice.

The name, however, is very improper; and, though every body converſant in Tan-yards muſt have ſeen the thing, yet it has always paſſed as an effloreſcence of the bark, till the curious Mr. Marchand enquired more accurately into its nature, and found it to be a plant of itſelf, wholly different from the matter of the Tan; and to which the bark which had been often wetted and dried again, ſerved as a proper matrix. He found it to be more nearly allied to the ſpunge than to any other genus of plants, and therefore named it ſpongia fugax, mollis, flava, et amœna in pulvere coriario naſcens, ſoft, beautiful, yellow, fading ſpunge, growing on tanners bark.

It makes its appearance moſt frequently in the ſummer months, and is then ſeen in ſmall tufts of a beautiful yellow colour, on different parts of the old heaps of bark. It appears at firſt in form of a thin yellow ſcum, and is of a ſort of jelly-like ſtructure; but it every day grows larger and thicker, till it ſtands above half an inch out from the ſurface of the bark. As it grows, its ſurface becomes more and more cavernous and ſpungy, the pores or holes being of different diameters, and the interſticial matter forming a ſort of net-work more or leſs regular, and often interrupted by irregular prominences in ſeveral parts; and, in fine, when the growth is complete, the whole more reſembles a ſpunge, than any other vegetable ſubſtance, and is of a deep yellow colour, and conſiderably thick and tough conſiſtence; there are no roots to be diſcovered iſſuing from it; its ſmell is like to that of rotten wood, and its taſte is ſomewhat ſtyptic. It always appears in the warm months, and always upon ſuch old Tan as has begun to ferment, and is in the ſtate in which our gardeners uſe it for hot-beds. If it happens to ſtand expoſed to the ſouth ſun, it is but of ſhort duration; but, if it be in a ſheltered place, it will laſt a conſiderable time, and often ſpread itſelf to a great extent, and make a very beautiful figure for many weeks. *Mem. Acad. Par.* 1727.

TA'NNING (*Dict.*)— The operation of Tanning is performed, on leather, better in the Weſt-Indies than in England. They uſe three ſorts of bark, the mangrave-bark, the olive-bark, and another; and the whole buſineſs is ſo ſoon done, that a hide delivered to them is in ſix weeks ready to be worked into ſhoes, though they beſtow leſs labour than we do. *Phil. Tranſ.* N°. 36.

Every part of the oak-tree, of what age or growth ſoever, is fit for the tanners uſe, and all oaken coppice-wood, of any age or ſize, being cut and procured in barking-time, will tan all ſort of leather, at leaſt as well as the bark alone. When this material is got at the proper ſeaſon, it muſt be very well dried in the ſun more than the bark alone; thence it is to be cut up, and preſerved in a covered place for uſe.

When it is to be uſed, the greater wood muſt be firſt cleft ſmall, to fit it for the beating and cutting engine; and the ſmaller muſt be put into the engine as it is. Which done, it muſt be again dried on a kiln, and after that ground in the ſame manner that the tanners grind their bark. Such wood as is to be uſed preſently after it is gotten, will require the better and the more drying upon the kiln; and, if this is omitted, it will blacken and ſpoil all the leather it is to be uſed about. Where oak is ſcarce, black-thorn will tolerably well ſupply its place, and, where that is not to be had in ſufficient plenty, the white-thorn will do. *Philoſ. Tranſact.* N°. 108.

Birch alſo, being ordered in the ſame manner with oak, is fit for ſome uſes in Tanning, particularly it does very well for Tanning of ſhoe-ſoal leather. All theſe ingredients will tan much better than bark alone, and that with much leſs charge; ſo that this diſcovery may very well ſave the felling of trees when the bark is wanted, at a ſeaſon when the ſap is up, which, when it is done, cauſes the outſides of the trees to rot and grow worm-eaten; whereas, if the trees had been felled in winter, when the ſap is down, they would have been almoſt all heart, as the people expreſs it, and not ſubject to worms. This manner of uſing the wood with the bark, in Tanning, will alſo increaſe the value of underwoods very conſiderably. *Phil. Tranſ.* N°. 105.

The engine neceſſary for cutting the wood conſiſts of a long ſquare wooden block, and ſome pieces of iron to be faſtened on, and uſed about it, viz. a hammer, an anvil, and iron holding the wood to be bruiſed and cut, and a knife to cut it. The whole is a very ſimple and cheap machine, and is deſcribed at large, and figured in the above-mentioned number in the Philoſophical Tranſactions.

By Mr. de Buffon's experiments upon different ſkins, it was found that a decoction of young oak wood ſucceeded perfectly well in Tanning ſheep and calves ſkins, but did not do equally well for ox, and the other harder ſkins. This, however, he imagines might be only for want of knowing the beſt method of uſing the wood. And, certainly, theſe trials deſerve to be farther proſecuted; ſince the ſmall branches of the oak, which are of little value, might be thus made to ſupply the place of a much dearer commodity, the bark; and as, in many trees, the bark of the young branches is found to be of greatly more virtue than that of the larger branches, or the trunk, the uſe of theſe ſmall bows, bark and all, might very probably be found to anſwer to all the effects of the bark, of the larger kind alone. *Memoires Acad. Scien. Par.* 1736.

TAP-*root*, in trees, that part of the root that deſcends ſtraight down.

In removing or tranſplanting young oaks, great care ſhould be taken not to wound this root, much leſs to cut it off; but it muſt be dug up to the bottom, and the hole prepared deep enough to ſet it; otherwiſe the tree either dies, or, if not, yet it is always greatly ſtinted and impeded in its growth. *Ray's Engliſh Words.*

TAPE-*worm*, a ſpecies of worm breeding in the human bowels, and called by authors tænia, and lumbricus latus, or the broad worm.

The true hiſtory of this animal is, that it is ſhort and broad. What is called a link of the long worm is really a diſtinct worm; and, when one of theſe multiplies in the bowels, its young adhere to it, and to each other endwiſe, ſo as to form a ſort of chain, which lengthens as they continue to increaſe, and, in fine, becomes immoderately long. Hence it is, that the breaking, as it is called, of this worm, does not deſtroy it, and that the voiding large pieces of it is no cure, ſince it ſtill recovers that length again by new young ones. Every ſeparate link of ſuch a chain, if examined, is found to be intire, lively and briſk, and not at all injured by the ſeparation.

Authors who have treated of theſe worms as a diſeaſe, have given a canine appetite, or unnatural appetite to food, as one of the ſymptoms; but this is wrong, for it has never been found, in reality, that theſe worms, even where moſt numerous, have at all increaſed the natural appetite; and, indeed, it is very difficult to judge of their being in the body by ſymptoms, ſince they occaſion none which are not alſo common in many other diſeaſes. Many people have had them a long courſe of time, without being ſenſibly hurt by them; and there has never been a known inſtance of their occaſioning any one's death, or indeed any conſiderable diſorder. See the article WORMS.

TAP'HNEUS, a word uſed by ſome writers to expreſs any thing when depurated or purified to the greateſt degree, as the ſalts by repeated ſolutions and cryſtalliſations, and the like. Paracelſus uſes it for a ſpecies of earth, and things produced from which, he ſays, never alter their nature by calcination or reverberation, or the like operations.

TAPI'NOSIS, in rhetoric, the ſame with diminution.

TA'PLINGS, in the Engliſh ſalt-works, the name given to certain bars of iron which ſupport the bottom of the pan in which the brine is boiled.

Theſe pans are very large, and cover a wide furnace; but as their width would make them apt to bend in the middle, which would ſpoil the working of the ſalt, there is a ſort of wall of brick carried along the middle of the furnace; and on the top of this are placed theſe Taplings: they are about eight inches high, and from four to ſix in thickneſs, being ſmalleſt at the top. Theſe are placed at about three feet diſtance one from another, and the wall which ſupports them, and which is called the mid-feather, is broad at the baſe, and ſo narrow at the top, as barely to give room for the baſes of the Taplings.

TAR-*water.*—In ſome parts of America, Tar-water is made by putting a quart of cold water to a quart of Tar, and ſtirring them well together in a veſſel, which is left ſtanding till the Tar ſinks to the bottom. A glaſs of clear water, being poured off for a draught, is replaced by the ſame quantity of freſh water, the veſſel being ſhaken, and left to ſtand as before. And this is repeated for every glaſs, ſo long as the Tar continues to impregnate the water ſufficiently, which will appear by the ſmell and taſte.

But, as this method produces Tar-water of different degrees of ſtrength, Biſhop Berkley ſays, he chuſes to make it in the following manner: pour a gallon of cold water on a quart of Tar, and ſtir and mix them thoroughly with a ladle or flat ſtick, for the ſpace of three or four minutes; after which the veſſel muſt ſtand eight and forty hours, that the Tar may have time to ſubſide; when the clear water is to be poured off, and kept for uſe, no more being made from the ſame Tar, which may ſtill ſerve for common purpoſes.

It has been found, that ſeveral perſons infected with cutaneous eruptions and ulcers were immediately relieved, and ſoon after cured, by the uſe of this medicine. It is ſaid, that, even in the fouleſt diſtempers, it proved much more ſucceſsful than ſalivations and wood-drinks had done. It alſo ſucceeded, beyond expectation, in a tedious and painful ulceration of the bowels, in a conſumptive cough, and, as appeared by expectorated pus, an ulcer in the lungs, in a pleuriſy and peripneumony. And, when a perſon who had been for ſome years ſubject to eryſipetalous fevers, perceived the uſual forerunning ſymptoms to come on, the drinking of Tar-water prevented the eryſipelas.

Tar-water cures indigeſtion, and gives a good appetite. It is an excellent medicine in an aſthma; it imparts a kindly warmth and quick circulation to the juices, without heating, and is therefore uſeful, not only as a pectoral and balſamic, but alſo as a powerful and ſafe deobſtruent in cachectic and hyſteric caſes. As it is both healing and diuretic, it is very good for the gravel. The biſhop ſays, he believes it to be of great uſe in a dropſy, having known it cure a very bad anaſarca in a perſon whoſe thirſt, though very extraordinary, was in a ſhort time removed by the drinking of Tar-water. It may likewiſe be ſafely uſed in inflammatory caſes; and, in fact, hath been found an admirable febrifuge, at once the ſafeſt cooler and cordial.

To ſailors, and all ſea-faring perſons, who are ſubject to ſcorbutic diſorders, and putrid fevers, eſpecially in long ſouthern voyages, he is perſuaded this Tar-water would be very beneficial.

It is to be obſerved, that Tar-water ſhould not be made in unglazed earthen veſſels, theſe being apt to communicate a nauſeous ſweetneſs to the water.

The ſame ingenious author recommends Tar-water in the plague, and for the diſtemper among the horned cattle now raging; with what ſucceſs muſt be left to experience.

TA'RSO, in the glaſs-trade, a ſort of white ſtone found in many rivers of Italy, and other places; and uſed inſtead of ſand for the fineſt cryſtal-glaſs, being firſt burnt, and calcined with the ſalt of the polverine into frit. *Neri's Art of Glaſs.*

The Tarſo of this and other authors is truly a cryſtalline matter debaſed by an admixture of white earth, and found in form of ſmall pebbles, of a whitiſh, yellowiſh, or pale reddiſh colour; and this is common in all the gravel-pits of England, and in the beds of ſome of our rivers; and might be uſed with great advantage by our glaſs-makers, if they knew it was ſo eaſily to be had.

On comparing theſe ſtones of ours with the cuogolo or Tarſo of the foreign glaſs-makers, there is no difference diſtinguiſhable to the eye, nor will the niceſt experiments by the fire, acid menſtrua, &c. ſhew the leaſt diſtinction between them. We are not to wonder, however, that the glaſs-makers did not hitherto diſtinguiſh this to be the true cuogolo or Tarſo, ſince the characters of foſſils have been hitherto ſo little aſcertained, that the beſt and lateſt author on theſe ſubjects, Dr. Woodward, ſo far miſtook the ſtructure of this ſtone, as to call it a ſparry pebble. It is certain that ſpar could never have any thing to do with glaſs-making; but this ſtone has no ſpar in its compoſition.

Soluble TARTAR. The proceſs for making ſolublerTɹe is this: take of an alkaline fixed ſalt a pound, of water a gallon; and, having diſſolved the ſalt in this water boiling, throw in cryſtals of Tartar in powder as long as any fermentation is raiſed, which uſually ceaſes before thrice the weight of the alkali is thrown in. Then ſtrain the liquor through paper; and after due evaporation ſet it by for the ſalt to cryſtalliſe, or elſe evaporate the liquor wholly away, that the ſalt may be left dry.

This ſalt, by the action of the alkali on the acid of Tartar, being freed from thoſe groſs terreſtrious parts, with which the cryſtals of Tartar, how pure ſoever, remain ſtill charged; it diſſolves readily, and keeps ſuſpended in cold water. *Pemberton's Lond. Diſp.*

TA'WING (*Dict.*)—*Method of* Tawing, *or drawing ſkins in white.*—The wool or hair being well got off the ſkins, by means of lime, &c. as deſcribed under the article SHAMMY, they are laid in a large vat of wood or ſtone ſet in the ground, full of water, wherein quick-lime has been ſlacked; wherein they continue a month or ſix weeks, as the weather is more or leſs hot, or as the ſkins are required to be more or leſs ſoft and pliant.

While in the vat, the water and lime is changed twice, and they are taken out and put in again every day. When taken out for the laſt time, they are laid all night to ſoak in a running-water, to get out the greateſt part of the lime; and, in the morning, are laid, ſix together, on the wooden leg, to get off the fleſh, by ſcraping them ſtoutly, one after another, on the fleſh ſide, with a cutting two-handed inſtrument, called a knife; and, while this is in hand, they cut off the legs, and other ſuperfluous parts about the extremes.

This done, they are laid in a vat or pit with a little water; where being well fulled with wooden peſtles for a quarter of an hour, the vat is filled up with water, and the ſkins rinſed therein. They are next thrown on a clean pavement to drain; which done, they are caſt into a freſh pit of water, where being well rinſed, they are taken out, and laid on the wooden leg, ſix at once, with the hair ſide outermoſt, over which they rub a kind of whetſtone very briſkly, to ſoften, and fit them to receive four or five more preparations given them on the leg, both on the fleſh ſide and the hair ſide, with the knife, after the manner above-mentioned.

Theſe over, they are put in a pit with water and wheat-bran, and ſtirred about therein, with wooden poles, till the bran is perceived to ſtick to them; and then they are left; as they riſe of themſelves to the top of the water by a kind of fermentation, they are plunged down again to the bottom; and, at the ſame time, fire is ſet to the liquor, which takes as eaſily as if it were brandy, but goes out the moment the ſkins are all covered.

This operation is repeated as often as the ſkins riſe above water; and, when they riſe no more, they are taken out, laid on the wooden leg, the fleſh ſide outermoſt, and the knife paſſed over it to ſcrape off the bran. The bran thus cleared, the ſkins are laid in a large baſket, where they are loaden with huge ſtones to promote their draining; and, when ſufficiently drained, their feeding is given them, which is performed after the following manner:

For a hundred large ſheep-ſkins, and for ſmaller in proportion, they take eight pounds of alum, and three of ſea-ſalt, and melt the whole with water in a veſſel over the fire; pouring the diſſolution out while yet lukewarm into a kind of trough, wherein are twenty pounds of the fineſt wheat flower, with eight dozen yolks of eggs; of all which is formed a kind of paſte, a little thicker than children's pap; which, when done, is put into another veſſel, to be uſed in manner following: a quantity of hot water being poured into the trough wherein the paſte was prepared, two ſpoonfuls of the paſte are mixed therewith; in order to which, they uſe a wooden ſpoon, which contains juſt what is required for a dozen ſkins: and, when the whole is well diluted, two dozen of the ſkins are plunged therein: care being taken, by the way, that the water be not too hot, which would ſpoil the paſte, and burn the ſkins.

Having ſtaid ſome time in the trough, they are taken out, one after another, with the hand, and ſtretched out; which is repeated twice: when they have all had their paſte, they are put in tubs, where they are fulled afreſh with wooden peſtles. Then they are put in a vat, where they remain five or ſix days, or more; and are at laſt taken out in fair weather, and hung out to dry on cords or racks; the quicker they dry, the better; for, if they be too long a drying, the ſalt and alum within them are apt to make them riſe in a grain, which is an eſſential fault in this kind of dreſſing.

When the ſkins are dry, they are put up in bundles, and juſt dipped in fair water; from which being taken out and drained, they are thrown into an empty tub; and, after ſome time, are taken out, and trampled under foot.

They are then drawn over a flat iron inſtrument, the top whereof is round like a battledore, and the bottom fixed into a wooden block, to ſtretch and open them: when opened, they are hung in the air upon cords to dry; and, when dry, are opened a ſecond time by repaſſing them over the ſame inſtrument.

Laſtly, they are laid on a table, pulled out, and laid ſmooth; and are thus in a condition for ſale and uſe.

After the ſame manner are dreſſed horſes, cows, calves ſkins, &c. for the ſadlers, harneſs-makers, &c. as alſo dogs, wolves, bears-ſkins, &c. excepting that in theſe the uſe of the paſte is omitted, ſalt and alum-water being ſufficient.

TEETH (*Dict.*)—When the Teeth are ſubject to be overſpread with a black or yellow cruſt, it is a very good method to rub them well every day with a mixture of tincture of gum lac, honey of roſes, and ſpirit of vitriol, which will not only whiten the Teeth, but render the gums more firm.

The world is fond of tooth powders, and a moderate uſe of them may do ſervice; but the daily rubbing with them does more harm to the teeth than wholly neglecting them. Powders of this kind may be prudently uſed once in ſix or ſeven days, and will render the Teeth white and ſplendid. The common powders, prepared for this purpoſe, are too hard, and wear away the gums; ſofter ſubſtances ſhould be employed, and, when the gums are furred, a few drops of ſome acid ſpirit may be added to the powder. The following is a very efficacious and ſafe powder: take chalk in powder, myrrh, burnt hartſhorn levigated, and Florentine rice-root, of each two drachms. Spirit of ſalt, ſix drops; mix all into a powder.

The common trick of mountebanks, and other ſuch practiſers, is to uſe various waſhes for the Teeth, the ſudden effects of which, as cleaning and whitening the Teeth, ſurpriſe and pleaſe people; but the effects are very pernicious. All the ſtrong acid ſpirits will do this. As good a mixture as any thing can be, on this occaſion, is the following: take plantane-water, an ounce; honey of roſes, two drachms; ſpirit of ſalt, ten drops: mix the whole together, and rub the Teeth with a piece of linen rag dipped in this, every day, till they are whitened. The mouth ought to be well waſhed with cold water, after the uſe of this or any other acid liquor; and indeed the beſt of all Teeth-waſhes is cold water, with, or without a little ſalt; the conſtant uſe of this will keep them clean and white, and prevent them from aching. *Heiſter's Surg.*

TEGS, a term uſed in ſome parts of the kingdom by the farmers, to expreſs lambs of a year old.

TELEO'LOGY, the ſcience of the final cauſes of things. This is an ample and curious field of enquiry, though pretty much neglected by philoſophers. *Wolf. Diſc. Prælim. Logic.*

TELE'PHIUM, *orpine*, in botany, the name of a genus of plants; the characters of which are theſe: the flower is of the roſaceous kind, conſiſting of ſeveral petals, arranged in a circular form, and contained in a cup, conſiſting alſo of many leaves. The piſtil ariſes from the cup, and is finally converted into a triangular ſhaped unicapſular fruit, containing a number of ſmall and roundiſh ſeeds. To theſe marks it may be added, that the leaves ſtand alternately on the ſtalks.

TE'MACHIS, in natural hiſtory, the name of a genus of foſſils, of the claſs of the gypſums, the characters of which are theſe: it is of a ſofter ſubſtance than many of the other genera, and of a very bright and glittering hue.

The name is derived from the Greek τεμαχος, fruſtulum, a ſmall irregular fragment; the bodies of this genus being compoſed of an aſſemblage of multitudes of irregular flaky fragments, as are all gypſums; but no genus of them ſo viſibly as theſe.

TE'MPERATURE, or *climate for plants.*—The difference of climate or Temperature of the air has a very great effect on plants. The different degree of heat is the great cauſe of theſe changes, and the different degree of moiſture ſomewhat aſſiſts in it. The American and Aſian plants, famous in medicine, when of the growth of their native ſoils, yet when removed into our climate, though they grow and even produce their flowers and ripen their ſeeds, which ſeems the laſt perfection of a plant, when put to the trial, have been always found to want their proper medicinal virtues.

Many of thoſe plants and trees, which, though natives of another climate, will endure the open air with us, and grow in our gardens; yet loſe much of their ſtrength, and become dwarfs, in proportion to what they were when in their proper climate. But much leſs violent changes than theſe are able to produce the like effects, at leaſt in ſome degree. The ſeveral parts of Europe are able to alter the quality of the ſame plant, even while it grows naturally in them. Thus, the blue aconite or napellus, the root of which is a terrible poiſon in the ſouth of France; yet, in Brittany, a northern province of the ſame kingdom, the root of the ſame plant, though it ſeems to grow with equal vigour there, is equally large and ſucculent, has no bad effects; but has been eaten by old people and children without any injury.

In general, the farther north we go the leſs and leſs hurtful this plant becomes. It is common to almoſt all Europe, and we find the inhabitants of ſome places dreading it, and that, with great juſtice, as a fatal poiſon; while thoſe of others eat the leaves in their ſallads, and even eſteem them good to reſtore the appetite.

The common woad which ſucceeds well in many parts of England, is not ſo certain in France; but the different climates, in different parts of that great kingdom, make ſtrange alterations in its juices. In upper Languedoc they raiſe great quantities of it, and it makes an extremely fine blue dye for ſtuffs of all kinds; but, in Brittany, though the plant grows as high, and ſeems to flouriſh as well, yet the leaves never are ſo ſucculent, and the colour obtained from them is not of ſo fine a blue, but is duſky and browniſh.

This effect of the different climates, in changing the nature of things produced in them, is not confined to plants; but the animal kingdom ſhares in it. The whole ſerpent kind are in general larger and more venomous, as we approach the hotter climates. The tarantula, ſo poiſonous in the hot countries, is found greatly leſs ſo, as it is found in more cold regions; and the ſcorpion, whoſe ſting is fatal in ſome parts of Africa, is little more miſchievous than the waſp or hornet, in ſome of the coldeſt places where it lives. Nay, the Philoſophical Tranſactions inform us, that the bite of the tarantula, even in thoſe very places where moſt miſchievous, does not exert its power in cold weather; but that the perſon bitten at ſuch a time feels not the effect of the bite till the next ſultry hot day, though that may not happen till after two or three weeks.

The differences, made by variety of climates upon plants, are not limited to diſtance of place, but even in the ſame province the climate differs greatly in different years, by means of accidents, and more or leſs heat; and more or leſs moiſture will do as much violence to plants ſometimes, as change of place, which only operates by means of the ſame agents. Our farmers complain of great miſchiefs, from long droughts; and the French huſbandmen, in many of the provinces, always find, that when there has fallen very much rain, or thick fogs have been very frequent, all the bread-corn of every kind degenerates; the wheat and barley are poor and thin in the ear, and the grain ſmall; but the rye becomes ſo altered, that it is pernicious to uſe it in making of bread; and the poor, who are obliged to eat the bread made with it, are ſubjected to many diſeaſes by it. They call the rye thus vitiated ergot, and blé cornu. *Dreſland's Trait. Phyſ.*

TENCH, the Engliſh name of the tinca of the modern authors, the fullo and gnapheus of the ancients.

It is, according to the Artedian ſyſtem, a ſpecies of the cyprinus, and diſtinguiſhed by that author by the name of the blackiſh, mucous, or ſlimy cyprinus, with the end of the tail even.

This is a delicately taſted fiſh, though it lives in foul water, and ſeems to feed very coarſely. It is always found in the muddieſt parts of ponds, and where there are moſt weeds.

The ſlime of the ſkin of this fiſh is ſaid to be of a healing nature, and to cure all freſh wounds; and it is pretended that the other fiſh know this property in it, and always apply to the Tench when wounded. Whether their opinion be true or falſe, the Tench has obtained by it the name of the fiſhes phyſician. The pike is ſaid to pay ſuch reſpect to this fiſh, on this account, that he never ſeizes him. But theſe are things eaſier to be fancied and ſaid than proved; and, if it ſhould prove that the pike does not eat the Tench, it may be reſolved into a much more natural cauſe, by ſuppoſing the ſlime of the Tench too diſagreeable in his ſtomach to ſuffer it.

The ſeaſon for angling for Tench is in June, July, and Auguſt. The time of their biting is early in the morning, or late in the evening, and, in hot weather, all night long. The favourite bait for the Tench is a large red worm, and they will take this much more greedily, if it be dipped in tar, after it is put on the hook. There are ſeveral ſorts of paſte alſo that he bites very well at, particularly one made of brown bread and honey, with an admixture of tar. All paſtes that have any of the ſtrong-ſcented oil in them, are alſo good baits. Other baits are the cad-worm, lob-worm, flag-worm, green-gentle, marſh-worm, or ſoft-boiled bread-corn. All theſe will do very well at a proper ſeaſon.

When a number of Tench are to be taken out of a muddy pond, where they will not bite freely at the hook, the method is to take a very good and large caſting-net, well leaded, and with the meſhes from the crown to a full yard and an half, not too ſmall; for then, if the pond be deep, the fiſh will ſtrike away before the net gets to the bottom. The place where the net is intended to be thrown, muſt be made clean from buſhes and large weeds, with a rake. When the place is thus cleared of any obſtacles to the even deſcent of the net, a bait is to be prepared to draw the fiſh together, where the net is to be thrown. This bait is to be thus made: put a quarter of a peck of wheat into three quarts of water, ſend it to an oven, and let it be well ſoaked; then add to it five pints of blood, and as much bran as is neceſſary to give it the conſiſtence of a paſte. Mix ſome clay with it, that it may the better hold together; and, finally, add a quart of lob-worms chopped to pieces. Let the whole be wrought up into a ſtiff paſte, and rolled into balls of the ſize of a hen's egg; and let theſe be thrown into the pond, in the place where the net is to be thrown. At times theſe, and at times ſome grains, are to be thrown in; and the place in this manner thoroughly baited for ſeveral days. When the fiſh may be ſuppoſed to be very well acquainted with the ſpot, let a very good baiting be given in the morning, and in the cloſe of the evening let the caſting-net be carefully thrown in. When the net is ſunk, the mud all about is to be ſtirred up with a long pole, with a fork at the end; the net is to lie half an hour, and the mud to be thus ſtirred all the time; by this means the Tench will be raiſed, and will be taken in the pulling out the net; but, if the net were to be thrown in and taken out in the common way, there would hardly be one fiſh taken; for the cuſtom of both Tench and carp, when they are frighted, is to plunge their heads up to eyes in the mud, and thus placed, with their tails erect, any net in the world muſt draw over them, without a poſſibility of its entangling them.

TE'NTER (*Dict.*)—It is uſually about four feet and a half high, and for length exceeds that of the longeſt piece of cloth.—It conſiſts of ſeveral long ſquare pieces of wood, placed like thoſe which form the barriers of a manege, ſo, however, as that the lower croſs piece of wood may be raiſed or lowered, as is found requiſite, to be fixed at any height, by means of pins.—Along the croſs-pieces, both the upper and under one, are hooked nails, called Tenter-hooks, driven in from ſpace to ſpace.

To put a piece of cloth on the TENTER; while the piece is yet quite wet, one end is faſtened to one of the ends of the Tenter; then it is pulled by force of arms towards the other end, to bring it to the length required: that other end being faſtened, the upper liſt is hooked on to the upper croſs-piece, and the loweſt liſt to the lower croſs-piece, which is afterwards lowered by force, till the piece have its deſired breadth.—Being thus well ſtretched, both as to length and breadth, they bruſh it with a ſtiff hair-bruſh, and thus let it dry.—Then they take it off; and, till they wet it again, it will ſtill retain the width and breadth the Tenter gave it.

TE'PID, in natural hiſtory, a term uſed by writers on mineral waters, to expreſs ſuch of them as have a leſs ſenſible cold than common water.

They diſtinguiſh all the medicinal ſprings into three kinds; the hot, the tepid, and the cold; but the middle term might eaſily be underſtood to mean a great deal more than they expreſs by it; all that have what can be called the leaſt ſenſible warmth, are called hot; and the tepid are diſtinguiſhed from the abſolutely cold, only by their being leſs cold.

Some of this claſs of mineral waters, and ſome few alſo of the cold ones, have a ſharpiſh vinous taſte, which is never obſerved in any of the hot ones. This taſte is loſt on the giving the waters the ſlighteſt heat, and is therefore very difficult to be gueſſed at as to its origin. It is not only found in the aluminous and vitriolate waters, but alſo in thoſe which are manifeſtly nitrous, and which abound in ſulphureous ſalts, quite different in their nature from acids. It is therefore an additional ſomewhat, quite diſtinct from the ſaline properties of the fluid, and as eaſily connected with one kind of that as with the others.

The cauſes of heat in the mineral waters remain yet wholly unknown, notwithſtanding all that has been written concerning them. It is hard to believe, that there are continual ſubterranean fires near enough the ſurface, to give a heat that preſerves itſelf in ſo great a degree to the very place of their eruptions; and it is equally hard to conceive, that there can be beds of fermenting mineral matters, ſufficient in quantity and force to have given the ſame degree of heat to waters for ſo many ages, as ſome of our hot ſprings are known to have ſubſiſted. *Duclos's Exam. des Eaux Miner.*

TEREBI'NTHUS, *the turpentine-tree*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the apetalous kind, being compoſed of ſeveral ſtamina, furniſhed with their apices; theſe are however barren, and the embryo-fruits are produced on other plants of the ſame ſpecies, which produce no flowers. Theſe finally become a capſule, compoſed of one or two cells, and containing oblong ſeeds.

TERE'DO, a name given by naturaliſts to a ſpecies of ſea-worm, which eats its way into the bottoms of ſhips, lining the hole it makes with a kind of ſhelly matter.

The head or this creature is well prepared by nature for the hard offices it is to undergo, being coated with a ſtrong armour, and furniſhed with a mouth like that of the leech; by which it pierces wood, as that animal does the ſkin. A little above this it has two horns which ſeem a kind of continuation of the ſhell. The neck is as ſtrongly provided for the ſervice of the creature as the head, being furniſhed with ſeveral ſtrong muſcles. The reſt of the body is only covered by a very thin and tranſparent ſkin, through which the motion of the inteſtines is plainly ſeen by the naked eye; and, by means of the microſcope, ſeveral other very remarkable particulars become viſible there.

At that part where the inteſtines end, the tail begins; this is longer than all the reſt of the body; it is depreſſed in the middle, and puffed out on each ſide, and is joined to the callous part of the lower end of the body in an irregular manner, ſo that there is an intermediate void ſpace left between: this occupies the middle part between what the natural hiſtorians call two ſoleæ-form fins. This creature is wonderfully minute, when newly excluded from the egg, and at its utmoſt bigneſs is a foot long; three or four inches is however its more frequent length.

The ſkin of this little animal being ſtripped off, the heart, ſtomach, and inteſtines come plainly in view, as alſo the callous muſcles of the neck, and two white ovaries; the heart is compoſed of two pyramidal veſſels.

TERRE *verte*, in the colour trade, the name of a green earth much uſed by painters, both ſingly for a good ſtanding green, and in mixture with other colours.

The name is French, and ſignifies green earth.

It is an indurated clay, of a deep bluiſh green colour, and is found in the earth, not in continued ſtrata or beds as moſt of the other earths are, but in large flat maſſes of four or five feet in diameter; theſe break irregularly in the cutting, and the earth is generally brought out of the pit in lumps of different ſizes. It is of a fine regular and even ſtructure, and very hard. It is of an even and gloſſy ſurface, very ſmooth to the touch, and in ſome degree reſembling the morochthus, or French chalk, but adhering firmly to the tongue. It does not ſtain the hands in touching it; but, being drawn along a rough ſurface, it leaves an even white line, with a greeniſh caſt. It does not ferment with acids, and it burns to a duſky brown colour.

It is dug in the iſland of Cyprus, and in many other parts of France and Italy. That from the neighbourhood of Verona has been uſed to be eſteemed the beſt in the world; but, of late, there has been ſome dug in France that equals it. There is alſo an earth dug on Mendip Hills, in the ſinking for coal, which, though wholly unobſerved, is nearly, if not wholly, of equal value. *Hill's Hiſt. of Foſſils.*

TERRES'TRIAL *Line*, in perſpective, is the line an object is placed or ſtands upon, of which each object has its particular one, and the whole draught a general one.

The Terreſtrial line is always parallel to the horizon. Thus A B (*Plate* XLIV, *fig.* 25. in the Dictionary) is the Terreſtrial line, being parallel to D C, the horizontal line. Its uſe is to determine the lengths and breadths. Thus the viſual lines A E, B E, meeting in the point E, determine the dimenſions of a figure equal in length or breadth to A B, when it is removed to any diſtance from A B towards the point E.

TER'TIUM *Sal*, a third ſalt, a term uſed in chemiſtry to expreſs a ſalt reſulting from the mixture of an acid and an alcali, which partakes ſo of the nature of both, as to be itſelf neither acid, nor alcali, but neutral.

TEST *Liquor*, a term uſed by our dealers in brandies, &c. for a liquor which they uſe as the Teſt of brandy, &c. to prove whether they be genuine, or mixed with home ſpirit.

The people who uſe this, place great confidence in it, but it is really a very vague and uncertain thing. They pretend, that this liquor will ſhew by the colour which it makes, on being poured into brandy, whether it be genuine and unadulterated; or, if not, in what proportion the adulterating ſpirit is mixed with it.

The whole fact is this: if a little common green or white vitriol be diſſolved in ſome fair water, it makes a Teſt liquor; a few drops of which, being let fall into a glaſs of old French brandy, will turn the whole to a purple, or fine violet colour; and, by the ſtrength or paleneſs of this colour, the dealer judge the brandy genuine or mixed, in different proportions, with home ſpirits.

Old French brandy, having long lain in the caſk, takes a dilute tincture of the wood of the caſk, that is, of oak; and this, being of the ſame nature with a ſolution or tincture of galls, naturally turns bluiſh or blackiſh with vitriol. A new diſtilled brandy, though wholly foreign, would not give this Teſt; and a common malt-ſpirit, with oak chips infuſed in it, will turn as dark as the fineſt brandy. While our diſtillers indeed had nothing in uſe for the colouring their ſpirits but burnt ſugar, it was poſſible to make ſome gueſs at an adulteration with them, becauſe the brandy, in this caſe, would not become blackiſh in proportion to its former colour, the ſugar-colour not turning to ink with the vitriol like the other: but our diſtillers have of late found a way of uſing an extract of oak for the colouring of their ſpirits, and, ſince that, this Teſt liquor is of very little uſe, our common ſpirits, of any kind, turning as deep with it as the foreign brandies.

The very beſt way of making this Teſt liquor is with a calcined vitriol of iron, diſſolved in a dilute or aqueous mineral acid. The liquor, when well made in this manner, is of a fine yellow colour, and will give, for a time, the fineſt blue to any ſpirituous tincture of oak.

The Engliſh were, at one time, very fond of high-coloured brandies, and it was then that the uſe of this Teſt-liquor was moſt eſteemed; afterwards we, as well as other nations, finding that this colour was only owing to the caſk, began to diſlike it, and to favour the pale brandies; at length we fell into the uſe of ſuch as were wholly limpid and colourleſs, and the rediſtilling of all the old brandies people were poſſeſſed of took place; on this, the Teſt liquor was found to be of no uſe at all, and accordingly rejected; but as we are of late again come into the eſteem of coloured brandies, and that with great juſtice, as the colour, when genuine, is a certain mark of the age of the liquor, this Teſt liquor is again got into more credit than it deſerves.

The famous Helvetian ſtyptic depended wholly on this accident for its colour ; and it was no ſmall mortification to our chemiſts, when, ſome years ago, it was introduced into uſe among us, that they could not make it with our own ſpirits, but muſt be at the expence of true French brandy for it ; our own ſpirits, though equally coloured, would never make that violet tincture, becauſe their colour was owing to burnt ſugar, not a tincture of oak. At length this myſtery was explained, and a little ſcrapings of galls made all thoſe quantities of this ſtyptic, which had been ſet by as good for nothing, perfectly fine, and well coloured. *Shaw's Eſſay on Diſtillery.*

TETRADECARHO'MBIS, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ.

The word is derived from the Greek, τετρὰς four, δεκὰς, ten, and ῥόμβο, a rhomboidal figure, and expreſſes a rhomboidal body conſiſting of fourteen planes.

The characters of this genus are, that the bodies of it are exactly of the ſame form with the common ſelenitæ ; but that in theſe each of the end planes is divided into two, and there are by this means eight of theſe planes, inſtead of four. *Hill's Hiſt. of Foſſ.*

TETRADYNA'MIA *, in botany, a claſs of plants, whoſe flowers have four of their ſtamina of more efficacy than the reſt: theſe are always known by leaving the four efficacious ſtamina longer than the reſt. See *Plate* XLIII. *fig*. 5.

* The word is formed of the Greek τετρὰς, four, and δυναμὶς, power. Of this claſs of plants are ſcurvy-graſs, muſtard, radiſh, &c.

TETRA'NDIA *, in botany, a claſs of plants which have hermaphrodite flowers, with four ſtamina or male parts in each. See *Plate* XL. *fig*. 4.

* The word is formed of the Greek τετρὰς, four times, and ἀνὴρ, male. Of this claſs of plants are the teaſel, madder, plantane, &c

TETRAPYRAMI'DIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek τετρὰς, four, and πυραμὶς, a pyramid.

The bodies of this genus are ſpars influenced in their ſhape by an admixture of particles of tin ; and are found in form of broad-bottomed pyramids of four ſides.

Of this genus there is only one known ſpecies, which is uſually of a browniſh colour, and is found in Saxony ; as alſo in Devonſhire, Cornwall, and other counties of England, where there is tin. *Hill's Hiſt. of Foſſ.*

TEU'CRIUM, *tree-germander* in botany, the name of a genus of plants, the characters of which are theſe : the flower conſiſts of one leaf, and is of the labiated kind ; the ſtamina ſupplying the place of the upper lip ; the lower lip is divided into five ſegments, the middle one being largeſt and hollowed like a ſpoon ; the others ſtanding overagainſt one another in the neck of the flower. The cup is bell-faſhioned, and from it ariſes a piſtil which is fixed in the manner of a nail to the hinder part of the flower, and is ſurrounded by four embryoes, which afterwards become four roundiſh ſeeds, and ripen in the bell-ſhaped cup of the flower.

TFU'OI, in the Chineſe manufactory of porcelaine, a word uſed to expreſs a particular ſort of varniſh for that ware with violet colour and gold. The uſual method of doing this, at firſt, was by mixing gold with the common varniſh, breaking the leaves very ſmall, and then adding the common blue and the powder of calcined agate of a coarſe kind, found in great plenty on the ſhores of their rivers. But they have ſince found, that the brown varniſh called tſekin ſucceeds greatly better ; for, when the blue is mixed with this, its brown colour is loſt, and the gold lies on much better than it would any other way.

They had once a method of a varied varniſh, which was very beautiful, but is much neglected now ; this was the giving a veſſel the brown varniſh on the outſide with a large portion of gold, and the common white varniſh within. They alſo varied the degree of colour on the outſide, by laying on more or leſs of the varniſh ; and gave this way a variety, even in the ſame colour. *Obſerv. ſur les Coutumes de l'Aſie.*

THA'LAMUS, in botany, a term uſed to expreſs that part of the flower in the capitated, or floſculous flowered plants, where the embryo fruits of every ſeparate floſcule are lodged, and where afterwards the ſeeds are contained. This is the bottom of the cup, in the central part of which it adheres to the ſtalk.

THALI'CTRUM, *meadow rue*, in botany the name of a genus of plants. The characters of which are theſe : the flower is of the roſaceous kind, being compoſed of ſeveral petals arranged in a circular form. The piſtil ariſes from the center of the flower, and is ſurrounded by a vaſt congeries of ſtamina. This finally becomes a fruit compoſed of ſeveral capſules gathered into a ſort of head ; theſe are ſometimes alated, and ſometimes plain, and each of them contains one oblong ſeed.

THALLO'PHORI, Θαλλόφοροι, in antiquity, the old men and women, who, in the proceſſion of the feſtival Panathenæa, carried olive boughs in their hands. *Potter, Archæol. Græc.*

THALY'SIA, Θαλύσια, in antiquity, a ſacrifice offered by the huſbandmen after harveſt. *Potter, Archæol. Græc.*

THA'PSIA, in botany, the name of a genus of plants, the characters of which are theſe : the flowers are diſpoſed in umbels, and are of the roſaceous kind, being compoſed of ſeveral petals, diſpoſed in a circular order on a cup, which afterwards becomes a fruit compoſed of two long ſtriated ſeeds, ſurrounded with a foliaceous edge, and from both ſides emarginated inwards.

THARGE'LIA, Θαργήλια, in antiquity, an Athenian feſtival, in honour of the ſun, and his attendants the hours ; or, as others think, of the Delian Apollo and Diana. *Pot. Arch. Græc.*

THARGE'LION, Θαργηλιὼν, in chronology, the eleventh month of the Athenian year. It continued thirty days, and anſwered to the latter part of our April, and the beginning of May.

THE'ATINES, an order of nuns, under the direction of the Theatins.

There are two kinds of Theatines, under the title of ſiſters of the immaculate conception, who form two different congregations, the one engaged by ſolemn vows, and the other only by ſimple vows. — Their common foundreſs was Urſula Benincaſa. Thoſe who make the ſimple vows are the moſt ancient, and are called abſolutely Theatines of the congregation : they had their riſe at Naples, in 1583.

The others are called Theatines of the hermitage : the whole buſineſs of theſe is praying in retirement, and an auſtere ſolitude, to which they engage themſelves by ſolemn vows.

The Theatines of the firſt congregation take care of the temporal concerns of theſe laſt. Their houſes ſtand together, and communicate by a large hall. Their foundreſs drew up their conſtitutions, and laid the foundation of their houſe at Naples, but died before it was finiſhed.

Gregory the XVth, who confirmed the new inſtitute under the rule of St. Auguſtin, appointed that they ſhould be under the direction of the Theatins. Urban VIII. revoked this article by a brief in 1624, and ſubjected them to the nuncio of Naples ; but Clement IX. annulled this brief, and ſubmitted them anew to the Theatins by a brief in 1668.

THE'ATINS, a religious order of regular prieſts, thus called from their firſt ſuperior Don John Pietro Caraffa, archbiſhop of Chieſi, in the kingdom of Naples, which was anciently called Theate.

The ſame archbiſhop was afterwards pope, by the name of Paul IV, after having been a companion of Gaëtan, a Venetian gentleman, the firſt founder of this order, at Rome, in 1524.

The Theatins were the firſt who aſſumed the title of regular clerks. They have not only no lands, or fixed revenues, either in common or in propriety ; but they do not even aſk or beg any thing ; but wait for what providence ſhall ſend them for their ſubſiſtance.

They employed themſelves much in foreign miſſions ; and in 1627 entered upon Mingrelia, where they have an eſtabliſhment : they have had the like in Tartary, Circaſſia, and Georgia, which they have ſince abandoned, by reaſon of the little fruit they perceived thereof.

Their firſt congregation appeared at Rome in 1524, and was confirmed the ſame year by Clement VII.—Their conſtitutions were drawn up at a general chapter in 1604. and approved by Clement VIII.—They wear the prieſts habit.

THE'MIS, in aſtronomy, a name given by ſome to the third ſatellite of Jupiter.

THEO'DOLITE, (*Dict.*)— This inſtrument is now commonly made uſe of by ſurveyors. One of the beſt of the kind ſeems to be Mr. Siſſon's lateſt improved Theodolite.

In this inſtrument the three ſtaves, by braſs ferrils at top, ſkrew into bell-metal joints, moveable between braſs pillars, fixed in a ſtrong braſs plate, in which round the center is fixed a ſocket with a ball moveable in it, and upon which the four ſcrews preſs that ſet the limb horizontal. Next above is ſuch another plate, through which the ſaid ſcrews paſs, and on which round the center is fixed a fruſtum of a cone of bell-metal, whoſe axis, being connected with the center of the ball, is always perpendicular to the limb by means of a conical braſs ferril fitted to it, whereon is fixed the compaſs box, and on it the limb, which is a ſtrong bell-metal ring, whereon are moveable three braſs indexes, in whoſe plate are fixed four braſs pillars, that joining at top hold the center-pin of the bell-metal double ſextant, whoſe double index is fixed in the center of the ſame plate. Within the double ſextant is fixed the ſpirit level, and over it the teleſcope.

The compaſs-box is graved with two diamonds for north and ſouth, and with twenty degrees on both ſides of each, that the needle may be ſet to the variation, and its error alſo known.

The limb has two flour-de-luces againſt the diamonds in the box, and is curiouſly divided into whole degrees, and numbered to the left hand at every 10°. to twice 180°, having three indexes (with Nonius's diviſions on each for the decimals of a degree) that are moved by a pinion fixed below one of them without moving the limb, and in another is a ſcrew and ſpring under, to fix it to any part of the limb : it has alſo diviſions numbered for taking the quarter girt in round timber ; to which a ſhorter index is uſed, having Nonius's diviſions for the decimals of an inch ; but an abatement muſt be made for the bark, if not taken off.

The double ſextant is divided on one ſide from under its center (when the ſpirit-tube and teleſcope are level) to above 60 degrees each way, and numbered at 10, 20, &c. And the double index (through which it is moveable) ſhews on the ſame ſide the degree and decimal of any altitude or depreſſion to that extent, by Nonius's diviſions; on the other ſide are diviſions numbered for taking the upright height of timber, &c. in feet, when diſtant ten feet, which at twenty muſt be doubled, and at thirty trebled; and alſo the quantities for reducing hypothenuſal lines to horizontal: it is moveable by a pinion fixed in the double index.

The teleſcope is a little ſhorter than the diameter of the limb, that a fall may not hurt it; yet it will magnify as much and ſhew a diſtinct object as perfect, as moſt of treble its length; in its focus are very fine croſs wires, whoſe interſection is in the plane of the double ſextant, and this is a whole circle, and turned in a lathe to a true plane, and is fixed at right angles to the limb; ſo that whenever the limb is ſet horizontal (which is readily done by making the ſpirit-tube level over two ſcrews, and the like over the other two) the double ſextant and teleſcope are moveable in a vertical plane, and then every angle taken on the limb (though the teleſcope be never ſo much elevated or depreſſed) will be an angle in the plane of the horizon; and this is abſolutely neceſſary in plotting an horizontal plane.

THE'RAPHIM or *Teraphim* (*Dict.*) — We meet with this word thirteen or fourteen times in ſcripture, where it is commonly interpreted idols: but the rabbins are not contented to have it ſimply ſignify idols, but will have it denote a peculiar ſort of idols or images for the knowledge of futurity, i. e. oracles.

R. David de Pomis obſerves, that they were called Theraphim, from רפה, raphah, to leave, becauſe people quitted every thing to conſult them.—He adds, that the Theraphim were in human ſhape; and that, when raiſed upright, they ſpoke at certain hours, and under certain conſtellations, by the influence of the celeſtial bodies. This is a rabbinical fable, which he has learned from Abenezra.

Others hold, that the Theraphim were brazen inſtruments which pointed out the hours and minutes of future events, as directed by the ſtars.—De Pomis corrects Abenezra, ſaying, that, the Theraphim being made under a certain conſtellation, the devil made them ſpeak under the ſame.

R. Eliezer tells us the reaſon why the rabbins will have the Theraphim to ſpeak, and render oracles: it is, ſays he, becauſe it is written, in the prophet Zachary, x. 2. The Theraphim have ſpoken vain things.

The ſame rabbin adds, that, to make the Theraphim, they killed a firſt-born child, clove his head, and ſeaſoned it with ſalt and oil; that they wrote on a plate of gold the name of ſome impure ſpirit, laid it under the tongue of the dead, placed the head againſt the wall, lighted lamps before it, prayed to it, and it talked with them.

Be this as it will, Vorſtius obſerves, that, beſides the paſſage of Zachary juſt quoted, it appears likewiſe from Ezekiel xxi. 22, that the Theraphim were conſulted as oracles.

De Pomis endeavours to ſhew, that the Theraphim, which Michol put in David's bed, were not of this kind, becauſe they were not in the figure of men; but R. Eliezer is of another ſentiment.

As to the manner of making the Theraphim, Vorſtius takes it to be a vain tradition of the rabbins, though R. Tanichuma and Jonathan, in his Targum, Gen. xxxi. 19, relate it after R. Eliezer.—The chief reaſon of his diſbelief is, that Laban who had not quite loſt all notion of the true God, as appears from Gen. xxxi. 53, could not be guilty of ſo great a cruelty: but Vorſtius does not conſider, that the cuſtom might not be leſs real, for its not having been eſtabliſhed ſo early as Laban: and that the Hebrews ſometimes burnt their children to Moloch.

F. Kircher directs us to ſeek the origin of the Theraphim in Egypt; adding, that the word is Egyptian.—Spencer, in his diſſertation on the Urim and Thummim, maintains the word to be Chaldee, and to ſignify the ſame with ſeraphim, the Chaldeans being frequently known to change the ש into ת, that is, *ſ* into *t*. He adds, that thoſe images were borrowed from the Amorites, Chaldeans, or Syrians; and that the Serapis of the Egyptians is the ſame thing with the Theraphim of the Chaldeans. See *Selden de Diis Syriis*, *ſynt.* I. c. 2.

THESMOPHO'RIA, Θεσμοφόρια, in antiquity, a feſtival in honour of Ceres, which was celebrated by many cities of Greece; but eſpecially the Athenians obſerved it with great devotion and pomp.

THESMOTHE'TÆ, Θεσμοθέται, in antiquity, an appellation given to ſix of the nine Athenian archons; the firſt and chief of the nine was called, by way of eminence, archon; the ſecond in dignity was called baſileus, the third polemarchus, and the other ſix Theſmothetæ.

THE'TA, Θ, among the antients, one of the Greek letters. It was uſed as a mark on the ballots of judges, by which they condemned the perſon to death, it being the firſt letter of the word ϑάνατος, death. Whence it had the epithet of niger and infelix, thus: O multum ante alias infelix litera Theta.

THE'TES, Θῆτες, in antiquity, the loweſt claſs of people at Athens. Ariſtides repealed Solon's law, by which the Thetes were made incapable of bearing any office in the government. *Potter*, *Archæol.*

THE'VET, a name of one of the Hebrew months, anſwering to our December moon.

THIRD *Major*. The logarithm or meaſure *a* of the octave $\frac{2}{1}$ being 1.000000, the meaſure of the greater Third $\frac{5}{4}$ will be 0.321928.

The Third major is by practitioners often taken for the Third part of an octave; but this is a great error, ſince three geater Thirds fall ſhort of the octave by a dieſis: For $\frac{5}{4} \times \frac{5}{4} \times \frac{5}{4} \times \frac{128}{125} = \frac{2}{1}$; or by logarithms $3 \times 0.321928 +$ log. dieſis $= 0.965784 + 0.034215 = 0.999999$ or 1.000000 the logarithm of the octave.

THIRD *Minor*. The logarithm or meaſure of the octave $\frac{2}{1}$ being 1.000000, the meaſure of the Third minor $\frac{6}{5}$ will be 0.263034. Hence, it appears, that four leſſer Thirds exceed the octave. But practical muſicians are apt to ſuppoſe them equal to the octave, as they are apt to confound three greater Thirds with that interval. Three leſſer Thirds exceed the octave by a dieſis and a comma, as it is eaſily proved by logarithms. *Euler. Tent. Nov. Theor. Muſ.* See the article INTERVAL.

THI'STLE, *carduus*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the floſculous kind, being compoſed of ſeveral floſcules, which, at the upper end, are divided into ſegments, and ſtand upon the embryo ſeed. The general cup which contains theſe floſcules is of a prickly ſtructure, and the embryoes finally become ſeeds winged with down.

THISTLE *Fly*, in natural hiſtory, a ſmall fly produced from a fly-worm, hatching in the protuberances of the carduus hæmorrhoidalis. In the protuberances of this Thiſtle, while they are cloſed in all parts, the worm of this fly, from whoſe injuring it, at the time of depoſiting the egg from which it was hatched, the protuberances aroſe, undergoes its laſt transformation. It here makes of its own ſkin a ſhell, in form of an egg, within which it puts on the nymph ſtate. When this nymph becomes a living fly, the leaſt part of its difficulty is the finding its way out of this ſhell; it has a much ſtronger priſon than that, and before it can obtain its liberty, muſt force its way through the much more cloſely compacted fibres of the protuberance of the vegetable. It has, however, no other means of doing this difficult and laborious work, but that of inflating its head, and throwing out the bladder or muzzle with which all theſe creatures are, by bountiful nature provided in this ſtate.

This is a difficult operation, and many of the creatures periſh in the attempt; but, what much forwards the ſucceſs of it, in many caſes, is, that the ſtalk of the Thiſtle often becomes naturally half rotten before the time of the fly's egreſs. *Reaumur*, *Hiſt. Inſ.*

Order of the THISTLE (*Dict.*)—The legend is, that, a croſs of St. Andrew (the patron of that kingdom) appearing to him at the time of the engagement, he bleſſed the happy augury, took the figure thereof into his ſtandard in honour of his protector, and inſtituted an order of knights whoſe collar is of gold interwoven with Thiſtle flowers, and ſprigs of rue.

From the collar hangs a medal, on which is the image of St. Andrew with his croſs on his breaſt; with this motto, Nemo me impune laceſſet, Nobody ſhall provoke me unpuniſhed.

Others give a different account of its origin, and aſſure us, it was inſtituted after the concluſion of a peace between Charles VII. of France and the king of Scotland.

The abbot Juſtiniani goes up higher, and will have it to have been inſtituted by Achaius I, king of Scotland, in 809; who, after an alliance made with Charlemaign, took for his device the Thiſtle, with the words Nemo me impune laceſſet, which, in effect, is that of the order: he adds, that king James IV. renewed the order, and took St. Andrew for his protector.

The order only conſiſts of twelve knights, beſides the king, who is the chief, or ſovereign. Their ordinary badge is a green ribbon, to which hangs a Thiſtle of gold, crowned within a circle of gold, in which is the foreſaid motto.

Our Lady of the THISTLE, was alſo a military order inſtituted, in 1370, by Louis II, duke of Bourbon. — It conſiſted of 26 knights, whereof that prince and his ſucceſſors were the chiefs: their badge was a ſky-blue girdle; and, on ſolemn occaſions, a mantle of the ſame colour, with a gold collar, interwoven with flower-de-luces, among which was the word eſperance, hope, in capitals.

THI'MBLE-*making*. This art was brought from Holland, by Mr. John Lofting, a Dutchman, in 1695, who ſet up a work at Iſlington, and practiſed it with ſucceſs.

Thimbles are made of ſhruff, or old hammered braſs, the beſt being too dear, and the ordinary too brittle.

This they melt and caſt in a ſort of ſand, gotten only at Highgate, with which and red okre are made mould and cores, and in them they uſually caſt ſix groſs at a caſt, and about ſix or ſeven of theſe caſts in a day. They are caſt in double rows, and, when cold, taken out and cut off with greaſy ſhears.

Then boys take out the cores from the inſide with a pointed piece of iron, which cores were made by them, every core having a nail with a broad head in it, which head keeps it from the mould, and makes the hollow to caſt it in.

This done, they are put into a barrel as they do ſhot, and turned round with a horſe, till they rub the ſand one from another.

Thus far the foundery, in which are employed ſix perſons: firſt, the founder and two men make the moulds ready. Secondly, two boys make cores, for each Thimble one. Thirdly, one that blows the bellows. From hence they are carried to the mill to be turned.

Firſt, the inſide, which works with an inſtrument to the bottom, while its hold laſts, and flies back, when let looſe. Secondly, the outſide, which with a coarſer engine called a rough turning is made pretty ſmooth at one ſtroke; and afterwards with a finer engine both the ſide and bottom are at one ſtroke made very ſmooth.

Then ſome ſaw-duſt or filings of horn-combs are put half way into each Thimble, and upon it an iron punch, and then, with one blow againſt a ſtudded ſteed, the hollow of the bottom is made.

After this with an engine the ſides have the hollow made, and in this engine is their chief ſecret, and they can work off with it thirty or forty groſs in a day.

This done, they are again poliſhed on the inſide.

Then the rim, whether a ſingle or double one are turned at one ſtroke, and all theſe turnings are performed with five men and three boys.

After this, they are again turned in the barrel with ſaw-duſt or bran to ſcour them very bright, and ſo they are complete Thimbles.

Thus finiſhed, they are ſorted, and put ſix together one in another; and ſix of theſe ſixes are wrapped up in a blue paper, and four of theſe papers, making a groſs, are wrapped up in another blue or brown paper, and tied with a packthread, which makes them almoſt a ſquare, and are ſold by the firſt maker at four or five ſhillings the groſs.

The charge of this work per annum is much about 700 l. and there has been made, one week with another, about 140 groſs, which makes 7280 groſs, or 1048320 Thimbles, which at four ſhillings the groſs amounts to 1456 l. Out of this a great deal goes for the ſhruff they are made of, a groſs of Thimbles weighing about twenty-four or twenty-eight ounces.

THLA'SPI, *treacle muſtard*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of four leaves, and is of the cruciform kind. The piſtil ariſes from the cup, and finally becomes a roundiſh fruit, of a flatted ſhape, and uſually terminated all round with a foliaceous edge ſplit at the extremity, and divided by an intermediate membrane into two cells, which uſually contain a number of flat ſeeds. To theſe marks it is to be added, that all the Thlaſpi's have whole, not divided leaves, in which they evidently differ from the naſturtium, or creſs kind.

THLASPI'DIUM, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of four leaves, and is of the cruciform kind. The piſtil ariſes from the cup, and finally becomes a ſort of double fruit, flat, and compoſed of two parts ſeparated one from the other by an intermediate membrane, and each containing uſually one long-ſhaped flatted ſeed.

THOUGHTS, in a boat, a name given by ſeamen to the benches on which the men ſit down to row.

THOWLES, in a boat, are thoſe pins in its gunnel, between which the men put their oars, when they row.

THRA'NITÆ, in the Roman trireme gallies, or thoſe which had three rows of rowers; thoſe of the upper row were called by this name, the ſecond the zygitæ, and the loweſt thalamitæ.

THRAUSTO'MICTHES *, in natural hiſtory, the name of a genus of compound earths.

* The word is derived from the Greek θραύστος, brittle, and μιχθεὶς, mixed.

The bodies of this genus are loams compoſed of ſand and a leſs viſcid clay, and are therefore of a friable or crumbly texture.

THREAD.—The Thread of the Laplanders is very fine, white, and ſtrong, but it is of a very different nature from ours; they know nothing of flax or hemp, nor of any other plant whoſe ſtalks might ſupply the place of theſe in making Thread, but theirs is made of the ſinews of the rain-deer. They kill of theſe animals a very great number continually, partly for food, partly for the ſkins which they uſe in cloathing themſelves, covering their huts, and on many other occaſions; the ſinews of all that they kill are carefully preſerved, and delivered to the women, whoſe province it is to prepare this neceſſary matter. They beat the ſinews very well, and after having ſteeped them a long time in water, and then they ſpin them out.

The Thread they thus make is of any degree of fineneſs they pleaſe; but it never is any longer than the ſinew from which it is made. They uſe this in ſewing their cloaths, ſhoes, gloves, &c. and the trappings of their rain-deer. The Threads of the ſame ſinew are laid up together, and are all of a length; and, as the different ſinews afford them of very different lengths, they accordingly pick out ſuch as the preſent uſe requires, both in regard to length and fineneſs. This ſort of Thread is made with much more labour than ours; but it is greatly ſuperior to it on many occaſions, where ſtrength is rather required than beauty.

Theſe people have, beſides this, a way of making a ſort of yarn of ſheep's wool, which they weave into garters, and a ſort of ribbons, uſed by way of ornament; but they place no value on it, becauſe of its want of ſtrength. *Sheffer's Hiſt. of Lapland.*

THU'YA, *tree of life*, in botany, the name of genus of trees, the characters of which are theſe: the embryo fruits are of a ſquammoſe ſtructure, and finally become a ſort of oblong fruit, between the ſcales of which there lie a ſort of marginated ſeed. To this it is to be added, that the leaves are ſcaly.

THY'IA, Θυΐα, in antiquity, a feſtival in honour of Bacchus, celebrated by the Eleans. *Potter, Archæol. Græc.*

THY'MALLUS, in ichthyology, the name of a fiſh of the truttaceous kind, called in Engliſh the greyling or umber.

It is of a long and flatted body, the belly is ſomewhat broad, and the back rigid and thin. It ſeldom exceeds a pound, or at the utmoſt a pound and half weight. Its back is of a duſky browniſh green, with a ſomewhat bluiſh caſt intermixed, and its ſides of a more ſhining gloſs with an admixture of gold colour. The ſcales are of a ſort of rhomboidal form, and the ſide-lines are much nearer the back than the belly. The ſides are variegated with black ſpots placed irregularly, but there are none of theſe near the tail. The back has two fins, and the tail is forked. The head is ſmall, the eyes large and protuberant; the mouth is moderately large, and the upper jaw larger than the under; it has no teeth, but the whole jaws are rough like a file.

It is caught in the freſh rivers in the mountainous counties of England, and in the like ſituations in Germany and other kingdoms, and is one of the fineſt-taſted of all the freſh-water-fiſh. It feeds on worms, and ſpawns in May.

THY'MBRA, in botany, the name of a genus of plants, the characters of which are theſe: the flowers and ſeeds are in all reſpects like thoſe of thyme, but that they are placed verticillately round the ſtalks.

THY'NNIA *, Θυννία, in antiquity, a ſacrifice offered to Neptune by the fiſhermen, after a plentiful draught.

* The word is derived from θύννος, a tunny, that being the ſacrifice offered.

THY'NNUS, in ichthyography, the name of a fiſh, called in Engliſh the tunny, or Spaniſh mackarel, common in the Mediterranean, and other ſeas, and ſometimes, though not frequently, caught on the Engliſh coaſts.

It is a very large fiſh, growing ſometimes to ſeven or eight feet long, and more than an hundred weight. It is of a rounded and thick body, growing gradually ſmaller towards the tail, until it is at length extremely ſlender. It very much reſembles the pelamis in its whole figure, but that it wants the oblong black ſtreaks which that fiſh has on its ſides, and is much larger. The back is black, or, if held in ſome lights, is of a ſhining bluiſh or greeniſh hue. Its belly and half its ſides are of a ſilvery whiteneſs. Its ſcales are very ſmall, its ſnout pointed. Its jaws both of equal length, and armed each with one row of teeth. The mouth is large and black within, except that part of the palate is red. The eyes are large. The larger black fins are two in number; the foremoſt placed near the head, and riſing out of a cavity in the back, and the other at a ſmall diſtance behind that; and, in ſome fiſh of this ſpecies, of a reddiſh or yellowiſh colour; and, behind this laſt, there are eight, nine, or ten ſmall fins running down the ridge of the back, at equal diſtances to the tail. The tail is very forked. The fins at the gills are black, ſmall, and terminate in a point. The belly fins are placed but at a ſmall diſtance behind theſe, and are alſo ſmall; and both theſe, and the gill-fins, have ſinuſes in the body of the fiſh, into which they may be depreſſed. Behind the anus is a fin like that on the back, and behind it eight more ſmall ones, anſwering to thoſe on the back alſo; and the ſkin of the ſides, near the tail, is extended into two fins; ſo that this part of the fiſh looks in ſome ſort ſquare. It is a good fiſh for the table, and is ſalted in vaſt quantities in Spain and Italy.

THY'OS, Θύος, in antiquity, an offering of fruits, leaves, or acorns, which were the only ſacrifices at firſt in uſe. *Potter, Archæol. Græc.*

TIBERIA'DES *Water*, the water of a hot ſpring near Tiberiades in Egypt. Dr. Perry, when on the ſpot, tried ſome experiments on this water, which give us a much better idea of its nature, than we have from any other accounts of it. Half a drachm of oil of tartar being mixed with an ounce and half of the water, it becomes turbid and muddy; and, after twelve hours, three parts of the whole appear like white wool, only leaving a ſmall portion of clear water at the top. This white woolly matter, dried, produced only a ſmall quantity of yellow ochre.

Spirit of vitriol added to the water in the ſame quantity, affords a large unctuous ſediment of a white colour. A ſolution of ſublimate being mixed in the ſame quantity, it became turbid and yellowiſh, and yielded an earthy ſediment in a ſmall quantity; whence it ſeems evident, that it contains a ſal murale.

Saccharum ſaturni being added in the ſame quantity, the water depoſited a lateritious ſediment in a ſmall quantity. Mixed with ſpirit of ſal armoniac, it turns to a bluiſh green turbid liquor, and finally yields a woolly ſediment. Sugar of violets, mixed with it, turned it to a yellowiſh colour; and the ſcrapings of galls, mixed with it, turned it to a deep purple; and on ſhaking this became as black as ink.

It appears from theſe experiments, that the water contains a good deal of a groſs fixed vitriolic ſalt, ſome alum, and a ſal murale. It is too ſalt and nauſeous for internal uſe; but it muſt be of uſe as a bath in all cutaneous foulneſſes, eſpecially in ſcorbutic and leprous caſes; for it will powerfully deterge, ſcour, and cleanſe the excretory pores, and it may, by its weight and ſtimulus, reſtore them to their natural ſtate and tone, and reſtore the true ſtate of the vitiated ſolids in general. *Philoſ. Tranſ.* N°. 462.

TI'BICEN, in zoology, a fiſh of the cuculous kind, called by many authors lyra, or the harp-fiſh; and, in ſome parts of England, the piper.

TIES, aboard a ſhip, are thoſe ropes by which the yards do hang; and, when the halliards are ſtrained to hoiſe the yard, theſe Ties carry them up.

TI'FFE *de mer*, in natural hiſtory, a name given by Count Marſigli to a ſpecies of ſea plant, commonly but erroneouſly reckoned among the ſpunges, and called by authors a branched ſpunge. This author has called it by this name from its reſemblance to the heads of the typha paluſtris, or cat's tail, when ripe in the month of September.

TI'GRIS, *the tyger or tiger*, in the Linnæan ſyſtem of zoology, makes a diſtinct genus of the quadruped claſs; the characters of which are, that it has four paps placed near the navel, and feet adapted to climbing. The author takes in the panther to this genus, and diſtinguiſhes the tyger by the name of Tigris maculis oblongis, and the panther by that of Tigris maculis orbiculatis. *Linnæi Syſtem. Naturæ.*

The tyger has its name from its ſuppoſed ſwiftneſs, and has been deſcribed by almoſt all authors as one of the ſwifteſt of all the wild carnivorous animals; but this has been wholly contradicted by ſuch authors as have ſeen the creature, who all declare that it is a ſlow and ſluggiſh animal, and is unable to overtake a man, or almoſt any animal that has an opportunity of running away from it. It will give two or three large leaps; but, if it do not ſeize its prey in theſe, is but ill qualified to catch it afterwards. *Ray. Syn. Quad.*

It exceeds the lion in ſize, and is of an unconquerable fierceneſs. It agrees with the panther in the variegation of its colours, but differs in the diſpoſition of them; for in the panther the colours are diſpoſed in round ſpots or eyes, and in the tyger they are diſpoſed in long ſtreaks.

The Tyger is found in the Eaſt-Indies, in many parts of Aſia, and in America: but there ſeems ſome difference in ſpecies between the Aſiatic and American tygers, and poſſibly fuller obſervation may prove, that the Aſiatic are ſwift as the ancients have deſcribed them, and the American ones, of the ſlowneſs of which we have accounts, may be a different ſpecies.

The manner of carrying off the young brood of this animal is deſcribed by Pliny as follows: The Hircanians and Indians bring up the Tyger, ſays he, an animal of a dreadful ſwiftneſs, which is moſt put to the proof, when going to be taken. The whole brood, which is always very numerous, is carried off upon a horſe, as ſwift as poſſible, and often removed to a freſh one. When the mother tyger finds the neſt empty, and the brood gone, for the males take no care of them, ſhe traces the ſcent with furious ſpeed; and when ſhe is arrived within hearing of the perſon who is carrying off her young, he throws down one of them; this ſhe takes up in her mouth, and, as if made more ſwift by the load, carries it back, and then, returning, is treated in the ſame manner till the perſon gets on board a ſhip, and leaves her to vent her rage on the ſhore.

TI'LIA, *the lime-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, and is compoſed of ſeveral petals, arranged in a circular form. The piſtil ariſes from the cup, and finally becomes an unicapſular huſk, containing oblong ſeeds.

TILLS, a name given by our farmers to the lentil, a kind of pulſe propagated in ſome parts of the kingdom; they are the ſmalleſt of all pulſe. They require but an ordinary ground, but they produce a vaſt quantity, though they lie in a ſmall compaſs. They make a fine ſweet fodder, and are the beſt of all things of this kind, for calves, or any other young cattle. They are alſo the beſt of all ſorts of food for pigeons. *Mortimer's Husbandry.*

TI'LLAGE. The term Tillage, in its proper ſenſe, ſignifies the opening, breaking, and dividing the ground by the ſpade, the plough, the hoe, or other inſtruments which divide it by attrition, as the addition of dung does by fermentation. See AGRICULTURE.

TIMBER (*Dict.*) — The uſes of Timber are ſo many and ſo great, that the procuring a ſufficient ſupply of it extremely well deſerves the care of every ſtate, as it muſt be a great diſadvantage to it to be obliged to have recourſe to its neighbours, and purchaſe, at a very conſiderable and continually renewed expence, what might, by an eaſy œconomy, be ſufficiently ſupplied at home.

This œconomy, however, muſt be applied in time; for natural indolence, our love to reap the advantages of every thing ourſelves, and our little care for poſterity, give great room to fear ſucceeding ages will want wood, both for private and public exigencies. All our art ſhould be employed on this ſubject with two views: the one, to preſerve and cheriſh our growing wood; the other, to renew the trees which have been and are continually cut down.

The quantity of acorns, that the oak bears, has made many people ſuppoſe, that nature has taken care for a renewal for us, and that, of this vaſt quantity of ſeeds which annually fall, there will be always an over-ſufficient ſupply of young trees, which will grow up in the place of the old ones: but experience proves, that this is by no means the caſe. The greater number of theſe fallen acorns are devoured by a number of different animals, for whoſe nouriſhent nature has provided that abundance of them: and, of thoſe which eſcape this fate, we we are to conſider how few can come to good, from the natural accidents they are unavoidably expoſed to; they fall on a covered ground, where dead leaves, and decayed parts of branches of trees, uſually prevent their touching the earth, into which they are to ſhoot; or, if they can ſhoot here, it is merely from the ſurface, where they are, in their ſlow growth, liable, while very tender, to all the inclemencies of froſts; add to this, that it is very difficult for ſuch tender plants, as the young ſeedlings of theſe, to find room for growth or nouriſhment among the every-way-ſpreading roots of other trees; and the continual ſhade, and the want of free air, muſt render them very weakly and irregular in their growth, even ſuppoſing them to get over all the other difficulties.

It is very certain, that Timber-trees of oak are frequently met with among the underwood of foreſts; but we ſhall always find this to be the caſe, not in the cloſe places but on certain ſpots where there has been a vacancy or opening; and that, uſually, where there are not, nor have at any time been, oaks in the neighbourhood of the ſpot. The acorns that fall from the oaks uſually come to nothing, from the beforementioned accidents; and theſe trees, which grow at diſtances, are owing to the acorns brought thither by birds, and accidentally dropped there. This is an inſtance familiarly verified by obſerving, that there are frequently little buſhes near woods, which, tho' of white-thorn, or other trees, are uſually ſurrounded and ornamented with young oaks; the jays and the like granivorous birds are the authors of this crop; for, bringing the acorns from the adjoining woods, to eat under theſe buſhes, they drop many by the way, which they do not trouble themſelves to look for on the ground, and which, having here a freer ground to take root, and an open air to grow in, ſeldom fail of coming to good, unleſs deſtroyed, while young.

In order to the preſerving our growing Timber-trees, it would be a very uſeful law, that all, who cut down any number of oaks, ſhould alſo leave a given number in good condition for after-cutting; and that no Timber ſhould be cut down, but at a proper age, in regard to the nature of the ſoil; ſince it is certain, that trees grow to their perfection at very different periods of time, in proportion to the depth of ſoil they have to grow in; and that, as it is, on the one hand, not for the intereſt of the ſtate to ſuffer trees to be cut, till at their perfection for ſize and ſoundneſs, ſo, after they are arrived at that perfection, it is equally certain, that they gradually decay.

The quality of the ſoil the tree ſtands in may be neceſſary to be obſerved to this purpoſe; but the quantity or depth of it is the great ſubject of inquiry; and a great number of obſervations have proved, that the proper ſeaſon for cutting oaks, in a ſoil of two feet and an half deep, is at fifty years old; thoſe, which ſtand in a ſoil of three feet and an half deep, ſhould not be cut down before ſeventy years; and thoſe, which ſtand in a ſoil of four feet and an half deep, or more than that, will increaſe in goodneſs, and in ſize, till they are an hundred years old: and obſervation has proved, that, after theſe ſeveral periods, the trees begin to decay.

This ſeems the beſt rule to eſtabliſh, in regard to the common ſoils; but thoſe, which grow in a lighter or more ſandy ſoil, may have their periods changed from theſe to forty, to ſixty, and to eighty years at the greateſt depth; and after theſe times it is always beſt to fell the wood meant for public ſervice, whether then wanted, or not; ſince it is much better to keep it in public magazines, than to leave it to be daily decaying.

Heaths, and other uncultivated places, where there is no regular growth of wood, but where fern and uſeleſs plants alone ſeem to flouriſh, uſually afford alſo ſome ſtraggling trees of the oak. Theſe, probably, have had their origin from acorns dropped by birds; but theſe ſeldom grow tall or regular, ſince, not having been defended from the injuries of cattle, they are uſually browſed on and ſtunted, while young, and ſo become crooked and ſhort-trunked, or pollard trees. Theſe, though not of ſuch value as the regular oaks, yet deſerve care, both with regard to their preſervation and felling, ſince they afford a number of trees naturally bent and formed for many parts of ſhip-building.

The little care uſually taken of theſe trees, though on this occaſion of great value, ſeems to threaten a general loſs of them; but, as trees, thus naturally crooked and bent, are of value, it is a laudable attempt to try at the finding a regular method of producing ſuch; and this is eaſily practicable, by following the ſame method by which theſe wild ones become ſo. They wholly owe their figure to the cattle's biting off their tops, while young, and afterwards biting off again the tops of the ſhoots from the firſt wound. In this manner, if a number of young trees, ſet apart for the experiment, have their tops cut off at two, four, ſix, eight, ten, and twelve feet from the ground, and, four years afterwards, the ſhoots from theſe ſtunted tops are again cut in the ſame manner, the trees will be found afterwards to grow up in all the irregularly crooked figures that can be conceived; and, by this means, a ſupply of naturally crooked wood may be raiſed for all the occaſions of ſhip-building, with infinitely greater eaſe, and more certainty, than by the method, propoſed by ſome, of bending them down with weights tied to their tops, while young.

As to the ſupply of young wood in the place of what is cut down, there are ſome circumſtances, which have not had the attention paid to them which they deſerve. The ſpring froſts, which come on at a time when the ſhoots, by which nature is to raiſe the ſupply for what is cut down, are juſt preparing to grow, are of prodigious injury, and do not leſs miſchief to theſe, than to the young ſhoots of garden-plants, though the diſtant hope of the ſucceſſion to the proprietor, and uſually alſo the diſtance of the place, and want of repeated obſervations, occaſions its not being perceived. This, however, may in a great meaſure be guarded againſt. Frequent experiments, and repeated obſervations, prove, that the miſchief done by theſe froſts affects, in a much greater degree, thoſe ſhoots which are expoſed to the north, than thoſe which face the ſouth; and that it is greatly more powerful againſt ſuch as are wholly expoſed to the wind, than againſt ſuch as are ſheltered. Theſe known circumſtances may give the hint to a method of ſaving, at leaſt, a great part of a wood to be felled, from this deſtruction, to its renewal, by the making it a rule to begin cutting down on the ſouth ſide; and, as the whole felling is a work of ſome years, the ſtanding wood of every ſeaſon will defend the young ſhoots of the newly-cut ſtumps, the following ſpring, not only from the north expoſure, but will ſhelter them alſo from the wind.

Many prudent managers have made fine eſtates of their coppice-woods, by regularly felling a certain portion every year, and providing for a renewal of the firſt cutting againſt the felling of the laſt portion, by proportioning the time of growth to the quantity to be cut every year; and there is great intereſt to be made of a true knowledge of the growth of wood in this manner. Whoſoever obſerves the growth of young trees will find, that the ſecond year's growth is much more conſiderable than that of the firſt; the third year's growth is much more conſiderable than that of the ſecond, and ſo on for many years, the yearly growth of young wood greatly increaſing every ſeaſon, up to a certain time or age of the tree; after which, the increaſe in bulk, by growth, becomes gradually leſs. The great advantage to be made of coppice-wood would be by knowing this intereſting period, and ſeizing on it, always to cut down the trees juſt at that time when they have arrived at the end of their quick growth, and ſo, ſetting nature to work with new ſhoots, to employ the ſame ſpeed on inriching again the owner. Regular obſervation and experiment alone can aſcertain this happy period; but any man, who has much coppice-wood upon his eſtate, may aſſure himſelf of it, by cutting a given quantity every year, for ten years ſucceſſively, and then carefully reviewing the differences of the yearly produce.

Preſerving of TIMBER.— When boards, &c. are dried, ſeaſoned, and fixed in their places, care is to be taken to defend and preſerve them; to which the ſmearing them with linſeed-oil, tar, or the like oleaginous matter, contributes much.

The Dutch preſerve their gates, port-culliſes, draw-bridges, ſluices, &c. by coating them over with a mixture of pitch and tar, whereon they ſtrew ſmall pieces of cockle and other ſhells, beaten almoſt to powder, and mixed with ſea-ſand, which incruſts and arms it wonderfully againſt all aſſaults of wind and weather.

Timber, felled before the ſap is perfectly at reſt, is very ſubject to the worms; to prevent or cure which, Mr. Evelyn gives us the following ſecret, as moſt approved: put common ſulphur in a cucurbit, with as much aqua-fortis, as will cover it three fingers deep; diſtil it to a dryneſs, which is performed by two or three rectifications.

Lay the ſulphur remaining at bottom on a marble, or in a glaſs, and, with the oil it diſſolves into, anoint the Timber. This, he adds, not only infallibly prevents or cures the wormineſs, but preſerves all kinds of woods, and even many other things, as ropes, nets, and maſts, from putrefaction, either in air, water, ſnow, &c.

For ſuch as would go a ſhorter way to work, two or three anointings with linſeed oil may do very well. As to poſts, &c. that are to ſtand in the ground, the burning the outſides to a coal is a great preſervative.

As to the chops or clefts green Timber is liable to after working, a very great eye-ſore in many fine buildings, they are cloſed by anointing, ſuppling, and ſoaking it with the fat of powdered beef broth, twice or thrice repeated.—Some carpenters uſe greaſe and ſaw-duſt mingled for the ſame purpoſe.— But the former method is excellent, only it is not to be uſed, while the Timber is green.

Seaſoning of TIMBER, a term uſed by our huſbandmen to expreſs the preparing Timber after it is felled, for cutting and working up for uſe.

As ſoon as felled, it ſhould be laid up in ſome dry airy place, but out of the reach of too much wind or ſun, which, when in exceſs, will ſubject it to crack and fly. It is not to be ſet upright but laid along, one tree upon another, only with ſome ſhort blocks between to give it the better airing, and prevent its becoming mouldy, which will rot the ſurface and produce muſhrooms on it. Some perſons daub the trees all over with cow-dung, which occaſions their drying equally, and prevents their cracking, as they are otherwiſe very apt to do.

Some recommend the burying Timber in the earth, as the beſt of all ways of ſeaſoning it; and others have found it a fine preſervative to bury their Timber under the wheat in their grainaries; but this cannot be made a general practice. In Norway, they ſeaſon their deal planks, by laying them in ſalt water for three or four days, when new ſawed, and then drying them in the ſun; this is found a great advantage to them; but neither this, nor any thing elſe, can prevent their ſhrinking.

The ſeaſoning Timber by fire is the beſt way of all, for piles, and other pieces that are to ſtand under the earth, or water. The Venetians firſt found out this method, and the way they do it is this: they put the piece to be ſeaſoned in a ſtrong and violent flame, in this they continually turn it round by means of an engine, and take it out when it is every-where covered with a black coaly cruſt; by this means the internal part of the wood is ſo hardened, that neither earth nor water can damage it for a long time afterwards. This method is practiſed in many places for ſeaſoning the poſts for paling of parks, &c. and has this to recommend it, that in the very oldeſt ruins we have ever been acquainted with, there have been found many times pieces of charcoal, all of which has been found uninjured, though buried in the earth for ever ſo many ages. *Mortimer's Huſbandry.*

TIN-*floors*, a contrivance uſed by our huſbandmen who propagate hops to dry them after the gathering. The common way of doing this is either on a hair-cloth on a malt-kiln, or elſe by the ooſt.

In both theſe ways, however, the hops ſuffer very much; the beſt way is by the Tin-floor. It is thus done: let a ſquare brick room be built, with a door on one ſide, and a long fire-place of a foot wide in the middle, reaching almoſt acroſs it; let holes be made at the ſides of this fire-place, to let out the heat into the room; and, at the height of five-feet above this, let a floor be made of laths of an inch thick, laid lattice-wiſe. Let this be covered with great plates of double Tin, taking care that the joinings of the Tin be well ſoldered, and lie upon the laths, not over the interſtices, which may be about four inches wide. Let a row of boards be fitted round the edge of this floor, to keep the hops from falling off; then lay on a covering of hops of a foot thick; then make a ſmall fire of charcoal in the mouth of the fire-place, and the hops will dry very quick and very regularly. They may be continually ſtirred about while drying, and, when enough, a part of the boarded edge of the kiln may be taken down, and the dried parcel thruſt out, and a freſh parcel laid on in their place. A very ſmall quantity of fuel is ſufficient in this way, and any fuel will do, for the ſmoke never comes at the hops. There is a very great improvement ſtill upon this method of drying hops, uſed by ſome people; this is the making a wooden cover, of the ſize of the Tin-floor; this is covered with plates of Tin nailed on, and is ſuſpended over the kiln in ſuch a manner, that it may be let down at pleaſure, when the lower parts of the hops are dry. This is to be let down within ten inches of their ſurface, and there it acts as a reverberatory, and drives back the heat on the upper ones, ſo that they are dried as ſoon as the lower ones: thus all the trouble of turning is ſaved, and the hops are much better dried than in any other way. *Mortimer's Huſbandry.*

TIN-*hatch*, in mining, a term uſed by the people of Cornwall, to expreſs the opening into a Tin-mine. They alſo call it a Tin-ſhaft.

They make ſeveral openings in the ſides of the hills where they ſuſpect veins of ore to be. All theſe, except that which opens on the head of the mine, are called eſſay-hatches; but that which does ſo, is made their entrance afterwards, and changes its name to that of the Tin-hatch.

TIN-*plates*, an article of manufacture very common among us, and vulgarly called Tin. It is iron plated over with Tin. The French call it fer blanc, white iron, as we ſometimes do in England. It was once known under a diſtinct name, latin. See the article LATIN.

TINCTURE (*Dict.*)—A general rule for the properly making light Tinctures may be taken from the following bitter: take half an ounce of Sevile orange-peel ſhaved thin, half a drachm of gentian-root thin ſliced, a ſcruple of the tops of Roman wormwood, half a drachm of cardamom-ſeeds, and the ſame quantity of cochineal, each of them lightly bruiſed; put theſe ingredients into a pint of French brandy, let them ſteep for one night, and filtre the liquor the next morning, and thus you have a fine light bitter.

Theſe bitters are of the number of many other ſubſtances, where the goodneſs of a Tincture does not more depend upon the choice of the ingredients, than upon the manner of their being infuſed; for, if ſuch be ſuffered to remain too long in the menſtruum, or, if heat be uſed in extracting the Tincture, the groſs terreſtrial and nauſeous parts of the ingredients will be fetched out, and the Tincture will thus be loaded with a heavy indolent matter of little virtue. *Shaw's Lectures.*

A great variety of Tinctures may be given to common water, and many remarkable things occur in their changes on the addition of common menſtruums: take a large ſpoonful of the ſyrup of pomegranate-flowers, mix it with five ſpoonfuls of water; the mixture will be of a very lively and brilliant red: for a violet colour, take the ſame quantity of ſyrup of violets, and the ſame of water. When the Tinctures are thus prepared, have at hand a phial in which is a ſmall portion of oil of tartar, which will only look like water remaining after the waſhing of the phial.

Pour the red or the violet Tincture into this phial, and it immediately becomes a fine graſs-green. Diſſolve the quantity of a walnut of crude ſal armoniac in a glaſs of water, pour all out except three or four drops at the bottom, and pour into this glaſs the fine red liquor, and it immediately becomes black as ink. In order to change the purple liquor red, only have a ſmall quantity of ſpirit of vitriol in the bottom of a phial, and pour it into this; the violet water, immediately on this, becomes of a florid red.

Steep Braſil wood in common water, or in white wine twenty-hours; the liquor will then look of the colour of red wine; pour this into a glaſs waſhed with vinegar, and it becomes of a fine yellow like ſack. If this experiment be made with white wine, the wood and the vinegar make ſo little alteration in it, that it may be drank afterwards, and the whole proceſs ſeems a way of turning red port into ſack. Into this liquor when yellow, drop a few drops of a Tincture of benjamin made in ſpirit of wine, and it immediately loſes its yellow colour and becomes white. Beat ſome galls to fine powder, and rub the powder on a towel; then put into a baſon of water, in which any perſon is going to waſh their hands and face, a ſmall piece of common green vitriol, or copperas; after the perſon has waſhed, let them have this towel to wipe on, and the hands and face will be as black as if waſhed with common writing-ink; the copperas in the water and the galls on the towel making real ink where they mix. This does no laſting injury to the ſkin, but will come off again upon waſhing with ſoap. *Philoſ. Tranſ.* N°. 238.

Tincture *of antimony*, tinctura antimonii, is thus made: take ſalt of tartar a pound, antimony half a pound, rectified ſpirit of wine a quart; reduce the antimony to a powder, and mix it with the ſalt by fuſion over a ſtrong fire. When it is cold, powder it, and pour on the ſpirit of wine; digeſt them together three or four days in a ſand heat, and then filtre off the clear Tincture for uſe. The ſalt of tartar yields a Tincture as well as the antimony.

Tinctura *Fœtida*, the ſtinking Tincture, a form of medicine in the late London Diſpenſatory prepared in this manner: take aſſa-fœtida four ounces, rectified ſpirit of wine a quart, digeſt them together for ſome time, and then ſtrain off and filtre the Tincture through paper.

Tinctura *Sacra*, a Tincture of aloes, called alſo hiera picra. The late London Diſpenſatory has ordered this to be made of only eight ounces of aloes, and two ounces of winter's bark powdered, and put into five quarts of white-wine, which is to be ſhook often, and kept in fuſion a week or more without heat, and then ſtrained off for uſe. *Pemberton's London Diſp.*

Tinctura *Saturnina*, the lead tincture, a name given in the late London Diſpenſatory to the tincture before called Tinctura antiphthiſica.

It is made of ſugar of lead and green vitriol, each two ounces; of rectified ſpirit a quart. The ſalts are ſeparately to be reduced to powder, and then put into the ſpirit; then the whole is to ſtand ſome days without heat to extract the Tincture, and afterwards filtred through paper. *Pemberton's London Diſpenſatory.*

Tinctura *Senæ*, a form of medicine preſcribed in the new London Pharmacopœa, and intended to ſtand in the place of the medicine commonly called elixir ſalutis, and Daffy's elixir. It is thus made: take ſtoned raiſins ſixteen ounces, leaves of ſena a pound, carraway ſeeds an ounce and half, cardamom-ſeeds half an ounce, proof ſpirit a gallon; digeſt all together without heat, and, when the Tincture is well extracted, preſs off the ſpirit, and filtre it for uſe. *Pemberton's London Diſpenſatory.*

Tinctura *Styptica*, a form of medicine made with very little trouble and apparatus, and ſerving to ſupply the place of that elaborate preparation the tincture of Helvetius; it is preſcribed in the late London Pharmacopœa, and is to be made by mixing a drachm of calcined green vitriol with a quart of French brandy, tinctured by the caſk; this is to be ſhook together that the brandy may turn black, and then ſtrained off for uſe. *Pemberton's London Diſpenſatory.*

Tinctura *Thebaica*, a name now given to the tincture of opium, commonly called laudanum.

The method of making this is alſo much altered, as well as the name in the late London Diſpenſatory, where the ſaffron, being looked on as an uſeleſs ingredient, is wholly left out, and the medicine ordered to be prepared in the following manner: take of opium ſtrained two ounces, of cinnamon and cloves each a drachm, white wine a pint; infuſe without heat a week, and then ſtrain off the wine thro' rough paper. *Pemberton's London Diſpenſatory.*

Tinctures, in heraldry, a word uſed to expreſs colours, red, blue, green, and the like.

TI'NGING *of marble.*— The art of doing this has in ſeveral people's hands been a very lucrative ſecret, though there is ſcarce any thing in it that has not at one time or other been publiſhed.

Kircher has the honour of being one of the firſt, who publiſhed any thing practicable about it. This author meeting with ſtones in ſome cabinets ſuppoſed to be natural, but having figures too nice and particular, to be ſuppoſed of nature's making, and theſe not only on the ſurface, but ſunk through the whole body of the ſtones, was at the pains of finding out the artiſt who did the buſineſs; and, on his refuſing to part with the ſecret on any terms, this author with Albert Gunter, a Saxon, endeavoured to find it out; in which they ſucceeded at length very well. The method is this:

Take aqua-fortis and aqua-regia of each two ounces, ſal armoniac one ounce, ſpirit of wine two drachms, about twenty-ſix grains of gold, and two drachms of pure ſilver; let the ſilver be calcined and put into a phial, and pour upon it the aqua-fortis; let this ſtand ſome time, then evaporate it, and the remainder will firſt appear of a blue, and afterwards of a black colour. Then put the gold into another phial, pour the aqua-regia upon it; and, when it is diſſolved, evaporate it as the former. Then put the ſpirit of wine upon the ſal armoniac, and let it be evaporated in the ſame manner. All the remainders, and many others made in the ſame manner from other metals diſſolved in their proper acid menſtrua, are to be kept ſeparate and uſed with a pencil on the marble, the ſeveral parts are to be touched over with the proper colours, and this renewed daily till the colours have penetrated to the deſired depth into the ſtone. After this, the maſs may be cut into thin plates, and every one of them will have the figure exactly repreſented on both the ſurfaces, the colours never ſpreading: the niceſt method of applying theſe, or the other Tinging ſubſtances, to marble, that is to be wrought into any ornamental works, and where the back is not expoſed to view, is to apply the colours behind, and to renew them ſo often till the figure is ſufficiently ſeen through the ſurface on the front, though it does not quite extend to it. This is the method that of all others brings the ſtone to a nearer reſemblance of natural veins of this kind. *Kircher's Mund. Subter.*

TINNU'NCULUS, in zoology, the name of one of the long-winged hawks, called by others cenchris, and in Engliſh keſtrel, ſtannel, or windhover.

It is about the ſize of a common pigeon. Its bill is ſhort, crooked, and very ſharp, and covered with a yellow ſkin at the top; near this the bill is white, elſewhere it is blue. Its tongue is bifid; its mouth very wide, and its palate blue. Its head is large and flatted, and is of an aſh-colour, with longitudinal ſtreaks of black. Its back and wings are brown, variegated with black ſpots; its rump is grey, with ſome tranſverſe black ſpots; and its breaſt and belly of a pale ruſt colour, with a few longitudinal ſtreaks of black. Its tail is long and pointed; its tip of a pale ferrugineous hue, with a broad tranſverſe ſtreak of black over it; and the reſt of the tail is a mixed grey and brown, with black ſpots and ſtreaks. Its legs and feet are of a fine yellow. It builds in hollow oaks, and lays four eggs, which are white, variegated with a number of ſmall red ſpots. It feeds on partridges and other birds. *Ray's Ornithol.*

TI'SRI, or **Tizri**, the firſt Hebrew month of the civil year, and the ſeventh of the eccleſiaſtical or ſacred year.

The Hebrews call it roſh-haſhanna, that is, the beginning of the year. It anſwered to the moon of September. On the firſt day of this month was kept the feaſt of trumpets, becauſe the beginning of the year was then proclaimed by ſound of trumpets. On this day they refrained from all ſorts of ſervile buſineſs, and offered in ſacrifice a calf, a ram, and ſeven lambs.

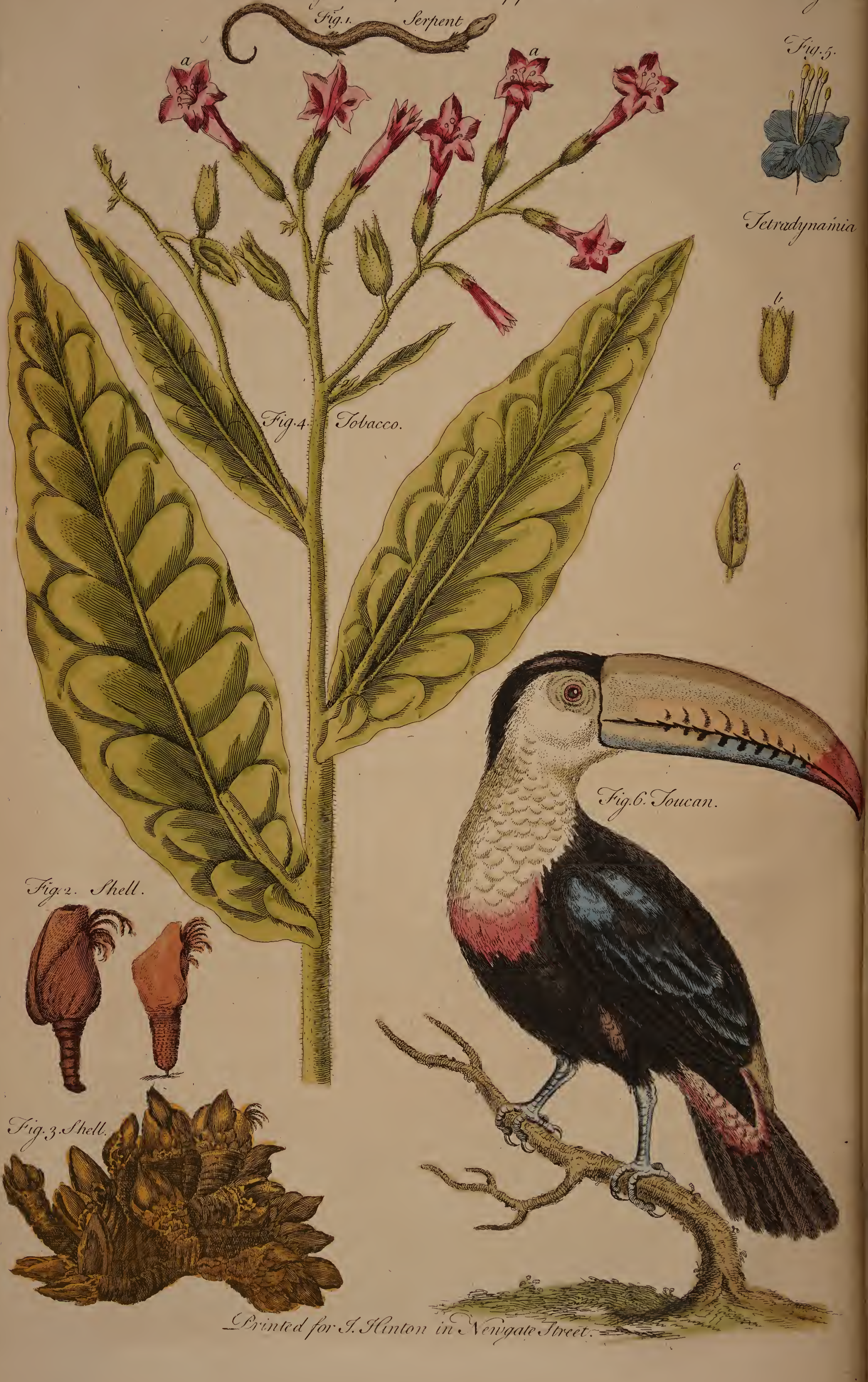
TITHES (*Dict.*) — The cuſtom of giving or paying Tithe is very ancient: in Gen. xiv. 20. Abraham gives Abimelech the tenth of all the ſpoils he had taken from the four kings he had defeated: in Gen. xxviii. 22. Jacob makes a vow, at Bethel, to give the tenth of all the riches he ſhall gather, in that ſojourn, to God.

But theſe Tithes were free and voluntary; and, beſides, differed in divers other reſpects from what was afterwards called Tithe: what Melchiſedec received, was only the tenth of the ſpoils, not of Abraham's poſſeſſions; and this once, not annually; and beſides, not as maintenance, which Melchiſedec wanted not, but as homage: add, that this was only from one prieſt to another; for Abraham had not only a prieſt in his loins, but was a prieſt himſelf.—And as to Jacob,

PLATE XLIII.

Engraved for the Supplement.

Facing Tobacc



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cob, who was alſo a prieſt, what he did was the effect of a vow, voluntarily taken, to offer the tenth of all he ſhould poſſeſs; not to any other prieſt, but to God himſelf upon an altar.

Under the new law, it is not Jeſus Chriſt that eſtabliſhed Tithes, as it was God himſelf did it under the old law by the miniſtry of Moſes; the Chriſtian prieſts, and the miniſters of the altar of the new covenant, lived, at firſt, wholly on the alms and oblations of the devout.

In after times the laity gave a certain portion of their revenues to the clergy, but voluntarily, and not out of any conſtraint or obligation: the firſt inſtances we have of it, are in the IVth and Vth centuries.

This gift was called Tithe; not that it was really a tenth part of their income, or near ſo much: but only in imitation of the Tithes of the old law.

In the following age, the prelates in their councils, in concert with the princes, made an expreſs law to the purpoſe; and obliged the laity to give a full tenth part of their revenues, their fruits, &c. to the eccleſiaſtics.

This the church enjoyed without diſturbance for two or three centuries; but in the VIIIth century the laity got hold of part of theſe Tithes, either by their own authority, or by grants and donations of the princes; and appropriated them to their own uſes.

Some time afterwards they reſtored them, or applied them to the founding of monaſteries or chapters; and the church conſented, at leaſt tacitly, to this reſtitution.

In 1179, the third council of Lateran, held under Alexander III, commanded the laymen to reſtore all the Tithes they yet held to the church.

In 1215, the fourth council of Lateran, held under Innocent III, moderated the matter a little; and, without ſaying any thing of the Tithes which the laity already poſſeſſed, forbad them to appropriate or take any more for the future.

Fra. Paolo, in his treatiſe of Beneficiary Matters, is of opinion, that the cuſtom of paying Tithes under the new law began in France; and affirms, that there are no inſtances of it before the VIIIth and IXth centuries: but he muſt be miſtaken; for in the 2d council of Matiſcona, held in 585, it is ſaid expreſsly, that the Chriſtians had a long time kept inviolate that law of God, whereby Tithe of all their fruits was enjoined to be given to holy places, &c.

In effect, Origen, Hom. XI. on Numbers, thinks, that the old laws of Moſes, touching the firſt fruits and Tithes, both of cattle, and of the fruits of the earth, are not abrogated by the goſpel; but ought to be obſerved on their ancient footing. The Vth canon of the council of Matiſcona orders Tithe to be paid to the miniſters of the church according to the law of God, and the immemorial cuſtom of the Chriſtians, and that upon penalty of excommunication: which is the firſt penalty we find impoſed on ſuch as would not pay Tithe.—On which grounds it is that many among the modern clergy hold their Tithes to be jure divino.

Others, on the contrary, plead, that the recompence, to be given church miniſters, is differently ordained by God, according to the differences he has put between his two great diſpenſations, the law and the goſpel: under the law he gave them Tithes; under the goſpel, having left all things in his church to charity and chriſtian freedom, he has given them only what ſhall be given them freely, and in charity. That the law of Tithes is in force under the goſpel, all the proteſtant divines, except ſome among the Engliſh, deny; for though hire to the labourer be of moral and perpetual right, yet that ſpecial kind of hire, the tenth, can be of no right or neceſſity, but to the ſpecial labour for which God ordained it: that ſpecial labour was the levitical and ceremonial ſervice of the tabernacle, Numb. xviii. 21, 31. which was aboliſhed: the right therefore of the ſpecial hire muſt be aboliſhed too.

That Tithes were ceremonial, is evident from their not being given to the Levites till they had been firſt offered as a heave-offering to the Lord, ver. 24, 28.

He, then, who by the law brings Tithes into the goſpel, brings in likewiſe a ſacrifice, and an altar; without which, Tithes, by the law, were unſanctified and polluted, ver. 32. and therefore were never thought of in the firſt Chriſtian times, till ceremonial altars and oblations had been brought back.

The Jews themſelves, ever ſince their temple was deſtroyed, though they have rabbies and teachers of the law, yet pay no Tithes, as having no proper Levites to whom, nor altar whereupon, to hallow them; which argues, that the Jews themſelves never looked on Tithes as moral, but merely ceremonial.

Add, that Tithes were not allowed to the prieſts and Levites merely for their labour in the tabernacle, but in conſideration of this likewiſe, that they were not allowed to have any other part or inheritance in the land, ver. 20, 24. and who, by that means, for a tenth, loſt a twelfth.

In effect, for the firſt three hundred years after Chriſt, no mention is made in all eccleſiaſtical hiſtory of any ſuch thing as Tithes; though, in that time, altars and oblations had been recalled, and the church had miſerably judaiſed in many other things. The churchmen confeſſedly lived all that time on free-will offerings; nor could the defect of paying Tithe be owing to this, that there were wanting civil magiſtrates to injoin it; ſince Chriſtians, having lands, might have given out of them what they pleaſed: and the firſt Chriſtian emperors, who did all things by advice of the biſhops, ſupplied what was wanting to the clergy, not out of Tithes, which were never propoſed, but out of their own imperial revenues. The firſt authority produced, ſetting aſide the apoſtolical conſtitutions, which few of the patrons of Tithes will inſiſt on, is a provincial ſynod at Cullen in 356, where Tithes are voted to be God's rent; but, before that time, divers other abuſes and complaints had got ground, as altars, candles at noon, &c. And one complaint begot another; as its is certain that Tithes ſuppoſe altars.

It is alledged, that Tithes are of early and ſolemn force among us, having been paid by ſtatute ever ſince the Saxon king Athelſtan, anno 928: to which it may be anſwered, that Romeſcot, or Peter-pence, had been likewiſe paid to the pope by ſtatute above 200 years longer, viz. from the year 725. And by the way it is to be noted, that theſe ancient Tithes, among our anceſtors, kept a nearer analogy to their original in the Moſaic law; for the prieſts had but a third part, the other two thirds being appointed for the poor, and to adorn and repair the churches, as appears from the canons of Ecbert and Elfric.

TITHY'MALLUS, *ſpurge*, in botany, the name of a large genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the campaniform kind but globoſe, divided into ſeveral ſegments at the edge, and incloſed in two little leaves which ſeem to ſerve in the place of a cup to it. The piſtil ariſes from the bottom of the flower, and is uſually of a three-cornered ſhape; this ripens into a fruit of the ſame form, which contains many oblong ſeeds.

TOBA'CCO, (*Dict.*)—In the iſland of Ceylon, there are two kinds of Tobacco cultivated for profit. They call both kinds dunkol, which ſignifies a leaf, the uſe of which is to be ſmoaked. The one kind they call hingele dunkol, or ſingele dunkol; and the other dunkol kapada. The kapada Tobacco is much ſtronger and more intoxicating than the other; but both kinds are the produce of the ſame plant, only the ſingle Tobacco has very little care taken of it, being, after the ſowing, in a manner left to itſelf, while the other has great pains beſtowed upon it during the whole time of its growth, and till it is fit for uſe, in the following manner: they clear a little piece of ground, in which they ſow the ſeed of the Tobacco, and againſt the time that the young plants have got three leaves a piece, they chuſe out another piece of ground into which to tranſplant them: this they hedge round, and turn their horned cattle into it, that their dung may fall upon it and ſufficiently enrich it. The ground is then dug with a ſharp hoe, or ſpade, in the form of a pick-ax, and the dung, by this means, thoroughly worked into it. When the earth is thus prepared, they take up the young plants, and ſet them in this new ground, at about a foot ſquare diſtant from one another.

The manner of giving more or leſs ſtrength to this Tobacco, is by ſuffering the plants to grow to a greater or leſs height before they top them, or cut off the ſtalk at the ſummit. The uſual way is to cut off the top when the plant has fifteen leaves. If they intend the Tobacco to be a little ſtronger, they do this when it has only thirteen; and, when they would have it ſtrongeſt of all, they do it when there are only eleven or twelve leaves. On the contrary, when they would have a milder Tobacco, they cut it not off till there be eighteen or twenty leaves; but, in this way of counting the leaves, they never reckon the three or four loweſt, which do not grow ſo large and fine as the others. The cutting off the top prevents the juices of the plant from being waſted in flowers and ſeeds, which are of no value; and, in conſequence of it, all being, after this time, employed to furniſh the growth of the leaves, they grow four times as large and thick as they otherwiſe would do.

To prevent all unneceſſary waſting of the ſap, theſe plants are tended every day; and, as the young ſprouts appear in the joining of the leaves and ſtalk, they are continually cut off: this is done once in three days, till the leaves have their full bigneſs, which is about that time when the flowers would have been ripe, had the plant been ſuffered to grow in its natural way: they are immediately to be gathered when they are full grown, otherwiſe they waſte and decay. They cut down the whole plant, and bring them into their houſes, laying them on a heap. When they have lain a little time together, they begin to ſweat and grow hot: when they have been a little while fermenting, they turn them, bringing thoſe which are in the middle to the ſurface, and placing thoſe which were at the ſurface in the middle; by this means the whole quantity of leaves ferments equally. The longer they lie in this manner, the darker-coloured the Tobacco becomes. When they have left it thus to ſweat as long as they judge neceſſary, they hang every ſtalk ſeparately on cords; and, when the whole is thoroughly dry, they carefully take off the leaves, and lay them by in bundles, till they have occaſion for them. This is the manner of their preparing the kappada. The ſingle Tobacco is ſown in the ſame manner with this; but it is never tranſplanted nor tended, it grows as it pleaſes, and, when the flowers are ripe, it is cut down, and laid careleſsly in heaps, where ſome of it ferments too much, and ſome too little. This is much weaker therefore than the kappada; and, as both kinds are common in the place, the natives ſmoak them either ſeparately or together, mixed in different proportions, as they like. Some of the Ceyloneſe chew this ſtrong Tobacco with their beetle, and ſome, who ſmoke it alone, uſe no pipe, but, taking a long leaf of it, they roll it up into a long form, and cover it with the leaf of the wattukan-tree; they then light one end of it, and ſmoak by the other, till the whole is conſumed. *Philoſ. Tranſ.* N°. 278. *Plate* XLIII. *fig.* 4. repreſents the Tobacco plant; *a* is the flower, *b* the calyx, and *c* the ſeed veſſel.

Adheſions of the TOES. It is a frequent thing to meet with new born infants with their fingers or Toes cohering or grown together, either by a ſtrict adheſion of the fleſh, or elſe by ſome looſe productions of the ſkin, as in the feet of ducks and geeſe; and a diſorder of the ſame kind is alſo ſometimes found in adults, from accidents; as when the fingers and Toes have been neglected, after an excoriation of them by burns or wounds. In both theſe caſes the ſurgeon's aſſiſtance is neceſſary, partly to remove the deformity, and partly to reſtore the proper uſe of the fingers.

Theſe adheſions, according to the nature of the diſorder, are to be ſeparated two ways, either by cutting out the intermediate ſkin with a pair of ſciſſars, or elſe barely by dividing them from each other with the ſame inſtruments. When this is done, to prevent their coheſions again, each finger muſt be inveſted ſeparately with a ſpiral bandage about an inch broad, dipped in lime-water and ſpirit of wine.

Sometimes the fingers, inſtead of adhering to each other, grow to the palm of the hand, from wounds or burns, ſo that they cannot be by any means extended, or drawn back to open the hand. The method of relieving this diſorder is firſt very carefully to ſeparate the fingers from their adheſions to the palm, without injuring their tendons; then dreſs them with a vulnerary balſam, and ſcraped lint, and extend them on a ferula or thick paſteboard; and let them remain in this extended poſture, ſeparately to be dreſſed till they are perfectly healed; but at every dreſſing they muſt be gently moved, to prevent a rigidity or ſtiffneſs of the joints. *Heiſter's Surgery.*

TO'KENS, in peſtilential caſes, thoſe livid ſpots, which appear in the ſeveral ſtages of the diſeaſe, and are certain forerunners of death.

TONGUE-*tied*, the popular name for a diſtemperature of the Tongue in children, when it is tied down too cloſe to the bottom of the mouth, by a ligament connected all along its middle, and called its frænulum, which requires to be divided, to give the Tongue its proper motion.

This is ſometimes the caſe in adults, but oftener in children, who cannot then exert their Tongues to ſuck. This is, however, by no means ſo common as the women uſually imagine; not ſo much as one child in a thouſand being afflicted with it; nor is the operation in cutting it of little conſequence, ſince often bad accidents follow it, and ſometimes the loſs of a child's life. When the infant can put its Tongue out of its mouth, the frænulum wants no inciſion; but, when the Tongue cannot be extended beyond the teeth, the operation is neceſſary. *Heiſter's Surgery.*

TON'SÆ, among the Romans, the blades of oars, or that part of them which beats againſt the water. *Pitiſc. in voc.*

TOP *of a ſhip*, a round frame of boards lying upon the croſstrees near the head of the maſt; here they furl and looſe the top-ſail, &c.

Top-*armours*, in a ſhip of war, are a kind of cloths hung about the round-tops of the maſts for ſhew; and alſo to hide the men which are on top in a fight, who lie there to fling ſtinkpots, &c. or to fire ſmall ſhot down on the enemy in caſe of boarding.

Top-*maſts*, in a ſhip, are four, which are made faſt and ſettled unto the heads of the main-maſt, fore-maſt, mizzen-maſt, and bow-ſprit reſpectively.

Top-*gallant-maſts*, in a ſhip, are two, viz. main-top-gallant-maſt and fore-top-gallant-maſt, which are ſmall round pieces of timber, ſet on their reſpective Top-maſts; on the Top of which maſts are ſet the flag-ſtaffs, on which the colours, as flags, pendants, &c. hang.

Top-*ropes*, in a ſhip, are thoſe with which the Top-maſts are ſet or ſtruck; they are received through a great block which is ſeized on one ſide under the cap, and then are reeved through the heel of the Top-maſt, where is a braſs ſhiver placed athwart ſhips; after this they are brought up and faſtened on either ſide the cap with a ring: the other part of them comes down by the ties, and ſo is reeved into the knight-head; and, when it is to be heaved, it is brought to the capſtan. Theſe Top-ropes belong only to the main and fore-maſt.

Top-*ſails* and Top-gallant-ſails, in a ſhip, are thoſe belonging to the Top-maſts and Top-gallant-maſts.

Top-*a-ſtarboard*, on board a ſhip, a word of command to hale upon the larboard liſt.

Top *the yard-arms*, on board a ſhip, a word of command to make the yards hang higher or lower.

Counterfeit TOPAZ. To counterfeit the oriental Topaz in paſte, take cryſtal prepared two ounces, ordinary minium or red lead ſeven ounces; put theſe into a crucible luted, and bake them twenty-four hours in a potter's kiln. If the maſs is not ſufficiently clear and fine, cover it up again and give a ſecond baking, and it will come out of a fine Topaz-colour. *Neri's Art of Glaſs.*

TORCH-*thiſtle*, *cereus*, in botany, a ſpecies of plants belonging to the cactus genus.

This plant conſiſts of a ſingle ſtem or body, twenty, thirty, or more feet high, and about five inches diameter. It is of an angular figure, and armed with cluſters of ſharp firm ſpines, growing from tubercles placed along the ribs. The flowers, when open, are of the ſize of a large roſe and conſiſt of forty or more petals; the outer ones purpliſh, or greeniſh; the inner ones white.

It is a native of Surinam, and many parts of South America. It has gotten the name of Torch-thiſtle, from its being much uſed for Torches.

The propagation of all the kinds of this remarkable plant is by cuttings, which muſt be laid in a dry place ten days or a fortnight before they are planted, or, if it be three weeks, there is leſs danger of their miſcarrying.

They are to be planted in ſmall pots, filled in a light ſandy earth, with a mixture of lime rubbiſh, laying ſome ſtones at the bottoms of the pots to drain off the moiſture. The pots are then to be placed in a gentle bed of tanner's bark, and once a week are to have a gentle watering; this is beſt done in June or July: towards the middle of Auguſt, they muſt have air given them by degrees, and at the end of September they muſt be removed into the ſtove, where they are to remain the winter. They ſhould always have a dry ſituation, and ſhould never be expoſed to the open air, even in the midſt of ſummer. When the top of an old plant has been cut off for propagating, it always throws out ſeveral young ſhoots from its angles, which may be eaſily propagated in the ſame manner, that there will be a continual ſupply even from one ſtock. They may be brought in ſmall pieces from the Weſt-Indies packed up in ſtraw, and will grow when planted here, as well as if cuttings from our own plants. *Miller's Gard. Dict.*

TORDY'LIUM, in botany, the name of a genus of umbelliferous plants, the characters of which are theſe: the flowers are of the roſaceous kind, being compoſed of ſeveral heart-faſhioned petals of irregular ſizes diſpoſed in a circular order on a cup which afterwards becomes a fruit nearly of an orbicular figure, being compoſed of two flattiſh ſeeds with a high and uſually denticulated margin which eaſily depoſit their covering.

TORME'NTILLA, *tormentil*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roſaceous kind, conſiſting of four leaves diſpoſed in a circular form; the cup is of the ſhape of a baſon, conſiſting of one leaf, divided into ſeveral ſegments; the piſtil ariſes from this cup, and finally becomes a globoſe fruit compoſed of ſeveral ſeeds cloſely laid together, and covered by the cup.

TOU'CAN, in zoology, the name of a very remarkable Braſilian bird, a kind of magpie, of a middle ſize between our common magpie and the thruſh, but having a beak, prodigiouſly thick and longer and finely variegated; this beak is hooked at the end, and is of a very thin ſubſtance, not exceeding the thickneſs of a membrane, and very light and hollow, yet bony in ſubſtance, and the colours very bright. It has a ſort of toothed edge, which prevents its ſhutting cloſely, and, giving paſſage for the air, enables the bird to live without noſtrils.

It is covered with a ſort of ſcaly ſubſtance eaſily ſcraped off with a finger at the edge. Its head is large in proportion to its body, and is black on the crown; but the repreſentation of this curious bird, *Plate* XLIII. *fig.* 6. will give a better idea of it than the moſt prolix deſcription. The figure is taken from Mr. Edward's Hiſtory of Birds: and as that ingenious gentleman drew it from nature, it may be depended upon as very correct.. It is ſaid that it feeds on pepper, and Thevet affirms that it devours it greedily and returns it again undigeſted, and that the natives gather up that pepper, and uſe it in their food, as leſs hot and acrid than the freſh pepper. *Ray's Ornitholog.*

TOUCH-*hole*, or vent, in gunnery, is the ſmall hole at the end of the cylinder of a gun or muſquet, by which the fire is conveyed to the powder in the chamber. In a firelock, carabine, or piſtol, it is called the Touch-hole, but in a piece of cannon it is more properly called the vent.

Touch-*needles*, ſmall maſſes of gold, ſilver, and copper, each pure and ſimple, and, in all the different combinations, proportions, and degrees of mixture, prepared for the trying gold and ſilver by the Touch-ſtone, by compariſon with the mark they leave on it.

The metals uſually tried by the Touch-ſtone, are gold, ſilver, and copper, either pure, or mixed with one another in different degrees, and proportions, by fuſion. In order to find out the purity, or quantity of baſer metal in theſe various admixtures, when they are to be examined, they are compared with theſe needles, which are mixed in a known proportion, and prepared for this uſe. The metals of theſe needles, both pure and mixed, are all made into laminæ or plates, one twelfth of an inch broad, and of a fourth part of their breadth in thickneſs, and an inch and half long; theſe being thus prepared, you are to engrave on each a mark indicating its purity, or the nature and quantity of the admixture in it.

The manner of making the Touch-needles is by the proportions of the mark, a weight of half a pound, or eight ounces, being divided into ſixteen half ounces, the half ounces each into four drachms, the drachm into four penny-weights, and this into two half penny-weights.

Silver TOUCH-*needles*, theſe muſt be only tempered with copper, and the proportion determined by the mark divided into half ounces and grains.

You muſt uſe therefore for this purpoſe one mark of ſuch a weight that it may conſtitute a ſufficient maſs of metal for the making one needle, let it weigh for inſtance one drachm, then weigh ſuch a mark of the pureſt ſilver, wrap it up in a ſmall paper and upon this write ſixteen half ounces, which will ſignify that the whole mark of this metal is the pureſt ſilver; make the firſt needle of this maſs.

Next weigh fifteen half ounces of pure ſilver, and one half ounce of pure copper, wrap theſe both in a paper, and write on it fifteen half ounces, which will ſignify that there are in that ſmall maſs fifteen parts of pure ſilver, and one part of pure copper; make of this the ſecond needle. In the ſame manner go on with the reſt, add two half ounces of copper to fourteen half ounces of ſilver, mark it fourteen half ounces, make the third needle of this, and in the ſame manner proportion the ſmall maſſes of ſilver and copper for making the other needles, and put inſcriptions upon every one in the following manner:

For the needle	half oz. of ſilver	half oz. of copper.
1.	16	0
2.	15	1
3.	14	2
4.	13	3
5.	12	4
6	11	5
7.	10	6
8.	9	7
9.	8	8
10.	7	9
11.	6	10
12.	5	11
13.	4	12
14.	3	13
15.	2	14
16.	1	15

When you have gone thus far, and have the metals in each of theſe proportions, wrapped up in its ſeparate paper; put each ſeparately into a new crucible never uſed for any operation, and adding a little borax melt them together in a very quick fire, which muſt be well kindled before with bellows; or, what is yet better, throw them ſuddenly into a hot crucible, and, as ſoon as they melt, ſtir them with a dry wooden peg, burnt at the end, and pour them immediately into an ingot. When this is done, wrap up each maſs, when cold, in its own paper again, and weigh them ſingly, in a nice balance. If they ſtill weigh a whole mark they are good; but, if there is any conſiderable deficiency in their weight, it is a ſign that your fire having been of too weak, or of too long duration, has conſumed as much copper as is wanting in the weight; therefore this maſs muſt be eſteemed uſeleſs, and another made in its place in the ſame proportion.

When this is all finiſhed, make with a hammer, out of each theſe ſmall maſſes, a needle, heating them a little; then engrave, on each of theſe needles, the number of half ounces it contains, as before marked on its paper; that is, upon the firſt 16, upon the ſecond 15, and ſo on, and then pierce them at one end, and, running a ſilver wire through their eyes, collect them in order according to their different numbers. Theſe are the ſilver Touch-needles, made of the different allays of ſilver and copper.

In Holland they make uſe of the mint mark, divided into grains for the making their needles. The firſt needle made of pure ſilver is ſaid to be of twelve penny-weights. The ſecond is made of eleven penny-weights and eighteen grains, by the addition of ſix grains of copper. The third is made of eleven penny-weights and twelve grains, by the addition of twelve grains of copper; and ſo on, the proportion of ſilver decreaſing always ſix grains, that is, one quarter of a penny-weight at a time, and that of the copper being always increaſed in the ſame proportion, till at laſt the weight of the ſilver is reduced to one penny-weight, and that of the copper increaſed to eleven penny-weights, which proportion conſtitutes the laſt needle.

It is needleſs, however, to go through the whole ſeries of the needles, by ſo ſmall progreſſions to the very laſt, for very delicate proportions cannot be very accurately diſtinguiſhed in the operation.

Gold TOUCH-*needles*. Theſe muſt be mixed either with ſilver alone, or with ſilver and copper, variouſly intermixed. This mixture is called allaying or carracting, and is determined with a mark divided into carracts or weights of two ſixth parts of an ounce. There is nothing to be obſerved about the making of theſe needles, beſides what has been already ſaid in regard to the ſilver needles; except that the proportions of the weights are determined in another manner. Theſe needles are made according to the following diviſion and order; and they all weigh one mark.

The firſt is entirely of pure gold.

	pure gold	pure ſilver.
2.	23 Car. 6 Gr.	6 Gr.
3.	23 Car.	1 Car.
4.	22 Car. 6 Gr.	1 Car. 6 Gr.
5.	22 Car.	2 Car.
6.	21 Car. 6 Gr.	2 Car. 6 Gr.
7.	21 Car.	3 Car.
8.	20 Car. 6 Gr.	3 Car. 6 Gr.
9.	20 Car.	4 Car.
10.	19 Car.	5 Car.
11.	18 Car.	6 Car.

The decreaſe goes on thus, by whole carracts, till the weight of the gold is arrived at one carract, and that of the ſilver at twenty-three; for after the ninth needle you cannot make ſo exact a diſtinction of the half carracts.

This mixture of gold and ſilver is called the white allay; but, when copper together with ſilver enters into the mixture of the gold, then it is called a mixed allay. The needles, for trial of pieces thus debaſed, are made of mixtures analogous to the former, except only that thoſe portions which in the firſt caſe were pure ſilver, here conſiſt of copper and ſilver mixed. Therefore you have a double ſeries; for the mixture is either of two parts of ſilver, and one of copper, or of two parts of copper, and one of ſilver. For inſtance,

The firſt is of pure gold.

	of pure gold.	of pure ſilver.	of pure copper.
2.	23 Car. 6 Gr.	4 Car.	2 Gr.
3.	23 Car.	8 Gr.	4 Gr.
4.	22 Car. 6 Gr.	1 Car.	6 Gr.
5.	22 Car.	1 Car. 4 Gr.	8 Gr.
6.	21 Car. 6 Gr.	1 Car. 8 Gr.	10 Gr.
7.	21 Car.	2 Car.	1 Car.
8.	20 Car. 6 Gr.	2 Car. 4 Gr.	1 Car. 2 Gr.

and ſo on as in the foregoing.

If in this table you take pure copper inſtead of pure ſilver, and ſilver inſtead of copper, this gives you a third ſeries of golden needles. And you may have a fourth by mixing with gold equal quantities of ſilver and copper in the ſame proportion. Theſe allays of gold are much in uſe, but workmen may eaſily employ a multitude of other variations, which, compared with the already mentioned, will be diſtinguiſhed in a thouſand different ways by an experienced perſon, ſo that it is neither poſſible, nor neceſſary, to imitate them all.

But that theſe golden needles may not be too expenſive, they may be made much ſhorter than thoſe of ſilver, and afterwards ſoldered to plates of copper, that may be ſufficiently long for uſe.

The uſe of theſe needles is by means of the Touch-ſtone; and ariſes hence, that every metal when pure muſt have its ſpecific colour, that diſtinguiſhes it from the reſt: but, metals being the moſt opake of all known bodies, the ſpecific colour of every one appears moſt diſtinctly, when you rub it againſt a very black hard ſtone; and if the colours of two or more metals are expreſſed by large lively ſpots, made near each other on the ſame plane, by rubbing them againſt the ſurface of the ſtone, you will by that means eaſily diſcern their difference, or their likeneſs.

The ſtone adapted to this uſe, and called from its office the Touch-ſtone, muſt have the following qualities. It muſt be of the deepeſt black, leſt the tincture of the metal ſhould be altered by ſpurious rays of light ſhining among it: it muſt be capable of being pretty well poliſhed, for, when too rough, the colours of the metals rubbed againſt it cannot be neatly or regularly diſtinguiſhed; and, if it is too ſmooth, the metals are but faintly, and too ſlowly abraded or ſcraped by it, eſpecially when gold is tried. It muſt alſo be neither too hard, nor too ſoft. Tripoli, coal-duſt, and tin aſhes are uſed in rubbing off the thin metalline cruſts, and in a ſhort time the ſtone, when very hard, is apt to acquire too ſmooth a ſurface; and, when it is too ſoft, it eaſily wears, throws off a duſt, and contracts furrows.

The black rough marbles, and the ſofter black pebbles from the beds of rivers, are moſt proper for this uſe, and are to be made into the form of a quadrangular priſm, about an inch thick, and two or three inches long.

The method of uſing your needles and the ſtone is this: when you meet with a piece of metal to be tried, firſt wipe it very well with a clean towel, or piece of ſoft leather, that you may the better ſee its true colour; for from this alone an experienced perſon will in ſome degree judge before-hand what the principal metal is, and how, and with what debaſed. Then chuſe a convenient not over large part of the ſurface of the metal, and rub it ſeveral times very hardly and ſtrongly againſt the Touch-ſtone, that, in caſe a deceitful coat or cruſt ſhould have been laid upon it, it may be worn off by that friction. This however is done more readily by a grindſtone or ſmall file, if you have them at hand. Then wipe a flat and very clean part of the Touch-ſtone, and rub againſt it, over and over, the juſt mentioned part of the ſurface of the piece of metal, till you have on the flat ſurface of the ſtone a thin metallic cruſt, an inch long and about an eighth of an inch broad: this done, look out the needle that ſeems moſt like to the metal under trial, wipe the lower part of this needle very clean, and then rub it againſt the Touch-ſtone as you did the metal by the ſide of the other line, and in a direction parallel to it. When this is done, if you find no difference between the colours of the two marks, made by your needle, and the metal under trial; you may with great probability pronounce that metal, and your needle, to be of the ſame allay; which is immediately known by the mark engraved on your needle. But, if you find a difference between the colour of the mark given by the metal, and that by the needle you have tried; chuſe out another needle, either of a darker or a lighter colour than the former, as the difference of the tinge on the Touch-ſtone directs; and by one or more trials of this kind you will be able to determine which of your needles the metal anſwers, and thence what allay it is of, by the mark of the needle; or elſe you will find that the allay is extraordinary, and not to be determined by the compariſon of your needles.

But, if the metal under trial has been altered by tin, arſenic, zink, or other ſuch admixtures, the workmen may be deceived by the colour, ſo as to take for pure gold, or ſilver, that which is not by any means ſuch. Deceits of this kind however are found out by the aſſiſtance of acid menſtrua. Aqua-fortis anſwers this purpoſe, when the maſs is of the colour of gold, and aqua-regia, when it is of the colour of ſilver; for the firſt of theſe menſtrua diſſolves all metals except gold, and the latter all metals except ſilver. In this caſe then you are to pour, upon your metallic ſtreak on the ſtone, one ſmall drop of either of theſe liquors, and extend it gently over it with a feather. If it is neither gold nor ſilver, the whole ſtreak will be obliterated and conſumed; but, if there is any gold or ſilver in it, this remains undiſſolved, and ſhews another colour, becauſe the other parts have been ſeparated from it by the ſolution. When theſe menſtrua are uſed, great care muſt be taken that there is no oil in the way; for that would ſpoil and deſtroy their effects.

Beſides, theſe the following particulars are to be obſerved: gold and ſilver when pure, whether ſeparate or both mixed together, without the addition of any other matter, when made hot in the fire, not only preſerve their colour, but, if they were tarniſhed before, they recover their ſplendor there, not loſing the leaſt part of their weight: and, by this quality in theſe two metals, the caratura alba, or white allay, made by the mixture of gold and ſilver alone, is diſtinguiſhed from all the others. If you have not liberty to try the whole maſs in the fire, you may make this experiment on a ſmall piece of it with a blowpipe.

If you find a needle of the ſame allay with the metal under trial, the ſtreaks made by both upon the Touch-ſtone muſt undergo exactly the ſame changes when aqua-fortis is poured on them; and this ought always to be made a part of the trial by the Touch-needles, that no fraud may be at the bottom.

All gold rendered brittle, when compared with the Touch-needles by the ſtone, will appear leſs pure than it really is; and on the contrary all ſilver, rendered brittle, has the whiteneſs of ſilver in a higher degree: nor is there any wonder in this, when rightly conſidered, ſince the bodies which make gold and ſilver brittle are only a few metals, and ſemi-metals, all of a very bright white colour, and neceſſarily adding to the whiteneſs of ſilver, and taking from the yellowneſs of gold; ſuch are tin, lead, regulus of antimony, biſmuth, zink, and arſenic. Theſe dilute the yellow colour of gold or copper into a whiteneſs, ſo that the colour of copper mixed with the ſilver is hidden by admixtures of this kind, whereas gold on the contrary appears by them to have much more ſilver in it than it really has.

In a white allay, aqua-fortis does not diſcover the preſence of ſilver from twenty-three to ſeven carracts, becauſe aqua-fortis does not ſeparate ſilver from gold, unleſs the maſs contains three times more ſilver than gold.

Metallic ſtreaks or cruſts which have been left ſome time upon the Touch-ſtone, cannot be compared with freſh ones, with any degree of uſe, becauſe their remaining long on the ſtone always alters their colour.

Silver when tempered with braſs appears whiter than it would do with a like quantity of copper, and, as it may then be rendered ſufficiently ductile by a proper operation, you will hardly be able to find out the fraud with the Touch-ſtone, unleſs you make a ſecond time the ſame compariſon with the ſtreak of a needle of the ſame colour, having previouſly poured aqua-regia upon the metallic cruſt laid by rubbing on the Touch-ſtone; nor are Touch-needles, tempered with braſs, of any great uſe on this occaſion, ſince this artificial metal is ſometimes more and ſometimes leſs yellow.

Laſtly, if the metal laid upon the Touch-ſtone by rubbing does not appear neat or diſtinct enough, lick it over with ſpittle that is not frothy; and the colours will be by that means more diſtinctly and lively reflected. *Cramer's Art of Aſſaying.*

TOUCH-*ſtone* (*Dict.*)—The Iriſh Touch-ſtone, called baſanus Hibernicus by Molyneux and ſome others, is a black marble found in the county of Antrim in that kingdom, in angular columns, forming that amazing pile called by the vulgar the giant's cauſeway.

This marble has the property of trying metals by the Touch beyond any other known ſtone; but it is not eaſily wrought into form, being ſo hard that it turns the edges of all the tools uſed to cut ſtones. Were it not for this, it is admirably calculated for building, and for ornamental works; but nobody has attempted to uſe it in this manner, any where, except in the church of Ballywellan in the neighbourhood; and here the trouble of cutting is avoided, for the joints are taken as they found them, and the church is built of theſe in their natural ſhape, piled one upon another. The outer ſurface of this ſtone is of a whitiſh colour like lime-ſtone, but this is only the effect of the weather upon it; for where-ever it is broken it is found to be of a fine iron grey, and when poliſhed appears of a true and deep jetty black.

TOW-*chain*, in huſbandry, a name given by our farmers to a chain, that makes a part of the ſtructure of the plough, faſtening the plough-tail to what they call the plough-head.

This is an iron chain of few links, and very ſtrong; it is fixed at one end to a collar faſtened to the middle of the beam of the plough, and at the other end paſſes through that part of the plough-head called the box, which is the timber through which the ſpindle of the two wheels run. The ſtake of the plough, which is an upright piece running parallel with the crow-ſtaves, pins this in at the bottom, running through the link which comes out by the box; this ſtake is faſtened by wyths or cords in two places to the left crow-ſtaffs, and the chain is thus kept firm. *Tull's Huſbandry.*

TOXICODE'NDRON, *poiſon-wood*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of ſeveral leaves diſpoſed in a circular form. The piſtil ariſes from the cup, and finally becomes a fruit of a roundiſh ſhape, dry, not juicy, and uſually of a ſtriated ſtructure.

TOXO'TÆ, τοξόται, among the Athenians, bowmen, a ſort of inferior officers, or rather ſervants, who attended the lexiarchi.

TRACHU'RUS, in zoology, the name of a fiſh of the cuculus kind, called in Engliſh the ſhad, and by ſeveral authors ſuro, ſaurus, and lacertus marinus.

TRA'CING, in huſbandry, a term uſed by our planters in the method of preſerving the maize or Indian corn. This, being a large grain, is apt to ſpoil, if not carefully preſerved.

Some thraſh out the corn as ſoon as the ears are gathered, and lay it up in holes of the earth, which are their granaries: but thoſe who have not opportunities of doing this, trace it, that is, they leave it in the ear, and weave or faſten together a great number of ears by the ends of the huſks: theſe traces of corn they hung up within doors, on ſuch ſupports as will keep them from one another; and they will, in this manner, keep good the whole winter.

This is a method of our introducing; but their own of burying the clean corn was at leaſt as good, and was the ſame practiſed by the Ægyptians of old, and by all the wiſeſt nations of the Eaſt at this time. But whether we have improved their huſbandry in this particular, or not, it is certain that we have greatly aſſiſted them in the planting this corn, which we do by the plough, inſtead of the troubleſome method they had of doing it with the hoe. The manner of our planting it is this: we plow ſingle furrows the whole length of the field, and at about ſix feet diſtance one from another; we then plow others a-croſs at the ſame diſtance, and then, wherever the furrows meet, the corn is thrown in; it is then covered either by the hoe, or by running another furrow behind it with the plough; and when the weeds begin to overtop the corn, they plow the ſpaces again, and by this means deſtroy and turn in all the weeds, and give the earth ſtirring that greatly aſſiſts vegetation.

TRA'INING, or TRACING, in minerology, a term uſed by our miners, to expreſs the tracing up the mineral appearances on the ſurface of the earth to their head or original place, and there finding a mine of the metal they contain.

The principle on which this practice depends, is the change wrought in the face of the earth by the deluge, of the effects of which theſe remains are a very great proof. The ſuperficial or upper part of veins, or loads of ore, is always the pooreſt, the richer ores lying deeper down, the poor ones only ſerving to lead the way.

TRANSPORTA'TION *of plants*. In the ſending plants from one country to another great cautions are neceſſary. The plants, ſent from a hotter country to a colder, ſhould be always put on board in the ſpring of the year, that the heat of the ſeaſon may be advancing as they approach the colder climates; and, on the contrary, thoſe which are ſent from a colder country to a hotter, ſhould be ſent in the beginning of winter.

The beſt way of packing up plants for a voyage, if they be ſuch as will not bear keeping out of the earth, is to have boxes with handles, filling them with earth, and planting the roots as cloſe together as may be; the plants ſhould be ſet in theſe boxes three weeks before they are to be put on board, and in good weather they ſhould be ſet upon the deck, and in bad removed and covered with a tarpaulin.

If they are going from a hotter country to a colder one, they muſt have very little moiſture; if, on the contrary, they are going from a colder to a warmer, they may be allowed water more largely, and being ſhaded from the heat of the ſun, they will come ſafe.

Very many plants, however, will live out of the earth a great while; as the ſedums, euphorbiums, ficoides, and other ſucculent ones. Theſe need no other care than the packing them up with moſs in a cloſe box; and there ſhould be a little hay put between them, to prevent them from wounding or bruiſing one another, and holes bored on the boxes to keep them from heating and putrifying. In this manner they will come ſafe from a voyage of two, or three, or even four or five months.

Several trees alſo will come ſafely in the ſame manner, taking them up at a ſeaſon when they have done growing, and packing them up with moſs. Of this ſort are oranges, olives, capers, jaſmines, and pomegranate-trees. Theſe and many others are annually thus brought over from Italy; and, though they are three or four months in the paſſage, ſeldom miſcarry. The beſt way of ſending over ſeeds, is in their natural huſks, in a bag, or packed up in a gourd-ſhell, keeping them dry, and out of the way of vermin. *Miller's Gard. Dict.*

TRANSFORMA'TION *of inſects.* It is well known that flies are not produced in that form, from the eggs of their parent fly, but undergo a change like that of the butterfly, and the like winged inſects; the egg hatching into a worm; and this after eating, and performing all the operations of animal life for a certain time, enters into a ſtate of reſt, and thence is changed into a fly.

Though the general courſe of nature is the ſame in this reſpect in flies and butterflies, yet the means and manner of it are different; the butterfly makes its coat for this Transformation; the fly-worms of many kinds have only a ſhell of their own proper ſkin to undergo this change in.

All the fly-worms of the firſt and ſecond, and many of thoſe of the third claſs, have their caſe thus made only of their own ſkin; the different ſpecies afford indeed ſome varieties in the manner of this, but a general idea of the work may be had from obſerving the worm or maggot of the common fleſh-fly in its ſeveral ſtages.

When this creature has arrived at its full growth, it finds it not convenient any longer to remain among the food it has till then lived upon; it quits it and now goes in ſearch of a place where it may wait for its metamorphoſis. To this purpoſe it creeps into the earth, where it remains two or three days without any change; at the end of this time, inſtead of its pointed figure, its white colour, and ſoft fleſhy ſubſtance, it acquires the figure of an egg, and becomes of a cheſnut colour, or ſomewhat reddiſh, and looks opake and cruſtaceous: it is in this ſtate perfectly ſtiff, and deſtitute of motion, and the creature ſeems not only to have loſt its form, but wholly to have loſt its life alſo.

This however is not the caſe; all that is done, is that the creature has abſolutely quitted its ſkin, which is now become hard and of a determinate figure, and is within it compleating all its changes. *Reamur's Hiſt. of Inſects.*

TRA'NSUM, in gunnery, is a piece of wood which goes a-croſs the cheeks of a gun-carriage, or of a gun, to keep them fixed together; each Tranſum in a carriage is ſtrengthened by a bolt of iron.

TRAPE'ZIUM, in geometry, a plain figure contained under unequal right lines.

TRA'VERSE-*table*, in navigation, is the ſame with the table of difference of latitude and departure; being only the difference of latitude and departure ready calculated to every degree, point, half-point, and quarter-point of the quadrant; and for any diſtance under a hundred miles, though it may conveniently ſerve for more.

This table is one of the moſt neceſſary things a navigator has occaſion for; for by it he can readily reduce all his courſes and diſtances, run in the ſpace of twenty-four hours, into one courſe and diſtance; whence the latitude he is in, and his departure from the meridian, may be found.

TREME'LLA, *laver*, in botany, the name of a genus of ſmall and ſeemingly imperfect plants, the characters of which are theſe: they are a kind of plants ſeemingly of a ſort of middle nature between the alga and conferva. Theſe produce no flower, nor ſeed, ſo far as has been yet obſerved, but are throughout of one uniform and tender texture, pellucid and membranaceous, and frequently gelatinous; they, for the moſt part, live in the water, and conſiſt of flat and plain leaves, often very broad, and ſometimes tubular. *Dillen's Hiſt. Muſc.*

TREE.—Heat is ſo eſſential to the growth of Trees, that we ſee them grow larger and ſmaller in a ſort of gradation as the climates in which they ſtand are more or leſs hot. The hotteſt countries yield in general the largeſt and talleſt trees, and thoſe alſo in much greater beauty and variety than the colder do; and even thoſe plants which are common to both arrive at a much greater bulk in the ſouthern, than in the northern climates; nay, there are ſome regions ſo bleak and chill, that they raiſe no vegetables at all to any conſiderable height. Greenland, Iceland, and the like places, afford no trees at all; and what ſhrubs grow in them are always little and low. In the warmer climates, where Trees grow to a moderate ſize, any accidental diminution of the common heat is found very greatly to impede vegetation; and, even in England, the cold ſummers we ſometimes have, give us an evident proof of this; for though the corn and low plants have ſucceeded well enough, and gooſeberries, currants, raſpberries, and other low ſhrubs, have brought forth fruit in ſufficient plenty, yet the production of taller Trees has been found very much hurt; and walnuts, apples, and pears, have been very ſcarce among us.

Heat is heat, be it from what cauſe it will, and acts as well upon vegetation one way as another. Thus the heat of dung, and the artificial heat of coal fires in ſtoves, is found to ſupply the place of the ſun.

Great numbers of the Indian Trees in their native ſoil flower twice in a year, and ſome flower and bear ripe fruit all the year round; and it is obſerved of theſe laſt, that they are at once the moſt frequent and moſt uſeful to the inhabitants; their fruit, which hang always on them in readineſs, containing cool juices, which are good in fevers, and other of the common diſeaſes of that hot country.

Plantations of uſeful Trees might be made to very great advantage in many places in every country, and the country greatly enriched by it, while the public would be alſo benefitted by it, ſince it would raiſe a continual ſupply of timber uſed in ſhip-building, and on other public as well as private occaſions.

We have, in many places, heaths, and other barren and uncultivated lands, of very great extent; and how great an advantage would it be to the public to bring theſe to be truly valuable? Many, if not all of theſe heaths, would be found on trial capable of producing Trees; and ſome of them are truly the remains of deſtroyed foreſts; and, though the profits to be reaped from the planting theſe would come late, yet the expence of doing it would be very trifling in compariſon of that profit, and the means eaſy.

The authors who have given rules for planting, having employed themſelves only about ſmall ſpots of ground, the eſtabliſhing orchards, or parks, are by no means to be ſuppoſed proper guides in attempts of this kind; and Monſieur de Buffon, who had a great opinion of the knowledge of our Evelyn and Miller, who ſeem to ſpeak of every thing from their own experience, found, when he ſet about large plantations, that their opinions and rules were erroneous; and was obliged to have recourſe to experiments only; which he varied a thouſand ways: and, though many of them proved unſucceſsful, yet they all gave hints towards others, by which the attempt might afterwards be brought to ſucceed.

This ſagacious enquirer into the operations of nature in the growth of vegetables, having ſet apart a conſiderable quantity of land for the trial, and procured a number of young Trees, firſt divided the whole quantity into a number of ſmall ſquares, and, having made a plan of it, examined the nature, depth, and other circumſtances of the ſoil in each, and minuted the whole down on a proper part of the plan: that himſelf or whoever ſucceeded him might judge, from the different growths of a number of Trees planted in the ſame ſtate in the different ſoils, the different advantages and diſadvantages of every circumſtance in the depth and nature of the ground, in regard to the growth of uſeful Trees. Different numbers of labourers were employed about different ſpots of this ground, and the acorns for the young growth planted at different ſeaſons; but the reſult in general was, that what ſhould ſeem the beſt methods ſucceeded the worſt; and thoſe pieces where many labourers were employed, and the acorns planted before winter, were much thinner of young oaks, than thoſe where the leaſt labour had been beſtowed upon the ground, and where the acorns had been planted in the ſpring; but thoſe places which ſucceeded beſt from the ſowing, were thoſe which had the acorns planted in holes made by a pickax, without any preceding culture of the ground. And thoſe where the acorns had only been laid upon the earth, under the graſs, afforded a great number of vigorous young Trees, though the greater part had been carried away by birds, and other devouring animals. Thoſe ſpots of ground where the acorns were ſet ſix inches deep, were much worſe furniſhed with young ſhoots, than thoſe where they had been buried but at an inch deep; and in ſome places where they were buried at a foot deep not one ſhoot appeared, though in others where they had been buried at nine inches there were many.

Thoſe acorns which had been ſteeped for eight or nine days in wine lees, and in the water of the common ſewers, appeared out of the ground much earlier than thoſe which were put in without this previous management.

But the moſt ſucceſsful of all the trials was that of planting in the ſpring ſuch acorns as had been ſown together in another place, and had time to ſhoot there; of theſe ſcarce any failed, and the plantation was perfectly flouriſhing, though the growth of theſe young ſhoots was not ſo quick and vigorous as thoſe of the acorns which had remained, when firſt ſown; which was probably owing to the injury the tender radicles received in tranſplanting.

Thus ſucceeded the experiments by ſowing, while, of thoſe made by planting young Trees, ſuch as had been brought out of woods, and places under covert, ſucceeded much worſe than thoſe which had grown in more expoſed places.

The young Trees of the ſeveral parts of the plantation kept on their growth in the manner they had begun to ſhoot, thoſe of the more laboured parts continuing more weak, and lower than thoſe of the leſs laboured.

Thus were a number of neceſſary experiments carefully tried, and the reſult of the whole was, that to make a plantation of oaks, on a ſoil of the common clayey or loamy kind, the moſt ſucceſsful method is this: the acorns muſt be preſerved during the winter in the earth in this manner: let there be made a bed of earth ſix inches deep, on this place a layer of acorns two inches deep, over theſe lay a bed of another half foot of earth, over that another layer of acorns, and ſo on ſucceſſively, till as many are employed as there will be occaſion for; the whole is then to be covered with a foot depth of earth, to preſerve all from the froſt. In the beginning of March, theſe beds are to be opened, and the acorns which will by that time have ſhot out, and are then in reality ſo many young oaks, are to be planted out at a foot diſtance each, and the ſucceſs of a plantation of this kind need not be feared. This is a manner of planting that is done at a ſmall expence, and even that might be in a great meaſure ſpared, were it not for the birds and other devouring animals; ſince, could the acorns be defended from theſe, they might be only laid on the ſurface of the ground under the graſs in autumn, and they would infallibly ſhew themſelves in ſo many young oaks the ſucceeding ſpring.

It is eaſy to continue the carrying the acorns, when taken out of their winter's bed, to the place where they are to be planted, without doing them much injury; and the ſmall ſtop the tranſplanting puts to their growth, is in reality rather an advantage than an injury; ſince it only retards the young ſhoots for about three weeks, or leſs than that: and by that means ſecures them from the few cold mornings that may be expected about the time of their natural appearance.

TRE'NCHING-*plough*, in huſbandry, the name of an inſtrument uſed to cut out the trenches, drains, and carriages, in meadow and paſture ground. It is alſo uſed for cutting the ſides of turf even, which are to be laid down again, either in the ſame, or in ſome other places.

It conſiſts of a long handle, with a knob or button at the end, and at the other end it turns upwards like the foot of a plough, to ſlide in the ground. In this part is placed a coulter of the length proportioned to the depth to the cut, and with a ſharp edge: this has two wheels to make it run eaſy, and does a great deal of buſineſs in a little time. *Mortimer's Husbandry.*

TRIA'NDRIA *, in botany, a claſs of plants which have hermaphrodite flowers, with three ſtamina or male parts in each.

* The word is derived from the Greek τρεῖς, three, and ἀνὴρ, male. Of this claſs of plants are the valerian, ſaffron, a great many of the graſſes, &c. See *plate* XL. *fig.* 3.

TRIANGLE (*Dict.*) — Plutarch informs us, that Xenocrates the philoſopher reſembled the Deity to an equilateral Triangle, the genii to an Iſoſceles, and men to a ſcalenum. A Triangle has been ſince applied by Chriſtians to repreſent the Trinity, ſometimes ſingle, and at other times with additional lines, expreſſing a croſs. Thus we find them variouſly combined upon the medals of the popes publiſhed by Bonanni. And nothing was more frequent formerly with printers than to place theſe figures in the front of their books; at firſt, doubtleſs, with a religious intent, till at length, by common uſe, they became only preſs marks, and badges of diſtinction among the trade; as they now are with merchants, who mark their goods with them both here and abroad. *Phil. Tranſ.* N°. 474.

TRICHE'RIÆ *, in natural hiſtory, the name of a genus of foſſils, of the claſs of the fibrariæ, the characters of which are, that they are not elaſtic, and are compoſed of ſtraight and continuous filaments.

* The word is derived from the Greek τρίχες, capillaments or fibres.

TRICHE'STRUM *, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, but differing extremely in figure and ſtructure from the common kinds.

* The word is derived from the Greek τρίχες, hairs or filaments, and ἀστὴρ, a ſtar; and expreſſes a ſet of bodies compoſed of filaments arranged into the form of a ſtar.

The ſelenitæ of this genus are compoſed of filaments ſcarce any where viſibly arranged into plates or ſcales, but diſpoſed in form of a radiated ſtar, made of a number of disjunct ſtriæ. *Hill's Hiſt. of Foſſ.*

TRIEDRO'STYLA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek τρὶς, thrice, ἕδρα, a ſide, and στύλος, a column.

The bodies of this genus are ſpars, in form of trigonal columns, adhering by one end to ſome ſolid body, and terminated at the other by a trigonal pyramid.

TRIE'MERUS, *the three-day fly*, in natural hiſtory, a fly ſomewhat like the butterfly; it has four large yellowiſh wings, and a long body, with a head furniſhed with long antennæ, large eyes, and a ſpiral trunk. It is found among the nettles and mallows.

TRIEXAHÆ'DRIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek τρὶς, thrice, ἕξ, ſix, and ἕδρα, a ſide.

The bodies of this genus, are perfect, and pellucid cryſtalliform ſpars, conſiſting of thrice ſix planes, being compoſed of an hexangular column, terminated at each end by an hexangular pyramid.

TRIFO'LIUM, *trefoil*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of a papilionaceous kind: the piſtil which ariſes from the cup finally becomes a capſule, which remains covered with the cup, and uſually contains kidney-ſhaped ſeeds. To this it is to be added, that the leaves grow three on every ſtalk; though there are ſome inſtances of theſe plants truly of this genus, which have four or five on the ſtalk. See CLOVER.

TRIGONO'METRY (*Dict.*)—In ſolving the firſt caſe of oblique-angled plane triangles, the proportion is, as any one ſide is to the ſine of its oppoſite angle, ſo is any other ſide to the ſine of its oppoſite angle.

For take $A b = C B$ (*plate* LVII. *fig.* 8. in the Dictionary) and upon A C let fall the perpendiculars B D, *b d*; which will be the ſines of the angles A and C, to the equal radii A *b*, C B. Now the triangles A B D, A *b d*, being ſimilar, we have as A B : B D (ſine of the angle C) :: A *b* (B C) : *a b* (ſine of the angle A.)—Alſo, in caſe 4, the proportion is, as the ſum of any two ſides is to their difference, ſo is the tangent of half the ſum of the two oppoſite angles to the tangent of half their difference.

For let A B C (*plate* LVII. *fig.* 9. in the Dictionary) be the triangle, and A B and A C the two propoſed ſides; and from the center A, with the radius A B, let a ſemi-circle be deſcribed, interſecting C A produced, in D and F; ſo that C F may expreſs the ſum, and C D the difference, of the ſides A C and A B: join F, B, and B, D, and draw D E parallel to F B, meeting B C in E.

Then, becauſe $2 ADB = ADB + ABD = C + ABC$, it is plain that A D B is equal to half the ſum of the angles oppoſite to the ſides propoſed. Moreover, ſince $ABC = ABD\ (ADB) + DBC$, and $C = ADB - DBC$, it is plain that $ABC - C$ is $= 2 DBC$; or that D B C is equal to half the difference of the ſame angles.

Now, becauſe of the parallel lines B F and E D, it will be C F : C D :: B F : D E; but B F and D E, becauſe D B F and B D E are right angles, will be tangents of the foreſaid angles F D B (A D B) and D B E (D B C) to the radius B D.—Likewiſe, in caſe 6, the proportion is, as the baſe is to the ſum of the other two ſides, ſo is their difference to the difference of the ſegments of the baſe.

For, let A B C (*plate* LVII. *fig.* 13. in the Dictionary) be the triangle; then on B as a center, with the radius B C deſcribe the circle C D E F, produce A B to D, draw the right-line B F, and let fall the perpendicular B G. Then, becauſe B is the center of the circle C D E F, therefore B E, B C, and B D are equal, and $AD = AB + BC$, and $AE = AD - BC$; and, becauſe the point A is without the circle, $AC \times AF = AD \times AE$ (*by* 36 *of Euc.* 3.) which, being turned into an analogy, will be, as A C : A D :: A E : A F. Which was to be proved.

The meaſure of a ſpherical angle C A D (*plate* LVII. *fig.* 11. in the Dictionary) is an arch of a great circle intercepted by the two circles A C B, A D B, forming that angle, and whoſe pole is the angular point A. For let the diameter A B be the interſection of the great circles A D B and A C B, and let the plane, or great-circle D E C, be conceived perpendicular to that diameter, interſecting the ſurface of the ſphere in the arch C D; then it is manifeſt that $AD = BD = 90°$, and $AC = BC = 90°$, and that C D is the meaſure of the angle D E C (or C A D) the inclination of the two propoſed circles.

The firſt theorem for the ſolution of right-angled ſpherical triangles in the Dictionary may be thus demonſtrated:

Let A D L and A E L (*plate* LVII. *fig.* 10. in the Dictionary) be two great circles of the ſphere interſecting each other in the diameter A L, making an angle D O E, meaſured by the arch E D; the plane D O E being ſuppoſed perpendicular to the diameter A L, at the center O.

Let A B be the baſe of the propoſed triangle, B C the perpendicular, A C the hypothenuſe, and B A C (or $DAE = DE = DOE$) the angle at the baſe: moreover, let C G be the ſine of the hypotheneuſe, A K is tangent, A I the tangent of the baſe, C H the ſine of the perpendicular, and E F the ſine of the angle at the baſe; and let I, K, and G, H, be joined.

Becauſe C H is perpendicular to the plane of the baſe (or paper) it is evident, that the plane G H C will be perpendicular to the plane of the baſe, and likewiſe perpendicular to the diameter A L, becauſe G C, being the ſine of A C, is perpendicular to A L. Moreover, ſince both the planes O I K and A I K are perpendicular to the plane of the baſe (or paper) their interſection

tion I K will alſo be perpendicular to it, and conſequently the angle A I K a right angle. Therefore, ſeeing the angles O F E, G H C, and A I K, are all right angles, and that the planes of the three triangles O F E, G H C, and A I K are all perpendicular to the diameter A L, we ſhall, by ſimilar triangles,

$$\text{have}\left\{\begin{array}{l} OE : EF :: GC : CH \\ OE : OF :: AK : AI \end{array}\right\}$$

that is,
Radius : ſine of E O F or (B A C) : : ſine of A C : ſine of B C.
Radius : co-ſine of E O F (or B A C) : : tang. A C : tang. A B. *Q. E. D.*

Hence it follows that the ſines of the angles of any oblique ſpherical triangle A D C are to one another, directly, as the ſines of the oppoſite ſides.

In the Philoſophical Tranſactions, Vol. XLVII. p. 441, & ſeq. the learned Francis Blake, eſq; F. R. S. has given us the following method of reducing ſpherical Trigonometry to plane.

It is obſervable, that the analogies of ſpherical Trigonometry, excluſive of the terms co-ſine and co-tangent, are applicable to plane, by only changing the expreſſion, ſine or tangent of ſide, into the ſingle word, ſide, ſo that the buſineſs of plane Trigonometry, like a corollary to the other, is thence to be inferred. And the reaſon of this is obvious; for analogies raiſed not only from the conſideration of a triangular figure, but the curvature alſo, are of conſequence more general; and, though the latter ſhould be held evaneſcent by a diminution of the ſurface, yet what depends upon the triangle, will nevertheleſs remain. Theſe things may have been obſerved, I ſay; but, upon reviſing the ſubject, it further occurred to me, and I take it to be new, that from the axioms of only plane Trigonometry, and almoſt independent of ſolids, and the doctrine of the ſphere, the ſpherical caſes are likewiſe to be ſolved.

Suppoſe, firſt, that the three ſides of a ſpherical triangle, abd (*plate* XLI. *fig.* 5.) are given to find an angle, a; which caſe will lay open the method, and lead on to the other caſes, in a way, that to me appears the moſt natural. It is allowed, that the tangents, ae, af, of the ſides, ad, ab, including an angle, a, make a plane angle equal to it; and it is evident, that the other ſide, db, determines the angle made by the ſecants ce, cf, at c the center of the ſphere; whence the diſtance, ef, between the tops of thoſe ſecants, is given by caſe the fifth of oblique plane triangles (ſee Heynes's Trigonometry) which, with the aforeſaid tangents, reduces it to caſe the ſixth of oblique plane triangles alſo: and thus this eleventh caſe of oblique triangles, ſo intricate hitherto, becomes perfectly eaſy. The twelfth caſe is reducible to the eleventh, and the reſt, whether right-angled, or oblique, we are authoriſed to look upon as reducible to right-angled triangles, whoſe ſides are not quadrants, but either greater or leſs than ſuch. Conceive therefore, now, in a right-angled ſpherical triangle, gkb (*fig.* 7.) that the tangent, gm, and ſecant, cm, of either leg, gk, is already drawn; and in the point, m, of their union, draw a perpendicular, ml, to cm, the ſecant, directly above the other leg, viz. a perpendicular to the plane of the ſecant and tangent, that it may be perpendicular to both (Eucl. 4. 11.) for then will the tangent, gl, of the hypothenuſe, gb, drawn from the ſame point, which that of the leg was, conſtantly terminate in the perpendicular line, that the radius and tangent may make a right angle (Eucl. 18. 3.) Whence theſe tangents, gm, gl, and the perpendicular line, ml, together with the ſecants, cm, cl, will evidently form two right-angled plane triangles, gml, cml; and to one or other of theſe the ſpherical caſes are eaſily transferred. Thus, if in the ſpherical triangle, gkb, the hypothenuſe, gb, baſe, gk, and angle, g, at the baſe, be the parts given and required, when any two are given, the third may be determined by means of a plane triangle, and at a ſingle operation. We have, for inſtance, in the right-angled plane triangle, gml, formed as above, the baſe, gm, and hypothenuſe, gl, to find, by caſe the fifth of right-angled plane triangles, the angle included, which is the ſame as on the ſphere. And then, if the baſe, gk, the angle, g, at the baſe, and perpendicular, kb, be the ſpherical parts given and required; or, if the angles, g and b, and the hypothenuſe, gb, be the parts given and required; we have only that former proportion of the hypothenuſe and baſe, and angle at the baſe, in the triangles, P N D, D F G, (*fig.* 6.) obtained by the complements, to transfer to the plane. But, ſecondly, ſuppoſe the ſpherical proportion is of the three ſides, any two being given, the third may be alſo found at a ſingle operation, in the ſecond right-angled plane triangle, cml, formed as above. We have, for inſtance, the hypothenuſe and baſe, cl, cm, viz. the ſecant of the ſpherical hypothenuſe and baſe gb, gk, to find, by the fifth of right-angled plane triangles, the angle, c, at the center, which is the meaſure of kb, the ſide that was ſought. And then again, if the hypothenuſe, one leg, and the oppoſite angle be the ſpherical parts given and required; or, if the two angles and a leg be the parts given and required; we have only the former proportion of the three ſides in the triangles, P N D, D F G, obtained by the complements, to transfer to the plane. Whence, the ſix proportions of right-angled ſpherical triangles being comprehended in this method, it is fully demonſtrated, that all the caſes of theſe triangles are ſo to be reſolved.

The ſame might be deduced without the method of complements, but neither in ſo ſhort nor ſatisfactory a way, and it ſhall therefore be omitted. I have communicated this upon account of its perſpicuity, and ſuppoſing, that in an age ſo greatly advanced in mathematical learning, the leaſt hint of what is new would not be unacceptable.

TRILL-*books*, thoſe uſed to hold the ſides of a cart up to the horſe.

TRILLE'TO, in the Italian muſic, a little ſhort ſhake or quaver; it differs from trillo, only in point of continuance being its diminutive.

TRI'LLO, in the Italian muſic, is often found marked with a ſingle T, or tr, and often alſo by a ſmall t, as well in vocal as inſtrumental parts. It is deſigned to intimate, that you beat quick upon two notes in conjoint degrees, as *e f*, or *d e* alternately; beginning with the higheſt, and ending with the loweſt.

TRI'NGA, in the Linnæan ſyſtem of zoology, the name of a diſtinct genus of birds, of the order of the ſcolopaces: the diſtinguiſhing character of this are, that the feet have each four toes, and the beak is ſhorter than the toes. *Linnæi Syſtema Naturæ.*

TRINGA *minor*, in zoology, a name by which ſome authors called the bird commonly known in England by the name of the ſandpiper.

TRIPENTAHE'DRIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek, τρὶς, thrice, πέντε, five and ἕδρα, a ſide.

The bodies of this genus are ſpars compoſed of thrice five planes; being made of a pentangular column, terminated at each end by a pentangular pyramid. Of this genus we only know one ſpecies; this has a moderately long column, and very ſhort and broad pyramids; it is found in Derbyſhire, Yorkſhire, and Cornwall, and is very frequent about Goſſelaer in Saxony. *Hill's Hiſt. of Foſſ.*

TRI'POLI (*Dict.*)—The yellowiſh white kind is called by authors alana gleba, tripolis, and terra tripolitana; this is the produce of Germany, Saxony, and France; there is alſo ſome of it in the neighbourhood of Venice, but it is found in greateſt plenty in many parts of Africa. It is a dry hard earth, of a very pale yellowiſh white, of a firm texture, and moderately heavy; it is ſometimes found of itſelf, conſtituting a ſtratum; but is more frequently met with in detached pieces among ſtrata of other matter. It is of a rough, irregular, duſty ſurface; it adheres ſlightly to the tongue, is dry, hard, and harſh to the touch, is not to be broken between the fingers, and ſlightly ſtains the hands: it makes no effervescence with aqua fortis, and makes a ſlight hiſſing noiſe on being thrown into water. The reddiſh Tripoli is of our own production, though not peculiar to ourſelves; it is found in great abundance on Mendip-hills in Somerſetſhire, nor leſs plentifully in many parts of Germany. This is well known in the ſhops as a ſubſtance of great uſe in poliſhing braſs, but is not applied to any of the other uſes of the yellowiſh kind: this, like the former, is moſt frequently found in detached maſſes, and, while in the earth, is tolerably ſoft, and eaſily falls into flakes. When dry, it becomes of a conſiderable hardneſs; and is of a fine pale reddiſh white, of a looſe open texture, compoſed of a multitude of extremely thin plates or flakes laid evenly on one another, and conſiderably heavy; it is of a ſmooth and ſomewhat gloſſy ſurface; it adheres very firmly to the tongue, is dry and harſh to the touch, too hard to be broken between the fingers, and does not ſtain the hands: it makes no effervefcence with acids, and burns to a paler colour, with ſome additional hardneſs. *Hill's Hiſt. of Foſſ.*

TRIPYRAMI'DES *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek, τρὶς, thrice, and πυραμὶς, a pyramid.

The bodies of this genus are ſpars, compoſed of ſingle pyramids, each of three ſides, ſtanding on no column, but affixed by their baſes to ſome ſolid body.

TRO'CHUS, in natural hiſtory, the name given by authors to a genus of ſhells; ſome of the ſpecies of which reſemble the figure of the Trochus, or top which boys play with. As there are many ſpecies of this ſhell, however, which are flatted and have nothing of this form, the whole ſeries are much better named, by a denomination taken from the ſhape of the mouth, which is of an oval figure, and is alike in all theſe ſpecies, and different from all other ſhells. They are therefore aptly charactered by a late French writer under the name of cochleæ ore depreſſo.

TROIS-*cinque*, in French diſtillery, a term uſed to expreſs their brandy when of a peculiar ſtrength, conſiſting of five parts alcohol, and three parts phlegm.

The method of diſtilling the wines into brandy, in France, is exactly the ſame with that uſed with us to draw the ſpirit from our waſh or fermented liquor of malt, treacle, ſugar, or whatever other kind. They only obſerve more particularly to throw a little of the natural lee into the ſtill, along with the wine; and the pooreſt wines are found to ſucceed beſt on the trial, making by much the fineſt brandies. We are apt to wonder, that we cannot from the wines of particular countries diſtil their particular brandies; but the whole myſtery conſiſts in this, that they do not ſend us over the ſame wines which they uſe in diſtilling, becauſe theſe latter would not be liked as wines, nor would keep in the bringing over. Sometimes, in Scotland, they meet with the poor and pricked wines, the ſame that the French diſtil their brandies from; and from theſe they diſtil a ſpirit, not to be known from the brandy diſtilled in France.

The lee, which the French add in the diſtillation, gives the brandy that high flavour for which we ſo much eſteem it; but they themſelves like it much the worſe for it. The French notion of a proof ſtrength, determined by the chaplet or crown of bubbles, is the ſame with ours; and all their fine ſpirits are found of this ſtrength.

But they have one particular expedient for thoſe brandies which prove foul and ſeedy, or retain the taſte of certain weeds which grow among the wines; they draw them over again, with a deſign to free them from that adventitious flavour. In this operation they always leave out the faints, or rather they change the receiver as ſoon as ever the ſtream comes proof; then mixing together all that run off before, they make a brandy ſtronger than the ordinary kind, and this is what they call Trois-cinque.

The diſtillers in France ſcarce ever bring their brandies higher than this; for they have the art to perſuade the foreign merchant, that the phlegm of French brandy is natural and eſſential to it: but the truth is, that the ſpirit alone contains the flavour and excellence of the brandy, and it might as well be reduced to half its bulk for exportation, and ſent over in the ſtate of alcohol, and then lowered with common water, to the proof ſtrength.

The French uſe no art in colouring their Trois-cinque, any more than their common proof-brandy, nor do they add any thing to give them an additional flavour. The thing which they principally value themſelves upon, both in regard to brandies and wines, being to make them perfectly natural: ſo that all the colour we find in their brandies, is acquired from the caſk, and the time they are left in it. This is often twelve or eighteen months, ſometimes two or three years; in this time they acquire a brown colour, and loſe their acrid taſte.

The greateſt adulteration of brandies is in England; the French have no temptation to do it, they having no cheaper ſpirit, ſince the prohibition of moloſſes in their country. The Dutch are in the ſame condition, having no moloſſes ſpirit; and only a very coarſe and nauſeous ſugar-ſpirit, and yet a worſe malt-ſpirit of their own manufacture; a ſingle gallon of which would ſpoil a whole piece of brandy. The French brandy alſo, paying no duty in Holland, is as cheap, or nearly ſo, there, as in France itſelf. The duties being high upon brandy, it is greatly adulterated, and that with all ſorts of ſpirits, &c. as malt, moloſſes, cyder, and ſugar-ſpirits; and, when this is done in a dexterous and ſparing manner, the cheat is not eaſily found out. *Shaw's Eſſay on Diſtillery.*

TRO'PHY, in architecture, an ornament which repreſents the trunk of a tree, charged or encompaſſed all round about with arms or military weapons, both offenſive and defenſive.

TROUT, a very valuable river-fiſh, the diſtinguiſhing characters of which are theſe: its body is long; its head ſhort and roundiſh; the end of its noſe or ſnout obtuſe and blunt; its tail is very broad; its mouth large; and each jaw furniſhed with one row of ſharp teeth; and in its palate there are three parcels of teeth, each of an oblong figure in the congeries, and all meeting in an angle near the end of the noſe; and the tongue has ſix, eight, or ten teeth alſo on it, and its ſides are beautifully variegated with red ſpots.

This delicious fiſh is obſerved to come in and go out of ſeaſon with the ſtag and buck; the time of its ſpawning is remarkable: moſt other fiſh do this in warm weather, but the Trout in October or November. Among the ſeveral kinds of Trout the red and the yellow are the beſt for the table; and, in the ſame ſpecies, the female has always the preference to the male; the head of the female is ſmaller, and the body deeper than in the male. They are known to be in ſeaſon by the bright colour of their ſpots, and by the largeneſs and thickneſs of their backs; which laſt is a general rule in regard to all fiſh, to know when they are in ſeaſon.

In winter the Trout is ſick, lean and unwholeſome, and very often is louſy. The louſe, as it is called, of the Trout, is a ſmall worm with a large head, which ſticks very faſt to the ſides of the fiſh; they live upon the juices of the fiſh all the time of the cold weather, while he is poor and lies quiet in the deep waters; but when the warm weather in the ſpring comes on, and the fiſh leaves his lazy life at the bottom, and comes up to the ſhallow gravelly places, where the ſtream is ſwift, he ſoon ſhakes them off.

The Trout, at his firſt coming into the ſhallow waters, may be ſeen to rub his body continually upon the ſharp gravel at the bottom; it is by this means he gets off theſe worms or lice, as they are called. From this time he begins to feed on flies; but, in May, the peculiar fly that he is fond of is produced, and, after feeding that whole month on this inſect, the fleſh of the fiſh becomes more red and firm, and its higheſt ſeaſon begins.

The general baits for a Trout, are a worm, a minnow, or a fly, whether natural or artificial: among worms, there are ſeveral kinds which this fiſh is fond of; ſuch are the earth-worm and dung-worm in particular; the lob-worm and brand-ing-worm are alſo eſteemed: but the beſt of all is the ſquirrel-tail-worm, which has a ſtreak down the back, a red head, and a broad tail. The brandling is commonly found in an old dung-hill, or under cow-dung, or elſe among tanners bark; the others are found in the earth, and under large ſtones or ſtumps of trees: whatever worm is uſed, the longer it is kept to ſcower firſt, the better the Trout will take it: they are to be kept in an earthen pot among moſs, which is to be ſhifted once in three or four days, or oftener, if the weather be very hot.

To take the Trout with a ground-bait, the angler ſhould have a light taper rod, with a tender hazel top; and may angle with a ſingle hair of three links, the one tied to the other, for the bottom of the line; and a line of three-haired links for the upper part: with this ſort of tackle, if the ſportſman have room enough, he will take the largeſt Trout in the river. Some fiſh with three-haired links at the bottom of the line, but there is very little ſport to be expected this way, for the Trout is very ſuſpicious, and very quick-ſighted. The angler muſt always keep out of ſight, and the point of the rod muſt be down the ſtream. The ſeaſon for fiſhing for the Trout with a ground-bait begins in March, and the mornings and evenings in general are the beſt times; but, if the weather be cloudy, the ſport may be followed all day long: there muſt be a plummet at ten inches from the hook, which the angler muſt feel always touching the ground, and this muſt be heavier, the ſwifter the ſtream is. The common worm is a good bait.

The minnow is a very good bait for the Trout, and with this the tackle need not be ſo ſlight, for the Trout will make at this bait with leſs conſideration, and ſeize it as ſoon as it comes in ſight; the upper part of the line with this bait may be of three ſilks and three hairs for the upper part, and two ſilks and two hairs for the lower; and the hook may be moderately large. The whiteſt minnows and thoſe of the middle ſize are the beſt bait for the Trout, and they ſhould be ſo fixed on the hook, as to turn round when they are drawn up againſt the ſtream.

The beſt way of baiting this fiſh is to put the hook in at the mouth and out at the gills, then drawing it through about three inches, to put it again in its mouth, and let the point and beard come out at the tail, and then to tie the hook and his tail with a fine white thread, letting the body of the minnow be almoſt ſtraight down to the hook; by this means it will turn, as it is pulled againſt the ſtream; and, the more and quicker it turns, the better: for want of a minnow, a ſmall loach or a ſtickleback will ſerve.

The moſt agreeable manner of fiſhing for Trout is, however, with the fly, when the ſportſman has found the true method of doing it; the rod in this caſe muſt be light and pliable, and the line long and fine; if one hair be ſtrong enough, as it may be made, by proper ſkill in the angler, there will be more fiſh caught, than where a thicker line is uſed; and the fly-fiſher ſhould have the wind at his back, and the ſun before him.

TRU'MPET-*flower*, *bignonia*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is compoſed of only one leaf, of a tubular form, wide open at the mouth, and ſeeming as if bilabiated: from the flower-cup ariſes a piſtil, which is fixed in the manner of a nail to the hinder part of the flower; this afterwards becomes a fruit or pod, divided into two cells by a longitudinal membrane, and containing flatted and uſually alated ſeeds.

TRU'MPET-*ſhell*, *buccinum*. See the article BUCCINUM.

TRU'MPETER, in zoology, a name given in England, to a particular ſpecies of pigeon, called by Moore the columba tibicen.

This ſpecies is of the middle ſize of the common pigeon, and made conſiderably like it; but it is pearly-eyed; is of a mottled black, and is feathered down to the legs and feet, and is turn-crowned like the nun, and ſome of the other ſpecies; ſometimes like the finnikin, but much larger: this ſeems to be the beſt ſort, as being the moſt melodious. The beſt character, to know them by, is a tuft of feathers growing at the root of the beak; and, the larger this tuft is, the more they are eſteemed. The reaſon of their name is, that they imitate in their cooing the ſound of the trumpet; but, to be often entertained with their melody, it is neceſſary to feed them frequently with hemp-ſeed. *Moore's Columbarium.*

TSIN, in natural hiſtory, the name given by the Chineſe to a ſtone which they make great uſe of in their manufacture of porcelain ware. It is of a deep blue colour, much reſembling Roman vitriol in appearance, and is found in lead mines, and ſuppoſed to contain ſome particles of lead; its effects being the ſame in the porcelain manufacture as thoſe of ceruſs or white lead, in making the other colours penetrate into the ſubſtance of the veſſels. The deep violet colour that we ſee ſo beautiful on the China ware, is uſually made with this ſtone. They find it about Canton and Peking; but the latter place affords the beſt, and it ſells at greatly the beſt price. The painters in enamel melt this ſtone in their way, and uſe it very much; they form many beautiful works by laying it upon ſilver; but it is apt to come off in time.

When the Tſin is uſed in the porcelain manufacture, it it only uſed to the vaſes that paſs a ſecond baking, and are intended as the beſt kinds.

The Tſin is prepared by only beating it to powder, not roaſting it in the common way. They mix the powder with large quantities of water; and, ſtirring it together, they let it ſubſide a little to ſeparate any earthy or extraneous matter that might be among it. They then let the powder ſubſide. The water which is thrown away has no colour from this matter; and the powder itſelf is not of that fine blue it was in the lump, but of a pale aſh-colour; but this recovers all its beauty, when it is laid on the China and baked.

The ſettlement taken from the water is dried and preſerved in powder, and, when it is to be uſed, they only mix it up with gum-water, or a ſolution of glue, and lay it on with a pencil. *Obſervations ſur les Coutumes de l'Aſie.*

TU'BBER, or Tubble, in mining, a name given in Cornwall to that mining inſtrument, which is in other parts of England called a beele.

It is an iron inſtrument, pointed at each end, and having a hole in the middle for the handle.

TU'BEROUS, or Tuberose *roots*, among the botaniſts, ſuch as are large and fleſhy, thicker than the ſtalk of the plant, of an irregular figure, and wanting the characters of the bulbous.

TU'BERA, *truffles*, in botany, the name of a genus of plants, the characters of which are theſe: they are of a fungous fleſhy ſtructure, and are of a roundiſh figure, growing ſometimes ſingle, ſometimes many together, and always remaining under ground. See TRUFFLE in the Dictionary.

TU'BULATED *Flower*, *tubulatus floſculus*, in botany, a term uſed by authors to expreſs thoſe ſmaller flowers, a great number of which go to compoſe one large compound flower. Theſe are called Tubulated in diſtinction from another kind of them, which are, from their ſhape, called ligulated. The Tubulated floſcules generally compoſe the diſk, and the ligulated ones the radius of the compound flowers. The Tubulated ones are formed into a hollow cylinder, which expands into a mouth at the top, and is divided into five equal ſegments, which ſtand expanded, and in ſome meaſure bent backwards.

TU'BULUS *marinus*, or *canalis*, in natural hiſtory, the name of a genus of univalve ſhell-fiſh, the characters of which are theſe: it is of an oblong figure, terminating in a point, and hollow within; ſo that it reſembles a tube of horn. They are alſo called by the older writers dentalia, for their reſembling the tooth of a dog.

TUCK *of a ſhip*, the truſſing or gathering up the quarter under water; which, if ſhe lie deep, makes her have a broad, or, as they call it, fat quarter, and hinders her ſteering, by keeping the water from paſſing ſwiftly to her rudder; and, if this truſſing lie too high above the water, ſhe will want bearing for her works, unleſs her quarter be very well laid out.

TU'GUS, in botany, the name of a ſweet aromatic plant, much eſteemed in the eaſtern parts of the world, and ſuppoſed by father Camelli, who very ſtrictly compared it with the accounts given by Dioſcorides and the antients of their amomum, to be that very plant. The cluſtered manner of growing of the fruit, together with its oblong ſhape, and the aromatic taſte of the ſeeds, ſeem greatly to countenance this opinion.

TU'LIP, *tulipa*, in botany, a large genus of plants, the characters of which are theſe: the flower is of the liliaceous kind, and is compoſed of ſix leaves, and ſomewhat of the form of a pitcher; the piſtil occupies the center of the flower, and finally becomes an oblong fruit divided into three cells, which contain flat ſeeds, arranged in a double order; the root is tunicated, and the fibres grow from its bottom. The characters of a good Tulip are theſe: 1. It muſt have a tall and ſtrong ſtem. 2. The flower ſhould conſiſt of ſix leaves, three within and three without; and the former ſhould be larger than the latter. 3. The bottom of the flower ſhould be proportioned to the top, and the ends of the leaves ſhould be rounded, not pointed. 4. The leaves, when opened, ſhould neither turn inward, nor bend outward, but ſtand erect; and the whole flower ſhould be of a middling ſize, neither too large nor too ſmall. 5. The ſtripes muſt be ſmall and regular, and ſhould all ariſe from the bottom of the flower: the chives alſo ſhould not be yellow, but of a brown colour.

Tulips are generally divided into three claſſes, according to their times of flowering; the early, the middling, and the late.

The early ones are not near ſo high as the late, but they are valued for their earlineſs, as they flower in February.

The roots of theſe are to be planted in the beginning of September, under a warm pale or hedge. The proper ſoil for them is paſture land with the turf rotted among it, and a mixture of one-fourth part ſand; this ſhould be laid about ten inches deep, and ſhould be renewed every year. If the weather is very ſevere when they firſt appear, they ſhould be covered with mats; as alſo at nights, when they are in flower, if it be very froſty. When their flowering is over, and their leaves decay, the roots ſhould be taken up, and laid in a dry place; and afterwards cleaned and laid up in a ſafe place from vermin, till the September following.

The late blowers are propagated from what they call breeders; which are plain flowers, brought over principally from Flanders, which is the great mart for flower-roots; and theſe, by culture, are changed into ſtriped and variegated ones. They are alſo propagated by ſowing the ſeeds; but this requires great care, as in the raiſing all the other fine flowers from their ſeeds.

The ſeeds muſt be ſaved from the choiceſt flowers, and ſowed in ſhallow pans or boxes of earth, in September. The ſpring following they appear like the leaves of graſs or young onions; and after ſtanding two or three months thoſe decay. The boxes are to be kept clear of weeds, and removed to different ſituations where they may enjoy the morning ſun, and be defended from ſharp winds and froſts; at the Michaelmas of the following year they are to be removed out of the boxes into beds, where they ſhould be planted two inches deep, and at two inches diameter from one another. In October, an inch depth of new earth ſhould be ſifted on them, and they are to remain two years in theſe beds; at the end of this time they will flower, and the beſt of them muſt be marked with ſticks, that their roots may be diſtinguiſhed, when the leaves are decayed.

But there is no judgment to be paſſed either on Tulips, or any other flowers, on their firſt flowering; becauſe, the next year, the good ones are often found to have degenerated, and the bad to have improved: after this, however, they may be concluded good or bad.

The breeders, as they are called, being thus raiſed, are to be ſhifted every year into freſh earth, and they will in time break out into very fine ſtripes. The earth they are planted in ſhould be every year of a different kind, and the beſt general ſoil is made of a third part paſture land with the graſs rotted in it, a third part of fine ſea-ſand, and a third part of lime-rubbiſh; theſe ſhould be mixed half a year before they are uſed, and often turned. The beds muſt be laid eighteen inches deep with this earth. This ſhould be laid in firſt ten inches thick, and on this the roots ſhould be placed in regular order and at even diſtances; and then the other eight inches ſhould be laid over theſe, the top of the bed being a little rounded to throw off the wet. Thus they are to remain till the buds appear, and then, if the nights are very ſevere, they are to be ſheltered by covering them with mats. The flowers which break out into fine ſtripes here, ſhould be ſeparated afterwards from the reſt, and if they hold on their beauty to the laſt, which the floriſts call dying well, they will never return to plain flowers again; and the off-ſets from the roots of theſe will always produce ſuch flowers, and often more beautiful than thoſe of the parent-root.

When the Tulips have flowered, their heads ſhould be broken off to prevent their ſeeding, which would make them flower much the worſe the next year. *Miller's Gard. Dict.*

Tulip-*tree*, a very beautiful American tree, which produces flowers, ſuppoſed like thoſe of the Tulip. Theſe trees uſed to be kept in tubs, and houſed in winter with great care; but, ſome of them having been planted out in the open air at Lord Peterborough's at Fulham, they throve much better than thoſe which were ſo carefully nurſed up, and ſoon produced abundance of flowers.

The tree is commonly found wild in all the northern parts of America, where its timber is of very great uſe. The flowers are not in reality much like thoſe of the Tulip, though vulgarly ſaid to be ſo. The flowers are ſucceeded by canes, which are often ſent over from America; and the trees are frequently raiſed, with us, from the ſeeds contained in them.

The ſeeds muſt be taken out of the canes in the ſpring, and ſown in pots of light earth, which muſt be placed in a bark bed, and covered with mats, and frequently refreſhed with a little water. When the young plants appear, they ſhould be placed, during ſummer, in a ſhady ſituation; and in winter they ſhould be put into a frame, where they may have the benefit of the open air, in mild weather, and be ſheltered from the ſeverity of froſts. In the ſpring following, the plants ſhould be tranſplanted into ſmall pots, and taken the ſame care of for four years, as while they were in the ſeed-pots; after this they will be ſtrong enough to tranſplant finally into the places where they are to remain: it ſhould be planted on a light loamy ſoil, near other trees, but not overſhaded by them. Some raiſe them from layers, but they are two or three years before they take good root, and then never make ſuch ſtraight and regular trees. *Miller's Gard. Dict.*

TU'MBLER, a name given to a particular ſpecies of pigeon, called by Moore the columba revolvens.

It has its name from its peculiar property of tumbling, when it is in the air, which they are very fond of doing; and effect, exactly in the ſame manner as our poſture-maſters do it, by throwing themſelves over backwards. It is a very ſmall pigeon, on, and is always ſhort-bodied, full-breaſted, thin-necked, narrow-beaked, and has a ſmall ſhort head; the iris of the eye, in this ſpecies, is uſually of a bright pearl-colour.

The Engliſh Tumbler is uſually of one plain colour; black, blue, or white: the Dutch is much of the ſame make, but has different colours, and is feathered on the legs ſometimes; it has alſo a larger head, and thin ſkin round the eye. Some of the fineſt pigeons of this ſort are bred from a mixture of the Dutch and Engliſh kinds. Theſe pigeons are remarkable for the height they fly to; they never ramble far from home, but will riſe almoſt perpendicularly, till they appear no larger than a ſparrow, or become quite out of ſight; they will often keep at this height five or ſix hours, and then come gradually down again: they will never tumble when they are at any great height, but only as they aſcend or come down again. There are particular times alſo, at which thoſe birds will take much higher flights than at others; but they ought to be kept by themſelves, and practiſed to it by the company of one of their own ſpecies; for if they mix, while young, with other pigeons, they will learn to fly as they do: a flight of a dozen of theſe birds ſent out together will keep ſo cloſe as to be all in a compaſs that might be covered with a handcherchief; but they ſhould never be turned out in foggy weather, or in high winds; in the firſt caſe they loſe ſight of their home, and perhaps never find it again, and, in the others, they are blown away; and, if they return, it is not till another day: in the mean time, lying out, they are in danger of cats, and other accidents.

Laſtly, the hen ſhould never be turned out with egg, for ſhe is then ſick, and not fit for flying; and, beſides, often drops her egg, and the breed is loſt by it. *Moore's Columbarium.*

TU'NICATED *Roots*, among botaniſts, ſuch as are formed of a multitude of coats ſurrounding one another.

TU'NNY, a name given by us to the Spaniſh mackarel, a larger fiſh of the ſcomber kind, called by authors thynnus and arcynus, by Salvian limoſa, and pelamys by Ariſtotle, Ælian, and the other old writers.

It is properly a ſpecies of the ſcomber, and is expreſſively named by Artedi the ſcomber with eight or nine fins in the hinder part of the back, riſing out of a furrow; and a furrow at the place of the belly-fins.

TU'RBAN-*ſhell, cidaris*, in natural hiſtory, the name of a genus of the echinodermata, which are of the hemiſpheric or ſpheroidal figure, and have their name from the Latin, cidaris, a Perſian Turban, as in ſome degree reſembling that head-dreſs.

TURBINI'TÆ, foſſil ſhells of the turbo kind, or ſtones found in thoſe ſhells. Among the people who have objected to the ſhells found buried in the earth being the remains of real animals, it has been alledged by ſome, that theſe, in particular, are always of a blackiſh or aſh-colour, when found in chalk of clay, and white from the rocks, or when they have been bedded in ſtone.

TU'RBIT *pigeon*, a particular ſpecies of pigeon remarkable for its ſhort bill, and called by the Dutch cort-bek, that is, ſhort-beak. Moore calls it, in Latin, columba fimbricata: and its Engliſh name ſeems no other than a bad pronunciation of its Dutch one. It is a ſmall and ſhort-bodied pigeon, and has a beak no longer than that of a partridge; the ſhorter this is, the more the pigeon is eſteemed: it has a ſhort round head, and the feathers upon the breaſt open and reflect both ways, ſtanding out like the frill of the boſom of a ſhirt. This is called by many the purle, and, the more the bird has it, the more it is eſteemed. The tail and back are generally of one colour, as blue, black, red, yellow, or dun, and ſometimes chequered. The flight feathers, and thoſe of all the reſt of the body, are white. They are a light nimble pigeon, and, if trained to it, will take very high flights in the manner of the tumblers. *Moore's Columbarium.*

TU'RBO, *the ſcrew-ſhell*, in natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe: they are univalve ſhells, with a long, wide, and depreſſed mouth, in ſome ſpecies approaching to a round ſhape, and in ſome having teeth, in others not. They all grow narrow towards the baſe, and are auriculated, and terminate in a very long and ſharp point.

TU'RBUT, in ichthyology, a name given by us to the fiſh called by authors the hippogloſſus, paſſer major, and paſſer Britannicus.

According to the new ſyſtem of Artedi, this is a ſpecies of the pleuronectes, and it is diſtinguiſhed by him by the name of the wholly ſmooth pleuronectes with the eyes on the right ſide.

TU'RNING (*Dict.*)—The lathe, or principal inſtrument uſed in turning, is compoſed of two wooden cheeks, or ſides parallel to the horizon, having a groove, or opening between them; perpendicular to theſe are two pieces, called heads or puppets, made to ſlide between the cheeks, and to be fixed down at any point at pleaſure: theſe have two points or center pins, between which the piece to be turned is faſtened by the help of a ſcrew. There is alſo a ſquare piece of wood called a reſt, which bears up the tool, and keeps it ſteady. The piece is turned round backwards and forwards, by means of a ſtring put round it, and faſtened above to the end of a pliable pole, and below to a treddle or board moved by the foot. This is the common lathe; but there is another uſed in hollow Turning, &c. very different from it.

This lathe is compoſed like the other of two cheeks, and has alſo two heads fitted to ſlide between them; but has no pole, being turned by means of a wheel and a pulley. The pulley is faſtened on a kind of ſpindle called a mandrel, one end of which is pointed, and received into the center of the back-ſcrew, which goes through one of the heads; and near the other end called the verge it moves in a piece called the collar; the end of the mandrel paſſes through the collar, and on it the piece to be turned is faſtened. Theſe deſcriptions will be rendered abundantly more eaſy from the two perſpective views on *Plate* LIV, which repreſent both theſe kinds of lathes in ſo conſpicuous a manner, that a full idea of both may be eaſily attained.

Fig. 1. is the lathe uſed by hollow turners, &c.

1. The lathe. 2. The groove. 3, 3. The heads or puppets. 4. The pulley. 5. The mandrel. 6. The collar. 7. The back-ſcrew. 8. The reſt. 9. The wheel. 10. The crank. 11. The treddle.

There are ſeveral kinds of mandrels, adapted to the different kinds of work; as

Flat mandrels which have three or more little pegs or points, near the verge, and are uſed for turning flat pieces on.

Pin mandrels, which have long wooden ſhanks, to fit into round holes in the work to be done.

Hollow mandrels, which are hollow of themſelves, and uſed for Turning hollow work.

Screw mandrels, which are uſed in Turning ſcrews.

There are a great variety of other inſtruments uſed in Turning, as chiſſels and gouges of different kinds, perſpective views of moſt of which are repreſented in the figure. Thus, 12. Is a tool called a holdfaſt. 13. A point tool. 14. A broad chiſſel called a firmer.

Fig. 2. is a perſpective view of the common lathe.

1. The lathe. 2, 2. The heads or puppets. 3. The pole. 4. The treddle. 5, 5. ſcrews which fix the reſt at a proper height. 6, 6. The reſt. 7. The back-ſcrew.

The workman ſtands, or is ſeated in his lathe, having one of his feet on the treddle to give the motion, which muſt be very moderate and equal; he places his tool on the reſt, and approaches the edge of it gently to the piece, performing his work gradually, without leaving any ridges; and, when he meets with a knot, he muſt go on ſtill more gently, otherwiſe he would be in danger both of ſplitting his work, and breaking the edge of his tool.

The two perſpective views on the plate will give a better idea of the nature of Turning, than is poſſible to be conveyed by words. The firſt figure ſhews the nature of hollow Turning, and the ſecond that for common work.

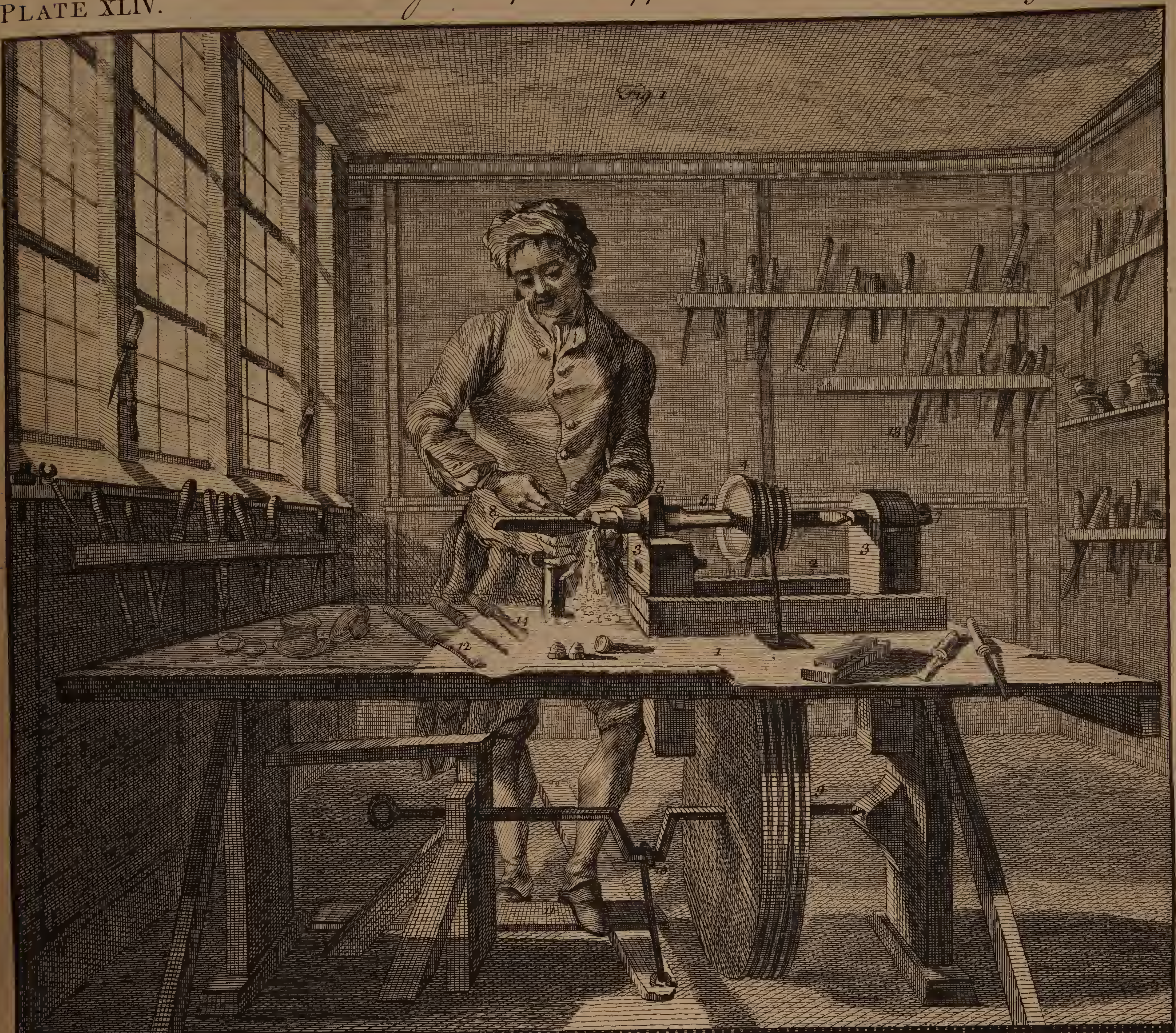
TU'RNSOL, a plant of conſiderable uſe by the colour prepared from it, and known under its name. The root of theſe plants is long and white; the leaves reſemble in ſhape thoſe of the xanthium, or leſſer bur-dock; they grow on long pedicles, and are of a whitiſh or aſh-coloured green. The flowers form a ſort of cluſter, and grow out of the alæ of the leaves; they are of two kinds on the ſame plant, barren and fruitful, or, as botaniſts expreſs it, male and female.

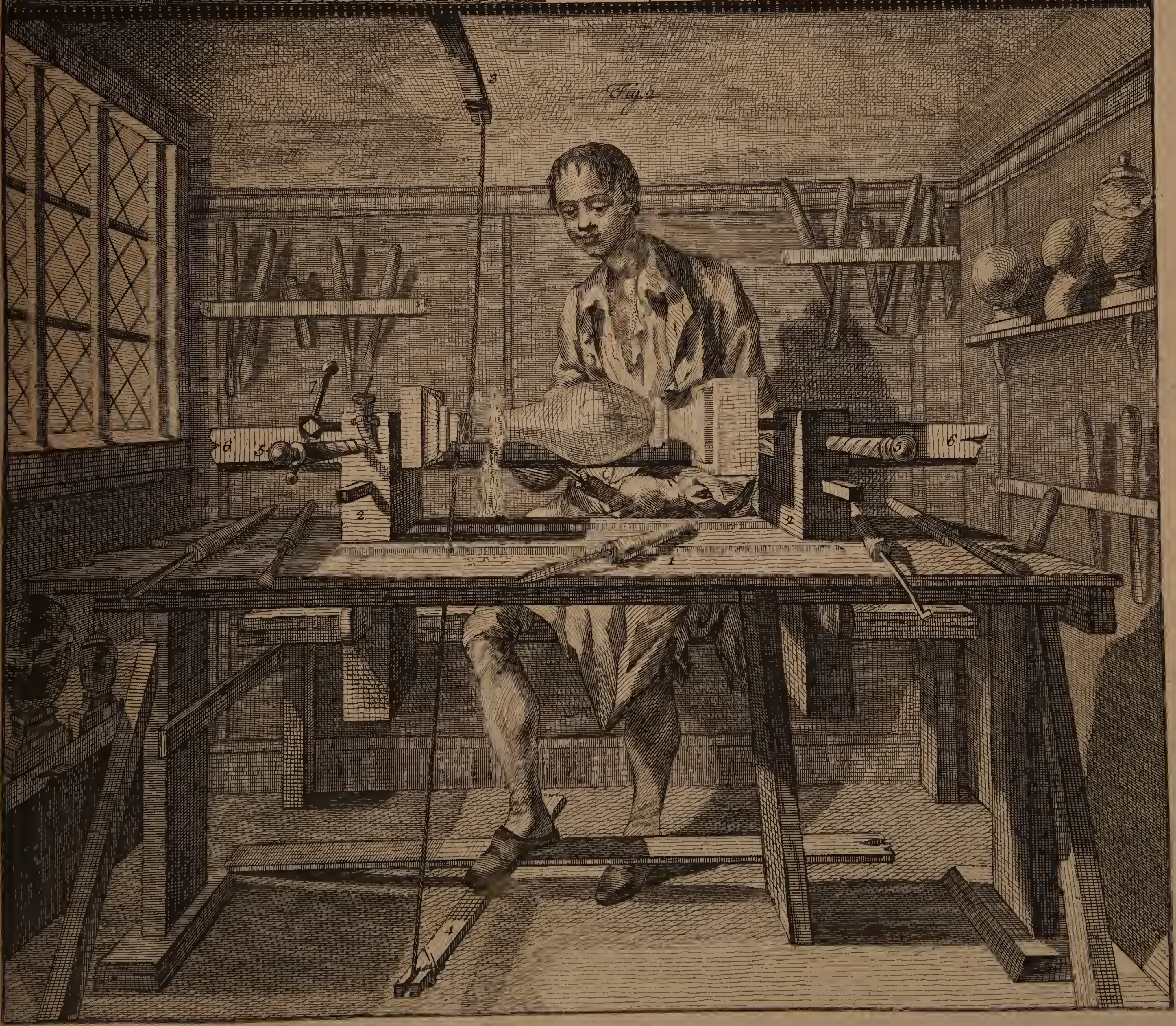
The barren, or male flowers, occupy the top of every cluſter, and are placed each in a cup, divided into five ſegments, and themſelves conſiſt each of five ſmall yellowiſh leaves with a bundle of ſtamina in the middle. The female, or fruitful flowers, are placed at the bottom of the cluſter, and are ſurrounded each by a cup, divided into ten ſegments; they are compoſed of five ſtamina, which ſurround a piſtil which is furniſhed with three forked filaments. This piſtil, which is fixed in the bottom of the cup, finally becomes a round fruit, of a rough ſurface, and green colour, its protuberances only appearing a little whitiſh. This fruit is divided into three cells, and each of theſe contains one round ſeed. The whole fruit is attached to the cup by a very long pedicle, ſo that when the flowers are withered, and it has arrived at its maturity, it is found hanging from the alæ of the leaves, and ſeems to have been produced without any flower; and this is what has led ſome writers into the error of imagining that the flowers and fruit of this plant grow on different ſtalks. Some have tranſlated Turnſol by the Engliſh word ſun-flower, which has led many to ſuppoſe, that the great yellow ſun-flower which we keep in gardens, was the plant that afforded the Turnſol colour: but this is a miſtake; and it is to be obſerved, that the true Turnſol plant here deſcribed is very common in the fields of France and Germany, but does not grow wild with us in England.

The juice of the berries of the Turnſol, rubbed upon paper or cloth, at the firſt appears of a freſh lively green, but preſently changes into a kind of bluiſh purple. The ſame cloth, afterwards wet in water, and wrung out, will turn the water into a claret-colour: and it is to be obſerved, that theſe are the rags of cloth uſually called Turnſol in the druggiſts ſhops. *Boyle's Works.*

TU'RNSTONE, in zoology, the Engliſh name of a bird called

PLATE XLIV. *Engraved for the Supplement.* *Facing* Turning.





Printed for J. Hinton in Newgate Street.

called by authors the morinellus marinus, or ſea-dotterel. It is a little larger than the blackbird; its head moderately thick, and its body of a longiſh ſhape; its beak a finger's breadth long, thick at the baſe, and ſharp at the point; and its head, neck, ſhoulders, wings, and the upper part of its breaſt, are of a browniſh colour; its throat and belly are ſnow-white: the middle of its back has a very large white blotch, and its rump is variegated by a broad tranſverſe ſtreak of black; its legs are ſhort, and of a reddiſh yellow or orange colour. *Ray's Ornithol.*

TU'RTUR, *the turtle-dove*, in zoology, a very beautiful little bird of the pigeon kind. The head, neck, and back, are of the bluiſh grey colour of the common pigeon, with ſome mixture of a reddiſh brown near the rump, and at the bottom of the neck. Its breaſt and belly are white; but its throat of a fine bright purple; and the ſides of the neck are variegated with a ſort of ringlet of beautiful white feathers, with black baſes.

It feeds on hempſeed, and other vegetable matters. *Willughby's Hiſt. Avium.*

TURTUR, *the turtle-ſhell*, in natural hiſtory, the name given by the collectors of ſhells to a very beautiful ſpecies of murex, common in the cabinets, but not found any where on the ſhores. This is owing to its having greatly altered its appearance in the poliſhing; for it is no other than the white and brown mouthed murex, which is common in its rough ſtate, with its outer coat taken off. See the article MUREX.

TUSSILA'GO, *colts-foot*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind. The diſk is compoſed of floſcules, and the outer circles of ſemi-floſcules; theſe ſtand upon the embryo ſeeds, and are all contained in a ſcaly cup. Theſe embryo's finally become ſeeds winged with down, and adhering to the thalamus of the flower. To this is to be added, that the flowers appear before the leaves. *Tourn. Inſt.*

The common colts-foot ſtands generally recommended as a very great medicine in coughs, and all diſorders of the breaſt and lungs. It is alſo ſometimes uſed externally in inflammations.

TU'TTI, in the Italian muſic, is uſed to ſignify that all the parts are to play together, or to make a full concert.

In this ſenſe Tutti ſtands oppoſed to ſoli or ſolo; which ſignifies one part playing alone.

V.

VA'NNING-*Shovel*, among miners, an inſtrument uſed for waſhing the ores of any metal, after being reduced to powder, thereby to diſcover the richneſs and other qualities of the ore. See the article SHOAD.

VA'POUR (*Dict.*) — *Fiery* VAPOURS, *halitus ignei*, a term uſed by ſome to expreſs thoſe exhalations from the earth, which either take fire of themſelves on the burſting forth into the air, or are readily inflammable on the bringing a candle to them. Many of the ſuppoſed burning lakes are owing to theſe fumes burſting up through the water, and not to any quality of the water itſelf. Our famous burning well at Wigan, in Lancaſhire, is of this kind. The common people affirm, that the water of this ſpring burns like oil; but there is nothing of truth in this. There thruſts up a vapour through the earth in this place, which keeps the water bubbling, as if boiling over the fire, though it is not warm; and the ſtream of this breath may be felt iſſuing up in theſe places like a ſtrong wind. This breath alone is inflammable, and takes fire at the approach of a candle, burning with a conſiderable violence for ſome time.

There are coal-pits in the neighbourhood, and the air is certainly of the ſame kind with that inflammable vapour, often met with in thoſe places, and which may alſo be prepared from iron diſſolved in a proper menſtruum. The water itſelf, taken from the place, does not burn; and, if the bottom be made dry, the vapour which aſcends from it will burn as ſtrongly as if the water were there. The flame is not diſcoloured like that of ſulphureous bodies, nor has it any bad ſcent; and the fumes, as they are felt burſting out of the earth, by the hand held over the place, are not hot. *Phil. Tranſ.* N°. 20.

VARI'ETIES, in natural hiſtory, a word uſed to expreſs an accidental change in ſome body which is not eſſential to it, and therefore does not conſtitute a different ſpecies.

The naturaliſts of former ages have run into great errors, in miſtaking the accidental varieties of plants, animals, and minerals for diſtinct ſpecies. Many of them have called a plant a new ſpecies, becauſe its flower, which ſhould have been blue or red, is white on account of the poorneſs of the ſoil, or ſome other ſuch reaſon. Mr. Ray has eſtabliſhed a very good teſt for Varieties in botany; he allows every thing to be a diſtinct plant which will propagate itſelf in its own form by its ſeeds, but ſuch, as when ſown, loſe their difference, and run back to the old ſtandard, he accounts Varieties, however great their diſtinctions may appear. In the hiſtory of fiſhes as much confuſion has been introduced by miſtaking Varieties for diſtinct ſpecies as in botany. Artedi is the only author who has rationally attempted to bring this part of natural hiſtory into order in this reſpect, and to ſettle regularly the rules by which to diſtinguiſh real and eſſential from accidental differences.

The principal grounds of the error of ſuppoſing Varieties diſtinct ſpecies of fiſh have been theſe: the variable and inconſtant colour of fiſhes has been miſtaken for a ſpecific difference; in this manner Rondeletius has deſcribed many Varieties of the turdi, labri, and other fiſhes, under the names of diſtinct genera.

Others have paid the ſame too great regard to the more conſtant Varieties of colour; which are found only to differ in degree, in the ſeveral individuals of the ſame ſpecies; and their differences to be only in the degrees of the ſame colour, which is much more intenſe in ſome, and more remiſs in others. Theſe differences can only make Varieties of the ſame fiſh, the ſpecies remaining always the ſame. Of the ſame kind are the miſtakes of thoſe who eſteem ſize or magnitude a ſpecific character; and thus, out of the Varieties of the ſame fiſh, occaſioned by ſcarcity or plenty of food, or other ſuch occaſions, make larger or ſmaller ſpecies. The place where fiſh are caught, is alſo another occaſion of making new ſpecies, with this ſort of authors; thus though the perca fluviatilis of Bellonius, and the perca marina of other authors, be the ſame fiſh, yet they are pretended to be different ſpecies. The time of ſpawning is alſo with ſome made a diſtinction of ſpecies; and thus we find the common pike divided into three ſpecies, according to its ſpawning in ſpring, ſummer, and autumn, which it does according to the heat or coldneſs of the climate.

All theſe differences are falſe and frivolous, and the utmoſt they can do, is to make what are properly called Varieties, though few of them are ſufficient even for that. A ſalmon, caught at ſea, is not different from one of the ſame brood caught in a river: and if the perca marina, falſly ſo called, be a little different from the perca fluviatilis, yet, if its ſpawn will produce regular percæ fluviatiles, its difference can only amount to a variety, not a diſtinct ſpecies.

The trifling nature of diſtinction by colour is ſeen by the Varieties we daily ſee in the colours of ſome of our moſt common fiſh; as the tench, the eel, the ſalmon, and ſome others, which vary more or leſs, from every change of the water; all the other diſtinctions, of ſize and place, are as frivolous; and the giant and the dwarf, the black and the white man, the Aſiatic and the European, may as well be called diſtinct ſpecies of men, as theſe of fiſhes.

Finally, the time of ſpawning is no eſſential difference; for we daily ſee the change of climate make changes of that kind in all creatures; and even in the ſame climate, and under the ſame circumſtances, the ſame ſpecies of birds will afford ſome individuals much earlier, or later, in laying their eggs than others.

China-VA'RNISH. The China Varniſhes have been always famous; the manner of making which is ſaid to be as follows: take crude Varniſh ſixty ounces, common water the ſame quantity, mix them well together till the water diſappears; afterwards put this into a wooden veſſel five or ſix palms long, and two or three broad; mix them together with a wooden ſpatula, for a whole day in the ſummer's ſun, for two days if in winter, and afterwards keep it in an earthen veſſel covered with a bladder. The water will not unmix itſelf again: this is called the ſun-Varniſh. The oil of wood, called by the Portugueſe azeile de Pao, is made in the following manner: take twenty ounces of that oil, which they call oil of wood, and ten drachms of the oil of the fruit; boil theſe a little together, and the oil will look yellow; then let it cool, and add to it five drachms of quick-lime powdered. To make the firſt grounds called camiſeca, take ſwine's blood and quick-lime powdered, of each an equal quantity; ſpread this mixture upon the wood, and, when it is dry, ſmooth it with pumice-ſtones.

To make the black Varniſh, take of the Varniſh prepared in the ſun ſixty ounces; ſtone black alum (ſuppoſed to be a ſort of copperas) diſſolved in a little water, three drachms; and ſeventy drachms of lamp-oil, called, by the Portugueſe, azeile de Candea. Theſe things are all to be mixed together in a wooden veſſel, putting the lamp-oil in at twice, and ſtirring the whole together with a wooden ſpatula.

The pitch-coloured Varniſh is made in the following manner: take oil of wood, crude, forty drachms, called de Pao; of the lamp oil, called de Candea, crude, forty drachms; mix them together in the ſun in a wooden veſſel, in the ſame manner as the common Varniſh, and water are ordered to be mixed in the firſt proceſs.

To make the red Varniſh, take ten drachms of cinnabar, twenty drachms of prepared Varniſh, and a little lamp oil; mix them all together; and,

To make a Varniſh of a muſk colour, take of the red Varniſh ten drachms, and of the black Varniſh four drachms; mix them all together. *Philoſ. Tranſ.* N°. 261.

Theſe are the accounts ſent to the great duke of Tuſcany, by the jeſuits in China. Dr. William Sherard communicated them to the Royal Society; and to render the accounts uſeful to the world, he preſented with them the ſeveral ſubſtances mentioned; theſe are depoſited in the Muſæum of the ſociety, and may ſerve as inſtructions to all who are curious in this art.

VARNISH *for porcelain.* The Chineſe have of late years diſcovered a new kind of Varniſh for their ware: they call this tſekinycou, that is to ſay, the browniſh gold Varniſh; it is of the colour of the brown images, or of what we call coffee colour. The novelty of this has made it much eſteemed: it is made in the manner of all their other Varniſhes, by diſſolving the finer part of an earthy ſubſtance in water. The ſubſtance which they make it of is a common yellow earth; this they diſſolve in water, and, letting the coarſe parts ſettle, they pour off the yet thick liquor, and what afterwards ſubſides from this, is the pure and fine part, which they keep in form of a ſoft paſte, or thick cream. They uſe this only to the thinneſt and moſt delicate porcelain ware.

The manner of uſing it is this: they mix a quantity of this fine ſediment with ſo much water as renders it thin and liquid, like to the common Varniſh; this and the common kind are to be uſed together, ſo that care muſt be taken that they are nicely of the ſame degree of thickneſs; this the workmen try by dipping a petunſe or brick of their earth into both, and ſeeing which comes out moſt covered; that which lies on the thickeſt, is to be diluted with more water, or the other to be heightened with more of the earth, to bring them to the ſame ſtandard. They are both judged to be ſufficiently liquid, when they enter the pores of the petunſe. They then mix ſome of the oil of fern aſhes and lime (ſee the article FERN-*oil)* along with the brown Varniſh, and add as much of this mixture to the common Varniſh as they find upon trial will give ſuch a colour as is required. The common proportion for the brown colour, moſt eſteemed at preſent, is two pints of the brown Varniſh to eight pints of the common; and to four pints of this mixture they add one pint of the Varniſh or oil of fern. It might puzzle a ſtranger to their terms to underſtand what theſe people meant by oil; but it is a word with them in uſe for any thing liquid; and they call all their Varniſhes ſo, though made of the powders of earths and ſtones mixed with water. They apply this Varniſh to the veſſels by dipping them into it, and ſo completely covering them inſide and out before they put them into the oven; and the baking gives a great brightneſs to the colour. This is the niceſt part of the whole manufactory of the porcelain, and other wares of that kind. The Varniſhes uſed by the Chineſe are two; the one they call the oil of ſtones, the other, oil of Fern; which ſee. They mix theſe together, and with great caution and delicacy, for it requires an experienced artiſt, apply them to the veſſels all over equally, with a ſteady hand and a fine pencil.

When the porcelain is very thin and fine, they give it two beds of the Varniſh, the one over the other, when dry; theſe are to be very thin, and they anſwer to the ſingle covering of Varniſh given to the common good China, that is thick and ſtrong. They give theſe coats by dipping, and uſe the foot of the veſſel to hold it by; after this they hollow the foot, and paint the circle that we ſee round it, or mark it with ſome Chineſe character.

The Varniſh they lay on is ſo thick, that it often hides the colours, till the baking afterwards brings them out again: this is the caſe with the fine deep blues; we ſee none on the beſt China, it is all hid under the coat of white, and the veſſel appears plain, till it has paſſed through the fire again; but then the colour appears deeper than when at firſt laid on. *Obſerv. ſur les Coutum. de l'Aſie.*

VAU'NING, in minerology, a term uſed by our miners to expreſs a coarſe and expeditious way of waſhing ores, for the examination of their nature and richneſs.

This inſtrument, called the vaun, is a long and moderately deep wooden ſhovel; into this they put the earthy or ſtony matter, which they ſuſpect to contain the metal in powder; they then add water many times, and, ſhaking and ſtirring it thoroughly about, they throw out the water, and add freſh, till at laſt the matter is ſeparated; the earthy part is waſhed away, and the ſtony and mineral matter only remain, the one at the hinder part, the other at the point of the ſhovel. This laſt is collected ſeparate; and, on being examined either by the eye or teſt, they are able to judge very nearly of the general profit of the mine.

This method is often uſed with the ſtones and earths found in the ſhoads, or trains of mines. *Phil. Tranſ.* N°. 69.

VEGETA'TION (*Dict.*)—The great attention of all who ſtudy botany, is at preſent placed on the diſcovery of new plants; but we are yet unacquainted with many peculiarities in the moſt common ones, which may prove not a leſs worthy employment for our thoughts.

The irregularities in the Vegetation of the ſeveral parts of plants ſeems a ſubject well deſerving our attention; and Mr. Marchand has laid before us an inſtance of this in one of our moſt vulgar plants, the common garden radiſh.

In the month of July, this gentleman obſerved a plant of this ſpecies, which had accidentally fixed itſelf in an open place, and was then full of flowers and pods. Towards the end of one of the branches, he obſerved a kind of tuberoſity of an oblong ſhape, which looked ſomewhat like one of the pods of the plant, but that it was too long, and was very oddly twiſted and contorted; this daily increaſed in ſize, and in a week was come to its full growth, which was, in the whole, about two inches and a half in length, and three quarters of an inch thick. It was of a very rough and knotty ſurface, and, like the reſt of the ſtalk, had ſeveral pedicles of flowers growing on each ſide from it; it terminated in a ſmooth end, divided into three parts, which all turned upwards.

The longeſt of theſe points terminated in a green cartilaginous flower of the ſame ſubſtance with the protuberance which produced it; in this were all the regular parts of the flowers of the more perfect kind; there were four leaves which ſerved for a cup; four more within theſe, which repreſented the petals; ſix other ſmall bodies there ſtood in the middle of the flower, which repreſented the ſtamina; and among theſe another body which repreſented the piſtil; ſo that here was, in this irregular Vegetation, a repreſentation at large of every part of the perfect flower of the radiſh, excepting only the apices; but theſe were all very different, in their nature and ſtructure, from their ſimilar parts in the natural flowers, being all of a hard, thick, and tough cartilaginous ſubſtance, and in colour of a greeniſh brown.

The ſhorteſt of the three points which terminated this tuberoſity, had alſo at its end a reſemblance of a flower compoſed of all the parts mentioned in the former, and of the ſame colour and ſubſtance with it, only differing in being a little ſmaller: and the third point had no regular reſemblance of a flower, but was of the ſame cartilaginous ſubſtance, and of a ſemi-circular figure, and had its upper ſurface ornamented with ſeveral irregular protuberances. This irregular Vegetation remained in vigour till October, when it gradually faded away, and there was no appearance of ſeeds in any part of it.

The radiſh, when its ſtalks are wounded by the pucerons, or other inſects, will often throw out a protuberance of ſome irregular figure; but the reſemblance of flowers, in this, was a ſingularity never before obſerved.

To explain this, it will be neceſſary to obſerve, that every organiſed part of a plant contains in it a number of inviſible ſeminal principles, capable of producing plants like that to which they have owed their origin; and this is a truth of which the ſucceeding inſtances will all bring very familiar and obvious proofs.

The graft of a tree, which, from only one ſingle bud, produces a tree like that from which it was taken, certainly acts upon this principle; for the whole tree is quite different from the ſtock on which it is grafted, which ſerves for no other purpoſe but merely to convey to it a proper nutritive juice from the developing its parts.

We very well know, that there are many roots, which being cut into little ſlices of only a quarter of an inch thick, each of theſe will propagate its ſpecies, and ſend up new plants like that which the root belonged to; and, ſome roots being ſplit longitudinally into four quarters, each of theſe will in the ſame manner grow and flouriſh, and ſhoot out roots from one part, and ſtalks from another, ſo as to furniſh perfect plants the ſame year: and how can this be, but by their having been ſeminal points in all theſe pieces and ſections of roots, which being dilated, and put in action by the humidity of the earth, have grown into perfect plants. Several of the bulbous-rooted plants produce off-ſets from the ſeveral ſcales of their roots, and from the ſides of their ſtalks; theſe in three years time produce perfect plants with their flowers; and what are theſe but ſo many ſeminal points ready upon occaſion to be developed?

Nothing is ſo obvious, as that the ſlips or cutting of trees, when planted in the ground, produce roots in one part, and buds for branches from another, and ſo finally become trees, like thoſe from which they were cut; and this, though the piece that is planted, has no viſible appearance of any bud in any part of it.

We alſo know, from daily experience, that many plants ſhoot out roots from their ſtalks as they grow, and that, though this uſually happens in places where there is ſome ſolid ſubſtance for theſe new roots to faſten themſelves to, yet it happens alſo in ſome plants where there is no ſuch uſe for them; and what are theſe roots in a new part of a plant, but the effect of ſo many ſeminal points, ready to grow, both into roots and into branches, in all thoſe places?

Among the thick and fleſhy-leaved plants, as the opuntia, and other of the ſucculent plants of the Indies, there needs no more to produce a new plant, but to cut off a part of a leaf, and ſtick it into the earth, where it will at once take root, and produce a new plant in a very ſhort time. A thouſand other inſtances of this kind might be given; but theſe may be ſufficient to prove, that there are, in almoſt all parts of plants, certain ſeminal points, which, like the plantula ſeminalis, incloſed in the perfect ſeed of each, need only humidity, and a proper degree of warmth, to develope and unfold themſelves into perfect plants.

We are not therefore to wonder at the imitation of perfection in any irregular productions of vegetables, ſince it appears that there are numbers of perfect plants contained in every part of a growing plant, of the ſame kind. *Mem. Acad. Par.* 1709.

VEIN, among miners, is that ſpace which is bounded with woughs, and contains ore, ſpar, canck, clay, chirt, croil, brown-hen, pitcher-chirt, cur, which the philoſophers call the mother of metals, and ſometimes ſoil of all colours. When it bears ore, it is called a quick vein; when no ore, a dead vein. *Houghton's Compl. Miner, in the Explan. of the Terms.*

The Veins of mines differ greatly from one another in depth, length, and breadth; ſome ſtretch obliquely, from the ſurface toward the central parts of the earth; and theſe the miners call deep Veins; others lie ſhallow and circular, ſo as to encompaſs a large ſpace, and theſe are termed ſpreading Veins; others poſſeſs a great part of the ſpace they lie in, both in length and breadth, and theſe are called accumulated Veins, being no more than a ſpace poſſeſſed by a large group of foſſils of one kind. To give the complete hiſtory of Veins and fibres, which are ſmaller Veins, their differences, their directions, their interſtices, their diſcontinuations, their riſings and fallings, and their goodneſs, would be a large work. Let it be obſerved, however, that theſe things ſeem all to proceed in a certain order, though that order, and the laws and rules of it, are not perfectly underſtood, ſo as to afford ſure directions for practice; whence it ſometimes happens, that, after a Vein has been ſucceſsfully traced for ſome time, it dips, breaks off, or takes a different courſe, leaving the workmen as it were at a fault.

When the Vein is found, a pit is to be ſunk upon it, and a crane fixed at the top of the pit for craning up the ore. Burrows, or adits, are alſo to be cut horizontally through the hill in one or more places, reaching to the mine, and ſerving to wheel out the ore, inſtead of craning it up. *Shaw's Lect.*

VELO'CITY (*Dict.*) — In the doctrine of fluxions it is uſual to conſider the Velocity with which magnitudes flow or are generated. Thus, the Velocity with which a line flows is the ſame as that of the point, which is ſuppoſed to deſcribe or generate the line. The Velocity with which a ſurface flows, is the ſame as the Velocity of a given right line, that, by moving parallel to itſelf, is ſuppoſed to generate a rectangle, always equal to the ſurface. The Velocity with which a ſolid flows, may be meaſured by the Velocity of a given plain ſurface, that, by moving parallel to itſelf, is ſuppoſed to generate an erect priſm, or cylinder, always equal to the ſolid. The Velocity with which an angle flows, is meaſured by the Velocity of a point, ſuppoſed to deſcribe the arc of a given circle which ſubtends the angle, and meaſures it. See *Mac-Laur. Fluxions, B.* I. *ch.* 1.

All theſe Velocities are meaſured at any term of the time of the motion, by the ſpaces which would be deſcribed in a given time, by theſe points, lines, or ſurfaces, with their motions continued uniformly from that term.

The Velocity with which a quantity flows, at any term of the time, while it is ſuppoſed to be generated, is called its fluxion.

VEL'VET (*Dict.*)— *Colour of black* VELVET. The manner of giving this deep and fine colour to glaſs is this: take of cryſtalline and pulverine frit, of each twenty pounds; of calx of lead and tin four pounds; ſet all together in a pot in the furnace, well heated; when the glaſs is formed and pure, take ſteel well calcined and powdered, ſcales of iron that fly off from the ſmith's anvil, of each an equal quantity; powder and mix them well; then put ſix ounces of this powder to the above deſcribed metal while in fuſion; mix the whole thoroughly together, and let all boil ſtrongly together; then let it ſtand in fuſion twelve hours to purify, and after this work it. It will be a moſt elegant Velvet black.

There is another way of doing this, which alſo produces a very fair black. It is this: take an hundred weight of rochetta frit; add to this two pounds of tartar, and ſix pounds of mangameſe, both in fine powder; mix them well, and put them to the metal while in fuſion, at different times, in ſeveral parcels; let it ſtand in fuſion after this for four days, and then work it. *Neri's Art of Glaſs.*

VENE'TA *Bolus*, a fine red earth uſed in painting, and called, in the colour-ſhops, Venetian red.

It is improperly denominated a bole, being a genuine ſpecies of red ochre. It is of a fine bright and not very deep red, approaching, in ſome degree, to the colour of minium, or red lead; and is moderately heavy, and of an even and ſmooth texture, yet very friable, and of a duſty ſurface; it adheres firmly to the tongue, is very ſmooth, and ſoft to the touch; eaſily crumbles to pieces between the fingers, and very much ſtains the ſkin in handling. It has a ſlight aſtringent taſte, and makes no fermentation with acids. It is dug in Carinthia, and ſent from Venice into all parts of the world, being an excellent colour, and very cheap; our colour-men, however, find too many ways of adulterating it. *Hill's Hiſt. of Foſſ.*

VENTILA'TOR (*Dict.*)— The noxious qualities of bad air have been long known, though not ſufficiently attended to in practice; but it is to be hoped, that the indefatigable pains taken by Dr. Hales, to ſet the miſchiefs ariſing from foul air in a juſt light, and the eaſy remedy he has propoſed by the uſe of his Ventilators, will at length prevail over that unaccountable ſloth or obſtinacy, which, where particular intereſts are not immediately concerned, ſeems to poſſeſs the generality of mankind, and which rarely allows them to give due attention to any new diſcovery.

The Ventilator invented by that ingenious author conſiſts of a ſquare box of any ſize; in the middle of one ſide of this box a broad partition, or midriff, is fixed by hinges, and it moves up and down by means of an iron rod, fixed at a proper diſtance from the other end of the midriff, and paſſing through a ſmall hole in the cover of the box. Two boxes of this kind may be employed at once, and the two iron rods may be fixed to a lever moving on a fixed center; ſo that, by the alternate raiſing and preſſing down of the lever, the midriffs are alſo alternately raiſed and depreſſed, whereby theſe double bellows are at the ſame time both drawing in air, and pouring it out through apertures with valves made on the ſame ſide with, and placed both above and below the hinges of the midriffs. For a farther account of this machine we refer to the author himſelf, who gives a full detail of it, and of its manner of working. See *Deſcription of Ventilators, by Stephen Hales, D. D. Lond.* 1743, 8*vo.*

VER-*puceron*, in natural hiſtory, a name given to a kind of inſects which are fond of eating the puceron, and deſtroy them in vaſt numbers.

They are thus called, as the ant-eater is formicalis, from their deſtroying great numbers of them.

Theſe Ver-pucerons are a ſort of worms produced from the eggs of flies; and are of two principal kinds; the one having legs, the other none.

VER-*polype*, in natural hiſtory, a name given, by Reaumur and ſome other authors, to a ſpecies of water-worm, by no means to be confounded with the creature called ſimply the polype, and which is ſo famous for its reproduction of parts cut off, and for many other ſingular properties. See the article POLYPE.

This Ver-polype is a ſpecies of water-worm, produced from the egg of a tipula; and had its name given it from ſome remarkable productions, placed at the anterior and poſterior parts of the body, which are ſuppoſed to have ſome analogy with the parts of the ſea-fiſh called the polypus.

Theſe worms are found in muddy ditches, uſually either crawling upon, or buried in the mud. They are of various ſizes, from more than an inch in length to a fifth of an inch, and are ſmooth and even on their ſurface; they are compoſed of ſeveral rings, as other inſects of this kind, and have a brown ſcaly head, of a regular figure, and much harder than the reſt of the body. Juſt below the head, on the under part of the body, there are placed two membranaceous productions which ſeem fragments of arms; they are conſiderably thick, and are cut off obliquely at the ends, and furniſhed with many hairs. At the other extremity of the body there are placed four other productions, reſembling four pieces of cords; two of theſe are affixed to the middle of the lower ſide of the laſt ring but one, and the other two, at the joining of this, to the laſt ring. The anterior pair ſerve the creature greatly in its moving, and theſe hinder ones have their uſe in fixing that part of the body in the earthy caſe the creature ſometimes makes for itſelf, while the head is at liberty to move every-where about in ſearch of prey. Theſe hinder ones are broadeſt at their inſertion, and ſomewhat narrower at the point, and are very flexible and moveable every way.

The anus of the creature is placed near the end of the laſt ring of the body, and is of a ſquare figure; it is ſurrounded with a number of rigid hairs or ſpines, and at each corner has a fleſhy tubercle, which ſtands out a conſiderable way from the level of the body; the two under ones are much larger than the other two, and the creature evidently uſes them to puſh itſelf forward in its moving about. Probably, however, theſe parts have ſome other more important uſe. The taking in of air or water is likely enough to be the uſe they are aſſigned for.

The cells which theſe creatures uſually live in, are compoſed principally of fragments of a light and ſpungy earth, and to this they add the broken pieces of ſticks and leaves, and other ſuch ſubſtances as are juſt heavy enough to ſink in water. Mr. Reaumur ſuſpects that they have a method of ſpinning ſome glutinous fluid out of their bowels, to fix theſe things together with. But, though they uſually reſide in theſe caſes, they often quit them, and are found ſwimming about the water, or with their tails at the top, and playing about with their bodies; or at the bottom, crawling on the ſurface of the mud.

When the creature has lived its deſtined time in this ſtate, it changes into a nymph, in the caſe in which it had lived to the time of this change; it throws off the head, and the productions that ſerved as arms, and to faſten it at the bottom of the caſe. Nature has generally made the nymph and cryſalis ſtate of animals a time of reſt and incapacity of motion; but in this, as in the great worms, has given even the nymph a locomotive power, and that a very briſk one. The creature, in this ſtate, had ſufficient need of it, and could never arrive at its laſt change without it. When the time of this final change comes on, the nymph riſes to the ſurface of the water, and, a crack opening on the back the winged inſect begins to appear. The getting thoroughly out is a work of time; and this is the moſt perillous period of the creature's life; for, if the weather be windy, it is commonly blown into the water and drowned before the hinder parts are looſe. *Reaumur. Hiſt. Inſ.*

VERBA'SCUM, *mullein*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of a ſingle leaf, rotated, and divided, into many ſegments at the edge. From the cup there ariſes a piſtil, which is fixed in manner of a nail to the middle part of the flower, and finally becomes a fruit or caſe of an oval pointed figure, divided by an intermediate ſeptum into two ſhells, which uſually contain a number of ſmall angular ſeeds fixed to a placenta.

VER'DETUM, the name of a green ſubſtance, uſed as a colour in painting. It is a very pure kind of verdigreaſe, being an ærugo of copper, produced by the vapour of vinegar.

VERO'NICA, *ſpeedwell*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is rotated and divided into ſegments at the end. From the cup there ariſes a piſtil, which is fixed in the manner of a nail to the middle part of the flower, and afterwards becomes a membranaceous fruit, divided into two cells, and containing uſually ſmall, but ſometimes larger ſeeds.

VE'RVAIN; *verbena*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the labiated kind. The upper lip is erect, and divided into two ſegments, the lower into three; and theſe are ſo diſpoſed, that, at firſt ſight, the flower has not at all the appearance of a labiated one, but ſeems only divided into five ſegments. The piſtil ariſes from the cup, and is fixed in the manner of a nail to the lower part of the flower: it is ſurrounded by four embryo's, which afterwards become four ſlender oblong ſeeds, which ripen in the cup, and fill it almoſt wholly up. To theſe marks it may be added, that the flowers of the Vervains grow in ſpikes, or ſometimes in ſhort heads, but never verticillately.

VESPERTI'LIO, *the bat.* In the Linnæan ſyſtem of zoology, this animal makes a diſtinct genus; but that not as a bird, as the vulgar eſteem it, but as one of the quadruped claſs. The characters of the genus are theſe: that the creature is viviparous, whereas all the birds are oviparous: that it has two paps: its feet have five toes on each; and the four feet are expanded into a ſort of wings; Under this claſs, the author takes in canis volans and glis volans; the flying dog and flying dormouſe, as they are called by other authors. *Linnæi Syſtem. Nat.*

VIBU'RNUM *Galls*, in natural hiſtory, the name of a ſpecies of galls, or ſmall protuberances, frequently found on the leaves of the Viburnum. Theſe are of a very ſingular nature, and ſeem to be compoſed of a different ſubſtance from that of the leaf. They appear in form of brown circular ſpots, of which there are ſometimes forty or more on one leaf. Theſe are about a fifteenth of an inch in diameter, and they riſe a little above the ſurface of the leaf, as well on the under as the upper ſide; each of theſe has alſo a ſmall prominence in the center, on each ſide of the leaf, looking like a nipple ſtanding on the breaſt.

VI'CES, a term uſed by the dealers in horſes to expreſs certain faulty habits or cuſtoms in that creature, which render him troubleſome to the rider, and are never to be worn off, but by attention to regular methods.

VI'CIA, *vetch*, in botany, the name of a large genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind: and the piſtil, which ariſes from the cup, finally becomes a pod, furniſhed with roundiſh or angular ſeeds; to this it is to be added, that the leaves ſtand in pairs on the rib, and that terminates in a tendril.

VIGORO'LSO or *vigoroſamente*, in the Italian muſic, is uſed to direct a performer to ſing or play with vigour, ſtrength, and firmneſs.

VINE (*Dict.*)—All the ſorts of Vines are propagated either from layers or cuttings. The former is the method uſually practiſed with us, but the latter ſeems much the better.

In order to propagate them by cuttings, let ſuch be choſen as are ſtrong and well ripened ſhoots, of the laſt year's growth, and ſhould be cut from the old Vine, juſt below the place where they were produced, taking a knot of the two years wood, which ſhould be pruned ſmooth.

The upper part of the ſhoot ſhould then be cut off, ſo as to leave the cutting about ſixteen inches long. Theſe cuttings are to be placed with their lower part in the ground, in a dry place, laying ſome litter about their roots to prevent them from drying. In this place they ſhould remain till the beginning of April, which is the time to plant them. They are then to be taken up and wiped clean, and, if they are very dry, they ſhould ſtand with their lower parts in water ſix or eight hours. Then, having prepared the beds for them, they are to be ſet at about ſix feet diſtance from each other, and making their heads ſlant a little towards the wall. The cutting is to be ſo buried in the ground, that only the uppermoſt bud be upon a level with the ſurface; the earth is then to be well cloſed about the plant, and a little mould heaped up over the eye of the bud, to keep it from drying. After this, there is no more trouble neceſſary, but to keep the ground clear from weeds, and to nail up the ſhoot, as it grows, to the wall, rubbing off all the ſide-ſhoots.

The Michaelmas following, if the cuttings have produced ſtrong ſhoots, they ſhould be pruned down to two eyes. In the ſpring following the ground is carefully to be dug up about the ſhoots, and the ſtalks to be earthed up to the firſt eye. During the ſummer all the lateral ſhoots muſt be rubbed as they appear, and only the two from the two eyes which were left, muſt be encouraged; theſe, as they grow, are to be nailed up againſt the wall; and in the middle of July theſe ſhould be ſhortened, by nipping off their tops, and this will greatly ſtrengthen the ſhoots. At the Michaelmas following theſe ſhould be pruned, leaving them each three eyes, if they are ſtrong; but, if they are weakly, only two. The next ſummer there will be two ſhoots from each ſhoot of laſt year's wood; but if there ſhould be two from one eye, which is ſometimes the caſe, then the weaker is to be rubbed off. At Midſummer the ends of the ſhoots are to be pinched off, as before; all the weak lateral ſhoots are to be diſplaced, as in the preceding ſummer; and the whole management is to be the ſame. This is all the culture neceſſary to young Vines.

As to the management of grown Vines, it is to be obſerved that theſe rarely produce any bearing ſhoots, from wood that is more than one year old; the great care muſt therefore be always to have plenty of this wood in every part of the tree. The bearing ſhoots for the following year ſhould be left at the pruning with four eyes each. The under one of theſe does not bear, and conſequently there are only three which do. Many leave more eyes on the ſhoots, that they may have more fruit, which is the conſequence; but then the fruit is much poorer; and this is ſo well known in the wine countries, that there are laws to direct that no more than ſuch a number of eyes are to be left on each ſhoot, for the grapes would elſe be of a poor juice, and deſtroy the reputation of their wine. Each of the three eyes, left, will produce two or three bunches; ſo that each ſhoot will give ſix or nine bunches, which is as much as it can bring to any perfection. Theſe ſhoots muſt be laid in at about eighteen inches aſunder on the wall; for, if they are cloſer, when the ſide-ſhoots are produced, there will be no room to train them in upon the wall: and the largeneſs of the leaves of the Vine requires alſo that the ſhoots ſhould be at a proportionable diſtance.

The beſt ſeaſon for pruning Vines is the end of September or beginning of October. The cut is always to be made juſt above the eye, and ſloped backwards from it, that, if it bleed, the juice may not run upon the bud; and, where there is an opportunity of cutting down ſome young ſhoots to two eyes to produce vigorous ſhoots for the next year's bearing, it ſhould always be done. In May, when the Vines are ſhooting, they ſhould be looked over, and all the ſhoots from the old wood ſhould be rubbed off, as alſo the weaker, whenever there are two produced from one eye. During the month of May, the branches muſt be nailed up againſt the wall as they ſhoot, and towards the latter end of this month, the ends of the bearing branches ſhould be nipped off, which will greatly ſtrengthen the fruit. Thoſe, however, which are to bear the next year, ſhould not be ſtopped before the beginning of July.

When the fruit is all gathered, the Vines ſhould be pruned, whereby the litter of their leaves is all removed at once, and the fruit will be theforwarder for this the ſucceeding year. *Miller's Gardener's Dict.*

The Vine is one of the trees moſt liable to be injured by froſts with us; its trunk is often ſplit in froſty weather, and that moſt frequently when it ſtands in the warmeſt aſpects. In the year 1683, the great froſt ſplit almoſt all our timber-trees; but this was owing to defects in them, by which the ſap was detained in very large quantities in particular places, from their being wind-ſhaken, coltie, or otherwiſe diſtempered; but the Vines ſuffered the ſame accident, ſeemingly, from another cauſe. Thoſe Vines were moſt ſplit this year which were expoſed to a ſouth aſpect, and planted againſt the warmeſt walls. The ſun, their uſual friend, now proved their enemy, and, daily thawing the ſap in the trunk, it was again frozen every night. This, often bending and unbending, ſoftening and hardening the vivid ſpirituous juice of this plant, deſtroyed it; and the ſap being the ſame year diſordered, and not gradually ſeaſoned, but even ſtopped before Michaelmas-day, and the freſh ſap wholly detained by the ſucceeding froſts from ariſing, the frozen and hard earth alſo denying its juices, even though the veſſels of the plant had been in a condition to receive them; the trunks and branches of the Vines were filled only with a thin, watery, and mortified ſap, and, this moſt of it extravaſated by the burſting of the veſſels it was frozen in, many of them ſuffered as much as if cut off from the root. Thus periſhed the greater part of the Vines expoſed to the ſun's action; while the other which ſtood in more ſhady places, not having their juices thawed and frozen daily, ſuffered but one change, and often eſcaped. It was alſo obſerved this year, that the red grape-trees eſcaped in general much better than the white, being hardier than they.

Other wall-trees, containing viſcous juices, eſcaped very well, while the Vines thus ſuffered, even though expoſed in the ſame manner. Among others, the plums, apricots, peaches, and wall cherries, had very little damage. It is eaſy to conceive why plants with viſcous juices ſhould ſuffer leſs by froſt, than thoſe with more thin ones; and we ſee that this is the caſe between theſe two ſorts of trees, the plums, &c. often exſudating their juices in form of gum-arabic; but the Vines, when they throw out any, ſhew that theirs is as thin as common water. The different kinds of trees have, doubtleſs, all their different conſiſtences, in their juices; and it may have principally been owing to that diverſity in others, as well as in the plum and Vine, that ſome eſcape, while others periſh by froſts. *Philoſ. Tranſ.* N°. 165.

VINE *Gallinſect*, an inſect of the gallinſect claſs principally found on the Vine, though capable of living on ſome other trees, and ſometimes found on them. It is much of the ſame ſhape, figure, and manner of life with the other animals of this claſs; but differs from them in this, that, as they lay their eggs all under their body, and continue abſolutely to cover them, till they are hatched, theſe protrude them from their body, and thus are found in prodigious abundance, lodged in a ſort of cottony or ſilky bags all over the ſtalks and branches of the Vines; the dead animal is ſometimes found covering them in part; but more frequently they are abſolutely naked, and often are ſo numerous as to appear like thin cobwebs hung one over another all over the Vine.

VINE *Grubs*, in natural hiſtory, a name given by ſome authors to the pucerons, or little inſects, which are uſually of a green colour, and are found often in prodigious numbers, ſticking to the leaves of trees and plants, and to their young ſtalks. Mr. Reaumur has been very curious in his inveſtigation of the nature of this inſect; but its manner of propagating its ſpecies was never clearly obſerved, till Mr Bonet diſcovered it.

VI'NEGAR *(Dict.)*— It is plain that the original component matter of Vinegar is ſugar, which, in the art of rectification, ſeems wholly converted into a fluid tartar; and, if the aqueous liquor be ſeparated from Vinegar, we find the Vinegar is thereby made the ſtronger, inſomuch that, if Vinegar were to be highly concentrated by congelation, it would become almoſt ſolid, or a kind of actual tartar.

Whence the rule is eaſy, that, in order to make an almoſt ſolid Vinegar, we ſhould endeavour to diſſolve tartar in an aqueous liquor, whence to perfect the art of acetification. The diſſolving of tartar largely with ſugar or treacle, and the ſtrongeſt Vinegar, by repeated imbibitions, that and a proper management is much to be recommended to the perſons concerned in this trade. *Shaw's Lectures.*

It is very well known that a large quantity of water, or mere inſipid phlegm, is contained in Vinegar, and that what we call Vinegar, would be infinitely ſtronger, if cleared of that. It is for this reaſon, that a great quantity of Vinegar will ſaturate but a very ſmall portion of an alkaline ſalt; and a great deal of this aqueous acid is, for the ſame reaſon, required to diſſolve a ſmall portion of metal. A pint of the ſtrongeſt Vinegar will ſcarce diſſolve more than two drachms of iron, and will not ſaturate more than the ſame quantity of pure ſalt of tartar.

It has been wiſhed by many, that ſome method could be contrived of concentrating Vinegar, ſo as to give it more ſtrength; this muſt depend alone on the extracting the aqueous humidity; and this has been attempted ſeveral ways. Of all others, however, that ſucceeds beſt which we find recommended by Stahl, which is by freezing. This method ſo far deprives Vinegar of its ſuperfluous water, and ſo far collects its acetous penetrating ſharpneſs, as to render it an extremely powerful menſtruum, throwing out five or ſix parts of phlegm, which ſcarce taſtes at all ſour, and having one ſixth or one ſeventh part poſſeſſed of all the virtues of the whole. Dr. Shaw aſſures us, that he has repeated this experiment, and found it to anſwer perfectly upon the trial.

This condenſed Vinegar, towards the end of the operation, or in the laſt congelations, lets fall a white ſhining powder, which is a tartar that, though diſſolved in great quantity in the whole aqueous fluid, could not be retained in this concentrated one. *Stahl, de Condenſat. Vini.*

The thicker Vinegar is, the leſs fit it proves for diſtillation, as there is always the greater danger of an empyreuma, or burnt ſmell, which would ſpoil the whole proceſs, and as it uſually in this caſe comes over oleaginous. And the pureſt white ſalt of tartar, ſaturated with this diſtilled Vinegar, being afterwards ignited, turns black, and yields a ſmell extremely like that of crude tartar in the calcination. *Shaw's Chemical Eſſays.*

Portable **VINEGAR**, a name given by the chemiſts to a ſort of Vinegar-powder, or Vinegar in a dry form. It is a preparation of tartar with Vinegar, and is made in this manner: take white tartar, half a pound; let it be carefully waſhed, then dried and powdered; infuſe this powder in the ſtrongeſt wine-Vinegar, then dry it, and infuſe it again, repeating this operation ten times. After this, the dry powder is to be kept for uſe; at any time a ſort of extemporaneous Vinegar may be made by diſſolving a ſmall quantity of this powder in any proper liquor.

VI'NOUS *Liquors* (*Dict.*)— All ſorts of Vinous and fermented liquors, both before and after the fermentation, conſiſt not of ſimilar, but heterogeneous parts, which are joined together in one certain and determinate order; thus, the action of fermentation being a ſeparation and deſtruction of the former connection of the ſubject, and tranſpoſing its parts anew, there muſt of neceſſity have been a kind of firm or durable texture in the ſubject ſo disjoined, ſeparated, and new ranged. For example:

Grapes being laid upon dry ſtraw, in a cold place, will, for ſome time after they are ſeparated from the Vine, preſerve that texture, which gives them their ſaline, unctuous, and ſlimy ſweetneſs; which the juice alſo retains after preſſing, and becomes a clear and tranſparent muſt, without ſeparating itſelf into parts, but continuing regularly and uniformly mixed, ſo as to preſerve the different matters it conſiſts of, intimately connected among themſelves. In this firmly connected ſtate they may be kept many months, if a caſk be filled with this juice, and ſet in a cool place, as we evidently ſee in ſtum. *Shaw's Eſſay on concentrating Wines.*

Wine, in the preciſe chemical or philoſophical notion of it, is a ſaline, clammy, oleaginous matter, diluted with a large proportion of water, whereby it is expanded, or ſet at diſtance from itſelf, while the ſaline parts are ſaturated with and interſperſed among the ſubtile earthy ones that make the ſlimineſs; thus, they together imbibe, detain, and hold the groſſer parts; beſides which there are other oily parts vaſtly more ſubtile, which, by means of the highly attenuated ſaline portion adhering cloſely to them, remain as much connected with the water as the reſt; and theſe are what we call the ſpirituous parts; but the connection of them all together is ſo ſtrong and durable, that they move for a long time as one body, without ſeparating, if carefully preſerved. An acquaintance with the true nature, hiſtory, and effects of Vinous fermentation, will fully explain and juſtify theſe poſitions.

If the ſpirituous part be once ſeparated and drawn away from the wine by diſtillation, though it were immediately to be returned back to the remaining maſs from whence it came, and ever ſo well ſhook again with it, the whole by no means retains its former taſte, odour, and durability, but turns to a confuſed turbid mixture, of a different and nauſeous taſte, and a diſagreeable ſmell; and, on the whole, approaches nearly to a ſtate of vapidity. The only objection to this general rule is, that if a new fermentation, or even but a fret be raiſed, when the ſpirit is newly joined to the remainder in the ſtill, the ſpirit may be thus reinſtated, and the wine rendered perfect. The proceſs is difficult and uncertain; but a nice management, and a proper intermedium, will bring it about.

If an inflammable ſpirit diſtilled from the ſame, or any other wine, be put to a parcel of wine which is too ſaline, or not ſufficiently ſpirituous, the bare addition, or tumultuous admixture thereof, very far from giving the fine and intimate ſoftneſs of a good wine, will rather manifeſt its own burning acrimony and nidorous flavour to the ſmell and taſte, and will add a nauſeous bitterneſs to the former tartneſs or acidity. This is an obſervation of Stahl's, and is allowed by Dr. Shaw to be true in general; but he obſerves, that, under a nice and proper management, a fine and taſteleſs ſpirit may be prepared and introduced into wines, and will, after a time, become intimately mixed with their other part, and remain abſolutely undiſcoverable to the taſte or ſmell, unleſs by the excellency and the ſtrength it gives. *Stahl's Schediaſma de Concentrat. Vini.*

VI'NI *Oleum*, *oil of wine*, a very precious liquid, kept as a ſecret in the hands of ſome dealers in ſpirits, and uſed to give the brandy flavour to ſpirits of leſs price. It is certain, that all the ſpirits we uſe take their flavour from the eſſential oil of the ſubſtance they are made from; that of malt is very nauſeous and offenſive, and renders the ſpirit horribly diſagreeable, if not carefully kept back in the diſtillation of it; that of the grape, on the other hand, is extremely agreeable, and is what gives the delicious flavour to French brandy: this, therefore is to be carefully brought over among the ſpirit in diſtillation.

This is that oil of wine ſo much celebrated among our diſtillers, and is for their uſe made ſeparate, being of ſuch effect, that half an ounce of it will determine a pure and clear malt ſpirit to be French brandy, ſo as to ſtand the teſt of the niceſt palate; and all the trials that can be invented, provided the oil and the ſpirit have both been carefully made.

The manner of making the oil is this: they take the cakes of dry wine lees ſuch as are uſed by our hatters, and, diſſolving them in ſix or eight times their weight of water, they diſtil the liquor with a ſlow fire, and ſeparate the oil by the ſeparating glaſs, reſerving for this nice uſe only that which comes over firſt, the oil that follows being coarſer and more reſinous. To render this buſineſs perfectly ſucceſsful, there muſt be ſeveral things obſerved: Firſt, the lee muſt be of the right kind, that is, of the ſame nature with the French brandy propoſed to be imitated. Secondly, The malt ſpirit muſt be extremely pure. Thirdly, the doſe of the oil muſt be very well proportioned: and, fourthly, the whole muſt be artificially united into one ſimple and homogene liquor. Theſe cautions all regard only the taſte, and beſides theſe, in order to come up to a nice counterfeit, ſeveral other particulars muſt be attended to; ſuch as the colour, proof, tenacity, ſoftneſs, and the like; ſo that, in ſhort, the operation has too much nicety in it to be hit off by every ordinary dealer. When this fine oil of wine is procured, it may be mixed into a quinteſſence, with pure diſtilled alcohol, or the totally inflammable ſpirit of wine, to prevent its growing diſtaſteful, rancid, or reſinous; and thus it may be long preſerved in full poſſeſſion of its flavour and virtues.

The ſtill bottoms, or remaining matter after the diſtillation of this oil, will yield many productions to advantage, particularly tartar, and ſalt of tartar, as alſo an empyreumatic oil, and a volatile ſalt, like that of animals. Some kinds of lees afford all theſe in much greater quantity than others; the lees of canary and mountain wines yield very little of them, and, indeed, ſcarce any tartar or fixed ſalt at all; but the white French lees of thoſe thin wines, that afford the ordinary brandies, yield them all very copiouſly, inſomuch that ſometimes a ſingle hogſhead of dry and cloſe-preſſed lees will afford, by this proceſs, three gallons of this oil, forty pounds of clean tartar, a large proportion of empyreumatic oil, and volatile ſalt, beſides full four pounds of good ſalt of tartar. It is not to be expected, however, that every parcel of this lee ſhould yield fully in this proportion. *Shaw's Eſſay on Diſtillery.*

VI′NUM *extemporaneum*, a name given by Dr. Shaw and others to a ſort of extemporaneous vinous liquor, made, without fermentation, from the melaſſes ſpirit, lemons, water, and ſugar, in the following manner: ſome good ſound lemons are to be cut into ſlices, rind and all, and put into a quantity of pure fine melaſſes ſpirit; when they have ſtood in fuſion three or four days, the liquor is to be ſtrained clear off, and filtred; and having before a very thin ſyrup of the fineſt ſugar diſſolved in ſpring-water, the two liquors are to be mixed together. The proportions of this liquor muſt be diſcovered by repeated trials, but, when once found, it will be eaſy to continue them; and a vinous liquor will thus be prepared not inferior to many foreign wines.

VI′OLA, *the violet*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the polypetalous, anomalous kind, much reſembling the papilionaceous ones. The piſtil ariſes from the cup, and finally becomes a ſeed veſſel, uſually of a trigonal form, which opens in three places when ripe, and contains roundiſh ſeeds.

Violet flowers, freſh gathered, are emollient and gently purgative. They are greatly recommended by authors in fevers, head-achs, pleuriſies, and peripneumonies. A ſyrup of them, made in a ſtrong infuſion in water, is the only preparation kept in the ſhops: it is given to children as a gentle evacuant, and ſerves as a teſt to diſtinguiſh acids from alkali's, the former turning it immediately red, and the latter green.

VI′RGA *aurea*, *golden rod*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the radiated kind; its diſk is compoſed of floſcules, and its outer circle of ſemi-floſcules. Theſe are all placed upon the embryo fruits, and are contained in a common ſcaly cup: theſe embryo's finally ripen into ſeeds, winged with down. To this it is alſo to be added, that the flowers uſually ſtand in long ſeries towards the tops of the ſtalks.

The common golden-rod is an aſtringent, and its root is given in powder with great ſucceſs in diarrhœas, dyſenteries, and in hæmorrhages of all kinds; particularly in ſpittings of blood.

VI′RGIN'S-*bower*, *clematitis*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roſaceous kind, and uſually conſiſts of four leaves arranged in a circular form, and without a cup. The piſtil ariſes from the center of the flower, and finally becomes a fruit compoſed of ſeveral ſeeds arranged into a ſort of head, and each ending in a long plume.

The ſeveral ſpecies of this plant make a very fine ornament in the quarters of gardens allotted to flowering ſhrubs. They are all propagated, by laying down their branches in ſpring, as is practiſed in vines and other ſuch ſhrubs; and in a year's time they will have taken ſufficient root, and may be taken up and removed to the places where they are to remain. This ſhould be done in the ſpring, and a little mulch muſt be laid about their roots, and they muſt be watered in dry weather. In two years after planting they will make very ſtrong ſhoots, which are to be trained up, to ſtakes, that they may not trail upon the ground. After this, they require no farther care, than to cut out their dead branches every year, and in the ſpring to ſhorten ſuch branches as are too long and rambling. They may alſo be raiſed from ſeeds, ſown either as ſoon as ripe, or in the ſpring; but this is a more tedious way, as they lie ſix or twelve months in the ground before they appear, and after that require two years care in a nurſery-bed before they are fit to be planted out where they are to ſtand.

VI′TEX, *the chaſte tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower conſiſts of one leaf, and is, as it were, bilabiated, and tubular behind; the piſtil ariſes from the cup, and is fixed in the manner of a nail to the hinder part of the flower; this finally becomes a roundiſh fruit, divided into four cells, each containing oblong ſeeds.

VI′TIS, *the vine*, the name of a genus of plants, the characters of which are theſe: the flower is of the roſaceous kind, and is compoſed of ſeveral petals, arranged in a circular form; from the middle of the flower there ariſes a piſtil, which is ſurrounded by a number of ſtamina; this finally becomes a round, ſucculent, or juicy berry, containing uſually four pear-faſhioned ſeeds. See the article VINE.

VITIS *Idæa*, *the whortle*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the globoſe campaniform kind. The piſtil ariſes from the cup, and is fixed in the manner of a nail to the hinder part of the flower; the cup finally becomes a ſoft umbilicated berry, juicy, and containing ſmall ſeeds.

VI′TRIOL *of copper*. The glaſs-makers have a method of making this without corroſives, which was originally practiſed by Neri, and with which they make very fine colours in glaſs, particularly a fine ſea-green.

The method of making the preparation is this: take little thin pieces of braſs, and lay them ſtratum ſuper ſtratum in a crucible, with powder of brimſtone. When the veſſel is full, ſet it luted and covered in an open wind furnace, with burning coals over it, and let it ſtand two hours; then let the furnace cool of itſelf, and take out the crucible; the maſs within will be of a blackiſh obſcure purple; powder and ſift it fine, and then, mixing with every pound of it ſix ounces of powdered brimſtone, take a round veſſel of earth that will bear the fire, place it upon iron bars ſet acroſs in an open wind furnace, fill it with coals, and then put in the powder; keep it burning and ſtirring about till all the brimſtone is burnt up; then take out the pan, and powder the calcined maſs again, ſift it fine, and proceed with it thrice as before; the laſt time let it ſtand on the fire till it become red. Put a pound of this calcined copper into a glaſs body, with ſix pints of water; evaporate two pints or thereabouts in a ſand heat; the water is then of a fine blue, and muſt be poured off clear; then filtrate it. Evaporate the water from the remaining ſediment of copper left in the glaſs, and with new ſulphur calcine it again and again; repeat this five or ſix times, and extract the blue tincture with water as before; filtrate all the waters, and put them together. Evaporate all to a fifth part or thereabouts, and ſet it in a cool place, and fine pointed cryſtals will be formed, reſembling emeralds; ſeparate theſe cryſtals, and evaporate the water again, till all the cryſtals be procured. Then put a pound of them into a glaſs retort, well luted and fitted to a capacious receiver; let the joints be well cloſed, and make a moderate fire for four hours; then make it violent for twenty hours, or till no more white fumes ariſe. The next day open the receiver, and ſeparate the liquor into a glaſs, where it muſt be kept carefully ſealed up. *Neri's Art of Glaſs.*

White VITRIOL. It has been diſputed whether white Vitriol is any thing elſe than green Vitriol calcined. But it ſeems that white Vitriol is of a quite different ſpecies from either the green or the blue Vitriols.

In the condition in which white Vitriol is uſually bought, it contains ſomewhat both of copper and iron; but, being purified by ſolution, filtration, and cryſtalliſation, it is freed from both theſe metals, and appears to be a native Vitriol ſui generis.

Blue VITRIOL, is made by evaporating ziment water to a proper ſtandard; after which it is to be let out into coblers, where it ſhoots into regular, and beautiful cryſtals of a rhomboidal form and compoſed of ten planes. Theſe have the ſame qualities with the water; and, being diſſolved in common water, they make a ziment liquor, undiſtinguiſhable from the native kind. See the article ZIMENT *Water*.

VITRIO′LIC *Waters*, waters impregnated with particles of vitriol.—The countries which abound with mines of copper and iron uſually afford a great many Vitriolic waters.

VIVACI′SSIMO, in the Italian muſic, denotes a degree or two quicker than vivace, and is much the ſame with allegro.

VIVES. A name given by our farriers to a diſeaſe of horſes, which conſiſts in the growth of certain flattiſh kernels in cluſters, like bunches of grapes, beginning from the ears and creeping downwards, between the chop and the neck of the horſe towards the throat.

U′LMUS, *the elm*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the campaniform kind, conſiſting of one leaf, and containing a great number of ſtamina. The piſtil ariſes from the bottom of the flower, and finally becomes a membranaceous or foliaceous fruit, of a heart-like ſhape, in the center of which, there is placed a pear-faſhioned capſule, which is alſo of a membranaceous ſtructure, and contains a pear-faſhioned ſeed. See the article ELM.

UN'DERWOOD.—In the cutting the Underwood of coppices, when the ſtubs are great, they ſhould be ſtubbed up, for they only take up a great deal of room, and ſend up few ſhoots, their cracks and holes letting in water, and uſually half killing them. The taking up theſe ſhould be performed in winter, and the ſpaces they leave will be ſoon occupied by young trees; if not, a long branch of ſome neighbouring tree may be laid down, and will ſoon ſend up a ſufficient ſupply of ſuckers for the place.

In felling the Underwood, it is always proper to leave young trees enough. The worſt of theſe may be taken down the next fall, eſpecially if any of them grow near a great tree that will be fit to fell the next ſeaſon, becauſe they may be ſpoiled by its fall. When trees are at their full growth, there are ſeveral ſigns of their decay, as the withering or drying of their top branches, their taking in water at ſome of their knots, their being hollow or diſcoloured, and their making but ſmall ſhoots. If wood-peckers make holes in the body, it is a bad ſign, and, according to the appearance of one or more of theſe ſymptoms, it is very proper to cut down the tree before it decays farther. Large and ſpreading trees in coppices are often of more miſchief than advantage, as they ſpoil a great deal of the Underwood by their droppings.

The owner of a coppice muſt be very careful, when he ſells the wood ſtanding, by the acre, to mark before-hand what ſtandards are to be left, becauſe otherwiſe the purchaſer ſeldom fails to cheat him, by felling ſome of them. *Mortimer's Huſbandry.*

Sea-UN'ICORN, in natural hiſtory, the name of a fiſh of the whale kind, remarkable for having a horn growing out at its noſe, in the manner of the ſuppoſed Unicorn's horn, as deſcribed by many too credulous authors.

This fiſh feeds on fleſh, or other fiſh, and is not only found in the main ſea, but ſometimes gets up into large rivers. In the year 1636 there was a large one caught in the river Oſte, near its diſcharging itſelf into the Elbe, in the duchy of Bremen; this place is four German miles from the ſea. The ſkin of this fiſh was ſpotted with dark brown ſpots upon a white ground; the epidermis was tranſparent, and under it was another ſkin very thin and ſpotted; but the true ſkin was brown, and near an inch in thickneſs. On the top of the head there is only a ſemilunar hole, as in the porpoiſes; this hole opens into the two channels, which run through the ſkull to the palate, and are called the ductus hydrogogi. The people who examined this creature, were not able to find any aperture in the body for the diſcharge of the excrements; whence it has been generally believed, that the creature voids them through this paſſage in the head.

Authors have differed in the name of the proceſs iſſuing from the head, ſome calling it a horn, others a tooth; for ſome are of opinion that it ſerves it to break the ice for air; but others pretend that it is an offenſive weapon, with which it wounds the common whale, and other large fiſh; and that, when it has plunged it up to the head in the whale's body, it ſucks the juices of that animal.

The fiſh was near twenty feet long, and about four feet in diameter. The horn ſtood on the fore-part of the head, juſt above the mouth, and was ſix feet long, white like ivory, and curiouſly wreathed or twiſted. The body was ſmooth and ſlippery, like that of an eel; the head, in proportion to the body, was ſmall, not exceeding ſixteen inches in length: the eyes not bigger than a ſix-pence. It had, on each ſide of the neck, two black fins, one above, another at a ſmall diſtance; theſe were two feet long, of the breadth of a hand, and about half an inch in thickneſs. *Phil. Tranſ.* N°. 447.

U'NIVALVE *Shells*, in natural hiſtory, a term uſed to expreſs one of the three general claſſes of ſhell-fiſh; the other two are the bivalves and multivalves. The Univalve ſhells are thoſe which conſiſt only of one piece, not of two or more joined together.

VOLU'TA, *the volute*, in natural hiſtory, the name of a genus of ſhells, the characters of which are theſe: they are Univalve ſhells, and have an oblong mouth, with a clavicle ſometimes erect, ſometimes depreſſed, and they are ſometimes coronated at the top.

VO'LVULA, in natural hiſtory, the name of an extraneous foſſil body, nearly allied to the entrochus, being compoſed of the ſame ſubſtance, and being, like that of a cylindric column, made up of ſeveral joints; the commiſſures of the joints are, however, much leſs viſible in the Volvulæ than in the entrochi, and they are not ſtriated, as in the entrochus, from the center to the circumference.

U'PLAND. The Uplands lie either on the tops of hills, or on their ſides, or on the ſlopes of riſing grounds. They ſometimes have a ſandy ſoil, ſometimes a rocky, gravelly, or loamy one; and ſometimes they conſiſt of tough clay, or a black mould. They are uſed by the farmers either for grazing or corn, as they happen to be more moiſt or more dry; and this difference depends upon their ſituation and nature.

Thoſe lands which lie flat upon the tops of hills are uſually the drieſt, and thoſe which form the ſlopes or ſides are uſually the moiſteſt, becauſe of the wet that is continually ouzing through them. The chalky, and eſpecially the clayey ſoils in theſe places, are moſt of all ſubject to be wet, eſpecially in winter, becauſe they retain the moiſture a long time; though they have alſo the inconveniencies of the ſandy and rocky lands in the ſame ſituations, chapping in ſummer. The black mould, and the hazely loams in theſe places, are the beſt for corn, as well as for paſture, eſpecially if the latter eſcapes the common misfortune of being full of worms. Theſe lands neither are waſhy in winter, nor parched up in ſummer.

The Upland meadows have ſome diſadvantages, as they often need mending or feeding, which thoſe that lie lower do not; but then they make amends for this in their hay, which is always much finer and ſweeter than that of the low-lands.

UPLO'PER, a name given to one particular ſpecies of pigeon, called by Moore columba gutturoſa ſaliens.

It was firſt brought to England from Holland, and much reſembles that kind of pigeon called the Engliſh powter, but that it is ſmaller: its crop is very round, and in this it buries its bill. Its legs are very ſmall and ſlender, and its toes are ſhort, and cloſe together, on which it treads ſo nicely, that, when moving, any ſmall thing might be put under the ball of its foot. The pigeons of this ſpecies are generally all blue, all black, or all white, ſeldom or never pyed. They are very ſcarce in England, and in Holland have been valued at five and twenty guineas a pair.

They have their name from the Dutch word oplopen, which ſignifies to leap up; and it was thus named from its manner of approaching the hen, which is always by leaping upon her. *Moore's Columbarium.*

URANO'SCOPUS, in zoology, the name of a fiſh of the cuculus kind, called in Engliſh the ſtar-gazer, and by ſome authors callyonymus.

URTI'CA, *nettle*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the apetalous kind, being compoſed only of a number of ſtamina placed in a cup. Theſe are barren, and the ſeeds grow on other plants of the ſame ſpecies, which have no flowers, and are contained either in round globules, or bivalve capſules, or in long tufts.

The roots of the common nettle are much recommended in medicine; they are powerful diuretics, and are ſaid to have great virtues againſt the ſtone and gravel. They cleanſe the blood, and are ſaid to be of great ſervice in hæmorrhages of all kinds, particularly in ſpittings of blood, and overflowings of the menſes. Authors add to this, that they are ſpecifics by way of antidote againſt the poiſon of henbane and hemlock; but this we are not ſo well aſſured of. The young ſhoots of the plant are eaten in the ſpring, as good againſt ſcorbutic complaints. *Dale, Pharm.*

URTICA *marina*, in zoology, the name of a remarkable genus of fiſhes, ſo called from their affecting the ſkin, on touching them, with a painful ſenſation like that of ſtinging of nettles. Theſe are an animal of the loweſt claſs, and have by many been reckoned among thoſe creatures called zoophytes, or plant animals, as ſuppoſed to partake of the nature of vegetables and of animals. Some of the ſpecies of this fiſh are found looſe upon the ſmooth ſhores, and ſome fixed to the rocks which are always covered with water. M. Reaumur obſerves alſo, that many of the ſpecies have no property of ſtinging, or cauſing any painful ſenſation of the fleſh.

VULNERA'RIA, in botany, the name of a genus of plants, whoſe characters are theſe: the flower is of the papilionaceous kind, and from its cup, which is of a tubular form and turgid, there ariſes a piſtil, which finally becomes a ſhort pod, containing roundiſh ſeeds; and being contained in a membranaceous bladder, which was before the cup of the flower.

VULPES, *the fox*. This creature has been long famed for its cunning, and is plainly of the dog kind.

It differs, however, from the common dog in the length, denſe diſpoſition, and ſoftneſs of its hair, eſpecially thoſe about its tail, and in its ſmell, which is peculiarly rank and diſagreeable. Its uſual colour is a reddiſh tawny, though it is ſometimes found white, and ſometimes black. Its manner of digging itſelf a hole in the earth, is alſo a cuſtom wholly different from all the dog kind, and it is far from the tameneſs of that animal, being with difficulty made to loſe its fierceneſs. Its internal parts, in general, are very much like thoſe of a dog. *Ray's Syn. Quad.*

W.

WALE, or WAIL, in a ſhip, thoſe outermoſt timbers in a ſhip's ſide, on which men ſet their feet when they clamber up a ſhip's ſide. They are reckoned from the water, and called her firſt, ſecond, or third Wale, or bend.

WALL. Of all the materials for building Walls for ripening fruit, brick is generally the beſt, as it reflects a great deal of heat, retains its warmth a great while, and affords, by the ſmalneſs of the joints, the convenience of faſtening up the trees with ſmall nails. If theſe Walls are coped with free-ſtone, and have ſtone pilaſters at proper diſtances, to break the force of the winds, and ſhelter the fruit-trees, they make the moſt advantageous, as well as the moſt beautiful of all Walls.

It is ſometimes an advantageous thing to build theſe Walls upon arches, that the roots of the trees may have room to ſpread under, and to the other ſide of them. This is neceſſary when the ſoil is a hard gravel; for, without this, when the roots of peaches, &c. have reached the gravel, they find not ſufficient nouriſhment, and the trees canker and die. But, though Mr. Fairchild had found great advantages from this way of building Walls, Mr. Miller diſapproves it. Some alſo have propoſed the building ſlanting Walls; but the ſame author gives many reaſons why the perpendiculars are preferable, and ſeems to think, that, if Walls could be eaſily contrived to ſlope a little forward, they would be even preferable to theſe. *Miller's Gard. Dict.*

WALL, in fortification, is that part of the parapet which is contained in one piece from end to end, and is about 2½ or 3 feet high.

The embraſures in the Wall ſhould as much as poſſible be cut perpendicular to the parapet; therefore the battery ſhould be parallel, or nearly ſo, to the object to be battered: for the direct ſhots have moſt force; and oblique embraſures weaken the merlons, or parts of the parapet ſtanding between the embraſures.

The embraſures are uſually about 2 or 2½ feet wide on the inſide, and about 9 or 10 feet on the outſide; whereby the cannon may be traverſed from the right to the left, ſo as to command a pretty large extent in front. The diſtance from the middle of one embraſure to the middle of the next ſhould be about 18 feet, in order to leave ſufficient room for the working of the guns, and the ſtowage of the ſhot and other neceſſaries.

WA'LNUT, in botany. See the JUGLANS.

The effluvia of Walnut-trees are ſaid to be hurtful to the head. Mr. Boyle aſſures us they cauſed the head-ach in himſelf. *Works abr. Vol. 1.*

WA'MPUM, a ſort of ſhells, ſeveral of which, being ſtrung upon threads, are uſed as money among the Indians.

It is made of a ſhell formed into ſmall cylinders, of about one quarter of an inch long, and a fifth of an inch over, and, being bored as beads, is ſtrung in great numbers upon long ſtrings. In this ſtate it paſſes among the Indians in their uſual commerce, as ſilver and gold among us; but, being looſe, it is not ſo current.

It is both white and black, and the meaneſt is in ſingle ſtrings, of which the white goes at five ſhillings a fathom, and the black at ten; or, by number, the white at ſix a penny, the black at three. The next in value to the ſingle ſtrings is that which is wove into bracelets of about three quarters of a yard long, black and white, in ſtripes, and ſix pieces in a row, the warp conſiſting of leather thongs, and the woof of thread; theſe the gentlewomen among them wear, wound twice or oftener about their wriſts.

The moſt valuable of all is that woven into girdles. Theſe are compoſed of many rows, and the black and white pieces woven into ſquares or other figures. Theſe girdles are ſometimes worn as their richeſt ornaments; but they are oftener uſed in their great payments, and make their nobleſt preſents, and are laid up as their treaſure. *Grew's Muſæum.*

WARD's *Pill.* Some have conjectured that this medicine, which had ſo great a run, and to which a diminution of the numbers in the bills of Mortality, one year after it happened to come on vogue, was ſaid in a public advertiſement to be owing; it has been conjectured, I ſay, that this medicine was made of butter of antimony; others think it the glaſs of antimony, and cinnabar of antimony amaſſed with gum tragacanth. See Ward's Pills diſſected, and *Med. Eſſ. Edinb.*

Mr. Clutton mentions ſome caſes where they did ſervice, but relates the hiſtories of fifty caſes where they did great miſchief.

To diſcover the compoſition of theſe pills, he diſſolved the ſeveral ſorts of them, and then, viewing with a microſcope the powder which precipitated, he ſaw three different-coloured powders remaining of the blue pill; to wit, a yellow, red, and white powder; the yellow and red agreed exactly with the glaſs of antimony, and the white ones appeared to be common arſenic. Ward's pill being incloſed in copper, and expoſed to a ſtrong heat, made the copper white, and as hard as iron, which arſenic always does. He alſo obſerved in this blue pill another powder, which he judged to be zaffer, that is, calcined, incorporated with flints. He thinks the proportion of the ingredients in this blue pill to be, one-third glaſs of antimony, near two-thirds of arſenic, and a very ſmall part of cobalt, or zaffer, with ſome powder of blue.

The red pill appeared to be much the ſame compoſition as the blue, only red arſenic was made uſe of inſtead of the white, and the colouring of blue powder was left out.

The purple pills tinged glaſs blue, which cobalt or zaffer does; and therefore Mr. Clutton thinks them principally compoſed of cobalt, with a little glaſs of antimony, which left a yellowiſh border upon the glaſs.

WA'RREN. The word Warren is now generally applied to a piece of ground ſet apart for the breeding and preſerving of rabbets.

In the ſetting up a Warren, great caution is to be uſed for the fixing upon a proper place and a right ſituation. It ſhould always be upon a ſmall aſcent, and expoſed to the eaſt or the ſouth. The ſoil that is moſt ſuitable, is that which is ſandy; for, when the ſoil is clayey or tough, the rabbets find vaſtly more difficulty in making their burrows, and never do it ſo well; and if the ſoil be boggy or mooriſh, there would be very little advantage from the Warren, for wet is very deſtructive of theſe animals.

All due precautions muſt be taken, that the Warren be ſo contrived, that the rabbets may habituate themſelves to it with eaſe. Many would have it that Warrens ſhould be incloſed with walls; but this is a very expenſive method, and ſeems not neceſſary nor adviſeable; for we find but very few that are ſo, and thoſe do not ſucceed at all the better for it.

Mr. Chomel's opinion is, that it ought to be ſurrounded with a ditch. This indeed is no fence to prevent the rabbets from going out, unleſs there be water in it; but it marks the intended bounds of the Warren, and the rabbets generally confine themſelves within its circumference, though not neceſſarily compelled to do ſo. The ſpace proper for a Warren has no limits but the owner's pleaſure; but, in general, the larger it is, the more profitable it alſo proves; and the rabbets, when once accuſtomed to the place, will keep within its bounds, though they are neither hemmed in with Walls nor ditches, nor any other fence whatever.

WASH, the diſtiller's name for the fermentable liquor, made by diſſolving the proper ſubject for fermentation and diſtillation in common water.

With reſpect to the proper workings of this liquor, great regard is to be had to the containing veſſel. Its purity, and the proviſion for its occaſional cloſeneſs, are the things to be principally conſidered. Though it is neceſſary that the veſſel be perfectly clean, yet in the cleanſing it great care muſt be taken that no ſoap, or other unctuous body, be uſed, for this would check the fermentation in it; and for the ſame reaſon all ſtrong alkaline lixiviums are to be avoided. Lime-water, or even the turbid ſolution of quick-lime, however, may be ſafely uſed for this purpoſe; and this is indeed particularly proper to deſtroy a prevailing acid, which is very apt to be generated about the ſides and bottoms of theſe veſſels, if the warm air has acceſs to them, and thus prevents the order of the fermentation. All ſtrong alkaline lixiviums have as bad an effect on the contrary, and a ſpecial care muſt be had that no corrupt or putrified yeaſt, nor any remains of former fermented matters, hang about the ſides of the veſſels, for this would infect whatever ſhould be afterwards put into them. Foulneſſes of this kind, when of long ſtanding, are of all others the moſt difficult to be cured, and often are of great damage to the diſtiller.

WA'SHING *of ores*, the purifying an ore of any metal by means of water, from earths and ſtones; which would otherwiſe render it difficult of fuſion.

The method of doing it is this: break the ore to a 'coarſe powder in an iron mortar, weigh twenty or thirty docimaſtical centners of it, put them into the Waſhing trough, and pour ſome water upon them, that the ore may be thoroughly moiſt; then have a veſſel full of water, the diameter of which muſt be a little larger than the length of the trough; take the trough with the left-hand by the top of the hinder part, and, dipping it horizontally into the water, move it gently with the right-hand from the fore-part of the trough, which is always to be made the ſhallower part of it, towards the hinder part, which is deeper; then take out the trough, and incline it a little on the fore-part, that the water may run out, and the heavier metallic part remain at the bottom; repeat this ſeveral times, till the remains at the bottom of the trough are quite pure. If the ſtone in which ore is lodged be too hard for powdering in its natural ſtate, as the flinty and debaſed cryſtalline ones commonly are; the whole muſt be calcined, and quenched in cold water ſeveral times over, and afterwards powdered and waſhed in this manner: when it is thus waſhed, aſſay a centner of it, and, from the head of metal this yields, it will be eaſy to eſtimate the value of the-ore. *Cramer's Art of Aſſaying.*

WASP. The Waſp has four wings and ſix feet; his body is yellow, with black triangular ſpots: the common Waſp breeds in the ground. There is another kind much more fierce, but very rare: theſe breed in woods and mountains; they are larger, and have broader bodies, and much more black about them; their ſting is ſo large, that it ſeems diſproportioned to the ſize of their bodies.

To theſe are to be added the ichneumon Waſps, which are ſmaller than the others, and have very ſlender bodies, but of the ſame colours with the common kind: they uſually live in the holes of mud-walls, and make a ſort of porch of mud before the doors of their habitations.

There is alſo another Waſp common about Vienna; this is three times as large as the common kind, and ſeems of two different ſpecies, the one having rough antennæ, and the other ſmooth; they are both variegated with black and a bright yellow. *Mouffet's Hiſt. Inſect.*

Wasp-*fly*, in natural hiſtory, a ſpecies of fly having very much the external figure of a Waſp, but harmleſs, without a ſting, and with only two wings.

Wasp-*tipula*, in natural hiſtory, the name of an inſect deſcribed by Mr. Reaumur, and being properly a tipula, or long-legs, though greatly reſembling a Waſp.

WASTE-*cloths*, in a ſhip of war, the cloths hung up on the uppermoſt work of a ſhip's hull, to ſhade the men from an enemy in the fight; and therefore by ſome are called fights.

Waste-*trees*, in a ſhip, are thoſe timbers which lie in Waſte.

WATCH-*glaſs*, aboard a ſhip, runs four hours and is uſed to ſhift or change their Watches by. There are alſo half Watches, hour-glaſſes, minute, and half-minute-glaſſes; by which laſt they count the knots, when they heave the log, in order to find the ſhip's way.

WAVE (*Dict.*)—The great Mr. Boyle has proved by numerous experiments, that the moſt violent wind never penetrates deeper than ſix feet into the water; and it ſhould ſeem a natural conſequence of this, that the water moved by it can only be elevated to the ſame height of ſix feet from the level of the ſurface in a calm; and this ſix feet of elevation being added to the ſix of excavation, in the part whence that water ſo elevated was raiſed, ſhould give twelve feet for the utmoſt elevation of a Wave. This is a calculation that does great honour to its author; for Count Marſigli meaſured carefully the elevations of the Waves near Provence, and found that, in a very violent tempeſt, they aroſe only to ſeven feet above the natural level of the ſea; and this additional foot in height he eaſily reſolved into the accidental ſhocks of the water againſt the bottom, which was, in the place he meaſured them in, not ſo deep as to be out of the way of affecting the Waves; and he allows that the addition of one-ſixth of the height of a Wave, from ſuch a diſturbance from the bottom, is a very moderate alteration from what would have been its height in a deep ſea, and concludes, that Mr. Boyle's calculation holds perfectly right in deep ſeas, where the Waves are purely natural, and have no accidental cauſes to render them larger than their juſt proportion.

In deep water, under the high ſhores of the ſame part of France, this author found the natural elevation of the Waves to be only five feet; but he found alſo that their breaking againſt rocks, and other accidents to which they were liable in this place, often raiſed them to eight feet high.

We are not to ſuppoſe, from this calculation, that no Wave of the ſea can riſe more than ſix feet above its natural level in open and deep water, for Waves immenſely higher than theſe are formed in violent tempeſts in the great ſeas. Theſe, however, are not to be accounted Waves in their natural ſtate, but they are ſingle Waves formed of many others; for in theſe wide plains of water, when one Wave is raiſed by the wind, and would elevate itſelf up to the exact height of ſix feet, and no more, the motion of the water is ſo great, and the ſucceſſion of Waves ſo quick, that, during the time this is riſing, it receives into it ſeveral other Waves, each of which would have been at the ſame height with itſelf; theſe run into the firſt Wave one after another, as it is riſing; by this means its riſe is continued much longer than it naturally would have been, and it becomes terribly great. A number of theſe complex Waves ariſing together, and being continued in a long ſucceſſion by the continuation of the ſtorm, make the Waves ſo dangerous to ſhips, which the ſailors in their phraſe call mountains high. *Marſigli Hiſt. Phyſ. de la Mer.*

Wave-*offering*, among the Jews, a ſacrifice offered by agitation or waving towards the four cardinal points.

WEALD, or **Wald**, in the beginning of names of places, ſignifies a ſituation near woods; and the woody parts of the counties of Kent and Suſſex are called the Wealds, though miſprinted wildes, in the ſtatute 14 Car. II. c. 6.

The word Weald in Saxon ſignifies a wood.

WEAVER's *Alarm*. This contrivance is only a weight faſtened to a packthread, which is placed horizontally, ſo that in a certain time a candle may burn down to it. Then, the flame of the candle ſetting fire to the thread, the weight falls, and awakens the ſleeping perſon. See *Phil. Tranſ.* N°. 477, where we have a figure to explain the invention, which got its name from being in frequent uſe among the Weavers.

WEEDS. The farmer finds it impoſſible ever wholly to deſtroy the Weeds in his lands; and the reaſon ſeems to be, that in many kinds the ſeeds will lie many years in the ground, and ſucceſſively grow, ſome one year and ſome another; ſo that the deſtroying the crop entirely, for one year, does not kill them for ſucceeding ones. The ſeed of red-poppy will lie twenty years in the ground, in a land all that time occupied by ſaintfoin; and, if it be, after that, plowed for corn, they will all grow, and fill the field.

The ſeeds of theſe plants will never all come up in one year, becauſe they muſt have their exact degrees of depth, moiſture, and covering; the ſeeds which want any of theſe one year, lie to grow up another. The beſt defence the farmer has hitherto found againſt theſe enemies, is to endeavour their deſtruction by a ſummer fallow. This, if the weather be propitious, does make ſome havock among them, but it never deſtroys them entirely. If the ſeeds lie ſo high that the ſummer's heat parches them up, or ſo deep that it cannot reach them, they do not germinate, and are by that means ſaved for another year. And another thing which ſaves a very great number of them, is their being able to bear the heat and moiſture of the whole year without growing. Wild oats, and many other ſeeds of Weeds, are of this kind. If you gather theſe when ripe, and ſow them in the moſt careful manner, watering them at times, and taking all the care of them that is neceſſary to the moſt tender plants, they will not grow till the ſpring come twelve-months after they were ſowed, and ſometimes not till the ſpring after that; that is, two years and a half after the time of putting them into the ground. It is plain from this, that no art can deſtroy theſe by fallowing, or other means, in one year.

The common way of weeding among the young corn turns out to very little good; if this is done while the weeds are young, the greateſt part of them are only cut or broken off near the ground; this, inſtead of deſtroying them, gives them new vigour, and they ſhoot up with many heads in the place of one, and draw more nouriſhment than at firſt: if, on the other hand, it is done when they are grown up, the relief comes after the diſeaſe; for by that time they have robbed the corn of all the nouriſhment, or nearly all, they could. Hand-weeders alſo frequently do more harm in the corn by treading it down, than they do good by taking out the Weeds. This operation ſometimes coſts the farmer twelve ſhillings an acre, beſides the miſchief done, and yet there remain Weeds enough for a crop the next year from ſeeds.

The method of horſe-hoeing is a very excellent way of curing lands of this diſeaſe, ſo long as it is carefully practiſed; one of the greateſt advantages it will bring the farmer is, that no Weeds will grow up but thoſe whoſe ſeeds are brought in the air, and theſe are but very few in compariſon of the other kinds.

Weeds, in mining, a term uſed by our Engliſh diggers to expreſs any ſort of unprofitable ſubſtance found among the ores of metals. They ſeem to have borrowed the phraſe from the gardeners; and as every thing with them is a Weed, except what they have planted, and expect to gather; ſo every thing is a Weed with the miners, except the thing they are ſinking for.

The principal ſubſtances known in our mines under the names of Weeds, are mundic or marcaſite; this is of three ſorts, white, yellow, and green; daze, a kind of glittering talcy ſtone, of the telaugium kind, which endures the fire, and is of various colours and hardneſſes; iron-moulds or pyritæ; caul, which is browniſh and ſpungy; and gliſter, which is a ſort of talc. *Phil. Tranſ.* N°. 69.

WEE'VIL, in natural hiſtory, the name of a ſmall inſect which does great damages in magazines of corn, by eating into the ſeveral grains, and deſtroying their whole ſubſtance.

This creature is ſomewhat bigger than a large louſe, and is of the ſcarab kind, having two pretty, jointed, tufted horns, and a trunk or piercer, projecting from the fore-part of its head: at the end of this trunk, which is very long in proportion to its body, there are a ſort of forceps, or ſharp teeth, with which it gnaws its way into the heart of the grain, either to ſeek its food, or to depoſit its eggs there. By keeping theſe creatures alive in glaſs tubes, with a few grains of wheat, their copulation and manner of generation have been diſcovered. The female perforates a grain of wheat, and therein depoſits a ſingle egg, or, at the utmoſt, two eggs; and this ſhe does to five or ſix grains every day for ſeveral days together. Theſe eggs, which are not longer than a grain of ſand, in about a week, produce as odd a ſort of white maggot, which wriggles its body very much about, but is very little able to move from place to place: this, in about a fortnight, turns to an aurelia, from which is produced the perfect Weevil. This deſtructive creature is itſelf very ſubject to be deſtroyed, and when in the egg or aurelia ſtate, is very ſubject to be eaten by mites. *Baker's Microſ.*

WEIGHT, *pondus*, in mechanics, is any thing to be raiſed, ſuſtained, or moved by a machine; or any thing that in any manner reſiſts the motion to be produced.

In all machines, there is a natural ratio between the Weight and the moving power.—If the Weight be increaſed, the power muſt be ſo too; that is, the wheels, &c. are to be multiplied, and ſo the time increaſed, or the velocity diminiſhed.

"The center of gravity F, *Plate* XLII. *fig.* 9, of a body IH, together with the Weight of the body, being given; to determine the point M, in which, lying on an horizontal plane, a given Weight G, hung in L, cannot remove the body I H out of its horizontal ſituation."

Conceive a Weight hung in the center of gravity F, equal to the Weight of the whole body I H, and find the common center of gravity M, of that and the given Weight G.—If the point M be laid on the horizontal plane, the Weight G will not be able to move the body H I out of its place.

WELD, the name by which our farmers commonly call the luteola or dyers weed. This is a very rich commodity among the dyers, and is the more advantageous to the farmer, as it may be raiſed on very poor land, and at a very ſmall expence. Moderately fertile land does beſt for it; but it will grow upon the moſt barren; and, if this be but dry and warm, it will require no tillage. The ſeed may be ſown with barley or oats, and only harrowed in with bruſh or furze, and rolled down with a wooden roller. It is a very ſmall ſeed, and the greateſt difficulty about it is the ſowing it even. It is a ſlow grower; a gallon of ſeed is ſufficient for an acre; and, though it makes but little progreſs the firſt ſummer, it begins to grow after the corn is cut, and the next year yields a good crop.

There is a great nicety required in the time for gathering it; for this ſhould be when the ſtalk is full ripe, and the ſeeds not ſo ripe as to fall out; it is to be pulled up by the hand, and made up into little bundles to dry. The ſeed may be either threſhed out, as ſoon as it is houſed, or in the ſpring following; but the plant muſt be carefully kept dry. The ſeed ſells at about ten ſhillings the buſhel, and the dyers uſe it for deep lemon colour, and bright yellows. It is more cultivated in Kent than in any other part of England, and it there yields the farmer from forty ſhillings to ten pounds an acre.

WET *Couch*, a term uſed by the maltſters for one of the principal articles of malt-making.

In the making malt, the uſual way is to ſoak the grain in water two or three days, till it becomes plump and ſwelled, and the water is brown; the water is then drained away, and the barley is removed to a floor, where it is thrown into a wet couch, that is, an even heap of about two feet thick.

In this heap the barley ſpontaneouſly heats, and begins to grow, ſhooting out firſt the radicle, and, if ſuffered to continue growing, ſoon after the blade; but, at the eruption of the radicle, the proceſs is to be ſtopped ſhort, by ſpreading the wet couch thin over the floor, and turning it once every four or five hours for two days, laying it thicker each time; after this it is thrown into a large heap, and there ſuffered to grow hot of itſelf, and afterwards ſpread abroad again and cooled, and then thrown upon the kiln to be dried criſp without ſcorching. *Shaw's Lectures.*

Toothed **WHALE**, *cetus dentatus*, a name given to a peculiar kind of Whale, called by Johnſton, and many other writers, by the too general name of balæna.

This is diſtinguiſhed from the common Whale which yields the Whale-bone, by having white and ſtrong teeth in the lower jaw, which that fiſh has not. This is the ſpecies of Whale from which the ſperma ceti was originally taken. It was firſt of all diſcovered on the coaſt of New England, being thrown on the coaſt there, and ſperma ceti formed by the ſun and air out of the oil of its head; but it is far from being peculiar to that place; the northern ſeas afford it, and it is not unfrequently taken on the weſtern coaſts of Ireland. One caught there, about fifty years ſince, meaſured ſeventy-one feet in length, which is nineteen feet more than the length Cluſius allows to this fiſh.

WHEAT.—When Wheat is planted early, leſs ſeed is required to an acre than when it is planted late, becauſe leſs of it will die; and poor land ſhould always be allowed more ſeed than rich, becauſe a greater number of the plants will periſh on this land than on the other. The leaſt quantity of ſeed is neceſſary for rich land, that is planted early; for, in this caſe, very few of the ſeeds will fail to produce a plant that will live and flouriſh. The uſe of the hoe cauſes every plant to ſend out a great number of ſtalks from the ſame root, and in theſe, more, than in the number of plants, conſiſts the richneſs of a crop, as the ears on theſe are always largeſt and fulleſt.

Another thing to be conſidered, in order to find the proper quantity of ſeed to plant, is, that ſome wheat of the ſame ſpecies has its grains twice as large as others: in this caſe a buſhel, containing but half the number of grains that it does in ſmall-grained wheat, one buſhel of the ſmall-grained will plant juſt as much as two buſhels of this; not the meaſure of the ſeeds, but the number of the grains being the thing to be conſidered in regard to the ſowing.

It is a very natural thing to ſuppoſe, that a large-grained Wheat will produce larger and finer plants, and larger grain than a ſmall-grained one; but experiments have proved, that there is nothing in this; for the ſmalleſt-grained Wheat produces fully as large plants as the largeſt, and thoſe with as great ears, and as big ſeeds; but the young plants appear ſmaller and poorer.

Six gallons of middle-ſized ſeed is the uſual quantity drilled upon an acre; but on rich lands, planted early, four gallons will ſuffice; becauſe then the Wheat will have roots at the top of the ground before winter, and tiller very much, without danger of the worms, and many other accidents, which the late planted Wheat is very liable to.

If it be drilled too thin, it will be in danger of falling, and, if too thick, it may happen to tiller ſo late in the ſpring, that ſome of the ears may be blighted; a medium therefore is beſt.

The depth to plant it at is from half an inch to three inches; for, if planted too deep, there is more danger of its being eaten off by worms between the grain and the blade. A Wheat-plant that was not ſown early, ſends out no root above the grain before the ſpring, and is nouriſhed all the winter by a ſingle thread, proceeding from the grain up to the ſurface of the ground: this is the thread of life to the plant during the winter, and, the longer that is, the greater danger there is of the worm, that creature much more eaſily finding a thread that extends by its length to five or ſix inches deep, than one which reaches but one inch; beſides, the worms in winter do not inhabit very near the ſurface of the ground, and therefore they never naturally come in the way of the ſhort threads, though the long ones are always in their reach.

It is very neceſſary to take care againſt the rooks, juſt at the time when the Wheat is ſhooting up. Theſe miſchievous birds perceive it beginning to ſprout, before the farmer can perceive any thing of it, and are led by the ſhoot to pick it up; they muſt be carefully kept off the ground for a week or ten days at this ſeaſon; for at the end of that time the blade will be grown up, and the grain ſo exhauſted of its flower, that it will be of no value to them, nor will they give themſelves any trouble about ſtealing it.

The rooks never moleſt ſuch Wheat as is ſown about Michaelmas time; for at this ſeaſon there is ſo much grain of the late harveſt ſcattered about the fields where it has grown, that they find it much more worth their while to pick it up there, than to ſearch under ground for it in the ſown crops, which therefore eſcape till too far grown for this animal. *Tull's Horſehoeing Huſbandry.*

The ſeaſon for ſowing Wheat is in the autumn in moiſt weather. In the down countries the farmers begin ſowing of their Wheat in Auguſt, if there happens rain; ſo that when they are in their harveſt, if the weather ſtops them, they employ their people in ſowing: for, if the corn is not forward in the autumn, ſo as to cover the ground before winter, it ſeldom ſucceeds well on thoſe dry lands; eſpecially if the ſpring ſhould prove dry. But in the low ſtrong lands, if they get their Wheat into the ground by the middle of November, the farmers think they are in good ſeaſon: but ſometimes it ſo happens, from the badneſs of the ſeaſon, that in many places the Wheat is not ſown till Chriſtmas, or after; but this lately ſown Wheat is ſubject to run too much to ſtraw, eſpecially if the ſpring ſhould prove moiſt.

The uſual allowance of ſeed-wheat to one acre of land is three buſhels; but, from repeated experiments, it has been found, that half that quantity is ſufficient: therefore, if the farmers have regard to their own intereſt, they ſhould ſave this expence of ſeed, which amounts to a conſiderable article in large farms, eſpecially when it is to be purchaſed; which moſt of the ſkilful farmers do, at leaſt every other year, by way of change; for they find, that the ſeeds continued long upon the ſame land will not ſucceed ſo well, as when they procure a change of ſeeds from a diſtant country. And the ſame is practiſed by the huſbandmen of the Low-countries, who commonly procure freſh ſeeds from Sicily every ſecond or third year; which they find ſucceed better with them, than the ſeeds of their own country. In the choice of the ſeeds, particular regard ſhould be had to the land upon which it grew; for, if it is light land, the Wheat which grew upon ſtrong land is the beſt; and ſo vice verſa.

There have been ſome perſons in England curious enough to procure their ſeed Wheat from Sicily, which has ſucceeded very well: but the grain of this has proved too hard for our Engliſh mills to grind, which has occaſioned their neglecting to procure their ſeeds from thence; nor do I think there can be much advantage in procuring the ſeeds from abroad, ſince the lands of England are ſo various, as to afford as much change of ſeeds as will be neceſſary. And, the leſs we purchaſe from abroad, the greater will be the ſaving to the public; ſo that it ſhould be the buſineſs of ſkilful farmers to want as few ſeeds as poſſible; ſince, by exchange with each other, they may ſo contrive, as not to part with ready money for any ſeeds.

The land which is uſually allotted for Wheat, is laid fallow the ſummer before the corn is ſown; during which time, it is plowed two or three times, to bring it into a tilth; and the oftener and better the ground is plowed, and the more it is laboured with harrows between each plowing, the better will be the crop, and the fewer weeds will be produced. But in this article moſt of the farmers are deficient; for, after they have given their lands one plowing, they frequently leave it to produce weeds, which ſometimes are permitted to ſtand until they ſhed their ſeeds, whereby the ground will be plentifully ſtocked with weeds: and, as an excuſe for this, they ſay, that theſe weeds will ſupply their ſheep with ſome feed, and the dung of the ſheep will mend their land. But this is a very bad piece of huſbandry: for the weeds will draw from the land more than the dung of the ſheep will ſupply: ſo that it is undoubtedly the beſt method to keep the ground as clean from weeds as poſſible, and to ſtir it often to ſeparate the clods, and render the land fine. And, where the land can enjoy a winter's fallow, it will be of much greater ſervice to it, than the ſummer: and, by thus labouring of the land, it will be of equal ſervice to a dreſſing of dung. Therefore, if the farmers could be prevailed on to alter their method of huſbandry, they would find their advantage in it: for the expence of dreſſing in ſome countries is ſo great, as to take away the whole profit of the crop.

There is alſo a very abſurd method in common practice with the farmers, which is the carrying of their dreſſing, and ſpreading it on the land in the ſummer; where it lies expoſed till the ſun has dried out all the goodneſs of it, before it is plowed into the ground; ſo that the dreſſing is of little value: but the dung ſhould never be laid on the land faſter than it can be plowed in; for one load of dung, ſo managed, is better than three in their uſual method.

As Wheat remains a longer time upon the ground than moſt other ſorts of corn, it requires a greater ſtock of nouriſhment, to lengthen and fill the ears: therefore, if the dreſſing is exhauſted in winter, the corn will have but ſhort ears, and thoſe but lean, nor will the grain afford much flour: ſo that it frequently happens, that a light dreſſing of ſoot in the ſpring, at the time when the Wheat is beginning to ſtalk, proves of greater ſervice to the crop, than a dreſſing of dung laid on the land before it is plowed; eſpecially if the dung is not very good. Deep plowing, where the ſtaple of the ground is deep enough to admit of it, will alſo be of great ſervice to the corn; for the ſmall fibres of the roots, which are the mouths that ſupply the nouriſhment, extend themſelves very deep into the ground. I have traced many of them upwards of three feet, and do believe they ſpread much farther where the ground is light; therefore it is of great advantage to the crop to have the ground ſtirred and looſened to a proper depth.

Of late years, many compoſts have been advertiſed for the ſteeping of the ſeeds of corn, in order to improve their growth: ſome of theſe have been ſold at a dear rate: but as ſo great ſucceſs was aſſured by the inventors, to thoſe who ſhould make uſe of them, there were numbers of perſons who made the trial; but, ſo far as I have been able to get information of the experiments, they did not ſucceed ſo well, as to encourage the uſe of theſe compoſitions. For in ſome trials, which I made myſelf with great care, it was found, that the Wheat which had been ſteeped in the compoſition, came up ſooner, and grew much ranker in the winter, than that which had not been ſteeped: but in the ſpring the unſteeped Wheat had a greater number of ſtalks to each plant, and the ears were better fed, than thoſe which had been ſteeped: therefore theſe ſorts of compoſts have been found of no uſe to the crop.

I have before obſerved, that, in general, the farmers ſow more than double the quantity of corn on their lands than is neceſſary: therefore there is a great waſte of grain, which, in ſcarce years, amounts to a conſiderable ſum in large farms. But I fear, whatever can be ſaid to prevent this, will have but little weight with the practitioners of agriculture; who are ſo fond of old cuſtoms, as rarely to be prevailed on to alter them, though they are extremely abſurd. But, if theſe people could be prevailed on to make the trial with care, they muſt be ſoon convinced of their error: for, if they will but examine a field of corn ſown in the common way, they will find but few roots with more than two or three ſtalks, unleſs by chance, where there may be ſome few roots which have room to ſpread; upon which there may be ſix, eight, or ten ſtalks, and frequently many more. I have ſeen a field of Wheat which had not a greater allowance than one buſhel of corn to an acre, where the produce was much greater than in any which was ſown with the common allowance. And if the land is good, and the roots ſtand at a proper diſtance from each other, there will be few roots which will not produce as many ſtalks as I have here mentioned, and the ears will be better nouriſhed.

But, if the land is not covered with the blades of corn by the ſpring, the farmers think they ſhall have no crop; whereas, if they had patience to wait till the roots put out their ſtems, they would ſoon be convinced of the contrary; eſpecially if they could be prevailed on to draw the roller over the Wheat in March, which will cauſe it to ſpread, and produce the more ſtalks. But, before this operation, it will be proper to have the corn cleaned from weeds; for, if theſe are permitted to grow, they will draw away much nouriſhment from the corn. And, if at this ſeaſon the land is made clean of weeds, the corn will ſoon after ſpread, and cover the ground, whereby the growth of weeds will be greatly leſſened.

There is not any part of huſbandry which requires the farmer's attention more, than that of keeping his land clean from weeds; and yet there are few who trouble themſelves about it, or who underſtand the proper method of doing it. Few of them know thoſe weeds which are annual, ſo as to diſtinguiſh them from thoſe which are perennial; and, without this knowledge, it will be much more difficult for a perſon to clean his land, let his induſtry be ever ſo great: for annual weeds may be ſoon deſtroyed, if taken in time; whereas, if they are neglected, their ſeeds will ſoon ripen, and ſcatter; after which it will require three times the labour and expence to get rid of them, as would have been ſufficient at the beginning; and then the crop would have had no bad neighbours to rob it of its nouriſhment. There is alſo another great advantage in keeping of corn clean from weeds, which is, that the corn is not ſo liable to take the ſmut, as when it is full of weeds, as I have frequently obſerved; ſo that cleanneſs is as eſſential to the well-doing and growth of vegetables, as in animals. And the changing of the ſeed annually is alſo as neceſſary, as the change of air is to all ſorts of animals: for, where this has been carefully practiſed, there has rarely happened any ſmutty corn on the farms.

Brining of the ſeed-wheat is what the farmers generally practiſe, to prevent the ſmut: which in moſt years anſwers very well: but there is nothing which contributes more to this, than keeping the plants in good health: which is better effected in the drill-huſbandry, than in the common method of ſowing in broad-caſt: for, by ſtirring of the ground with the hoe-plough between the rows of corn in the ſpring, the roots will be better ſupplied with nouriſhment: for, in ſtrong lands, where the water may have lain in the winter, the ground will bind ſo hard on the firſt dry weather, as to ſtint the corn, and frequently cauſe it to change colour. When this happens, the roots ſeldom put out many ſtalks; and thoſe which are put out, are weak: but, where the ground can be ſtirred to looſen the parts, the corn will ſoon recover its colour and ſtrength, and cover the land with ſhoots: and this corn will be much leſs in danger of being lodged by wet or wind, the ſtalks being very ſtrong.

Indeed the horſe-hoeing huſbandry has many advantages of the common method; but it is not likely to be brought into general practice by the preſent ſet of huſbandmen: ſo that, unleſs the gentlemen who have lands in their hands introduce it, and encourage young perſons to undertake it, who are not ſo much attached to the old practice, there is little hope of ſeeing this ſort of huſbandry ſpread in England.

The produce of an acre of Wheat is various, according to the goodneſs of the ſoil. In ſome of the ſhallow down-lands, where there have been near four buſhels of corn ſown, I have known the produce not double of the ſeed: but, when this is the caſe, the farmer had much better let his land lie waſte, ſince the produce will not defray the expence; ſo that more than the rent of the land is loſt. And, although theſe ſort of crops are frequent on ſuch lands, yet ſuch is the paſſion for plowing among the huſbandmen at preſent, that, if they were not reſtrained by their landlords, they would introduce the plough into every field, notwithſtanding they are ſure to loſe by it.

But, although the produce of theſe poor downs is ſo ſmall, as before related; yet, upon good land, where the corn has ſtood thin upon the ground, I have known eight quarters reaped from an acre, over the whole field, and ſometimes much more. And I have been informed by perſons of great credit, that on good land, which was drilled and managed with the horſe-hoe, they have had twelve quarters from an acre of land; which is a great produce: and this is with greater certainty, if the ſeaſons prove bad, than can be expected by the common huſbandry.

The price of corn varies continually; and this variation is often very great in the ſpace of one or two years: ſo that from being ſo cheap, as that the farmers could not pay their rents, in the compaſs of a year the price has been doubled. But this might be ſo managed by an honeſt adminiſtration, by purchaſing from the needy farmers in times of plenty, at a moderate price, and laying it up in public granaries, until there is a ſcarcity, as to ſupply the poor; whereby the public will never be in danger of wanting the ſtaff of life, nor will the farmers ſuffer by having too great plenty. For, when the Wheat is ſold much under four ſhillings the buſhel, the farmer cannot pay his rent, and live; nor can the poorer ſort of people afford to purchaſe good bread, when the wheat is ſold at a price much higher than five ſhillings the buſhel: therefore, when it is at a medium, between theſe, there can be no great cauſe of complaint. *Miller's Gard. Dict.*

Buck WHEAT. See BUCK *Wheat.*

WHEEL (*Dict.*)— The Wheel is one of the principal mechanic powers.—It has places in moſt engines; in effect, it is of an aſſemblage of Wheels, that moſt of our chief engines are compoſed.— Witneſs clocks, mills, &c.

Its form is various, according to the motions it is to have; and the uſe it is to anſwer.— By this it is diſtinguiſhed into ſimple and dented.

Simple WHEELS, are thoſe whoſe circumference and axis is uniform, and which are uſed ſingly, and not combined.— Such are the Wheels of carriages; which are to have a double motion: the one circular about their axis; the other rectilinear; by which they advance along the road, &c. which two motions they appear to have; though, in effect, they have but one: it being impoſſible the ſame thing ſhould move, or be agitated two different ways at the ſame time.

This one is a ſpiral motion; as is eaſily ſeen, by fixing a piece of chalk on the face of a Wheel, ſo as it may draw a line on a wall, as the Wheel moves.— The line it here traces is a juſt ſpiral, and ſtill the more curve, as the chalk is fixed nearer the axis.

We ſhall add, that, in Wheels of this kind, the heighth ſhould always be proportioned to the ſtature of the animal that draws or moves them.— The rule is, that the load and the axis of the Wheels be of the ſame heighth with the power that moves them: otherwiſe, the axis being higher than the beaſt, part of the load will lie on him; or, if it be lower, he pulls to diſadvantage, and muſt exert a greater force. Though Stevinus, Dr. Wallis, &c. ſhew, that to draw a vehicle, &c. over waſte, uneven places, it were beſt to fix the traces to the Wheels lower than the horſes breaſt.

The power of theſe Wheels reſults from the difference of the radii of the axis and circumference.— The canon is this: " As the radius of the axis is to that of the circumference, ſo is any power, to the weight it can ſuſtain hereby."

This is alſo the rule in the axis in the peritrochio; and, in effect, the Wheel, and the axis in peritrochio, are the ſame thing; only, in theory, it it uſually called by the latter name, and, in practice, by the former.

Dented WHEELS, are thoſe either whoſe circumference, or axis, is cut into teeth, by which they are capable of moving and acting on one another, and of being combined together.

The power of the dented Wheel depends on the ſame principle, as that of the ſimple one.— It is only that to the ſimple axis in peritrochio, which a compound lever is to a ſimple lever.

Its doctrine is compriſed in the following canon, viz.— " The ratio of the power to the weight," in order for that to be equivalent to this, " muſt be compounded of the ratio's of the diameter of the axis of the laſt Wheel to the diameter of the firſt; and of the ratio of the number of revolutions of the laſt Wheel, to thoſe of the firſt, in the ſame time.— But this doctrine will deſerve a more particular explication."

1. Then, if the weight be multiplied into the product of the radii of the axis, and that product be divided by the product of the radii of the Wheels, the power required to ſuſtain the weight will be found.— Suppoſe, for inſtance, the weight A, *Plate* XLII. *fig.* 8, = 6000 pounds, B C = 6 inches, C D = 34 inches, E F = 5 inches, E G = 35 inches, H I = 4 inches, H K = 27 inches. Then will B C, E F, H I = 120: and C D, E G, I K = 32130. Hence the power, required to ſuſtain the weight, will be 6000. 120: 32130 = 22 $\frac{1}{3}$ very nearly; a ſmall addition to which will raiſe it.

2. If the power be multiplied into the product of the radii of the Wheels, and the factum be divided by the product of the radii of the axis; the quotient will be the weight, which the power is able to ſuſtain.— Thus, if the power be 22 $\frac{1}{3}$ of a pound, the weight will be 6000 pounds.

3. " A power and a weight being given, to find the number of Wheels, and in each Wheel, ſo, as that the radius of the axis, to the radius of the Wheel: ſo, as that the power, being applied perpendicularly to the periphery of the laſt Wheel, may ſuſtain the given weight."

Divide the weight by the power: reſolve the quotient into the factors which produce it.— Then will the number of factors be the number of Wheels; and the radii of the axes will be to the radii of the Wheels, as unity to the ſeveral Wheels.— Suppoſe, for inſtance, a weight of 3000 pounds, and a power of 60, is 500, which reſolves into theſe factors, 4. 5. 5. 5. Four Wheels are to be made, in one of which, the radius of the axis is to be the radius of the Wheel, as 1 to 4.— In the reſt, as 1 to 5.

4. If a power move a weight by means of two Wheels, the revolutions of the ſlower Wheel are to thoſe of the ſwifter, as the periphery of the ſwifter axis is to the periphery of the Wheel that catches on it.

Hence, 1. the revolutions are as the radius of the axis F E, to the radius of the Wheel D C.— 2. Since the number of teeth in the axis F D is to the number of teeth in the circumference of the Wheel M, as the circumference of that, to the circumference of this: the revolutions of the ſlower Wheel M are to the revolutions of the ſwifter N, as the number of teeth in the axis, to the number of teeth in the Wheel M it catches into.

5. If the factum of the radii of the Wheels, G D, D C, be multiplied into the number of revolutions of the ſloweſt Wheel M; and the product be divided by the factum of the radii of the axes which catch into them, G H, D E, &c. the quotient will be the number of revolutions of the ſwifteſt Wheel O. For inſtance, if G E = 8, D C = 12, G H = 4, D E = 3, and the revolution of the Wheel M be one; the number of revolutions of the Wheel O will be 8.

6. If a power move a weight by means of divers Wheels, the ſpace, paſſed over by the weight, is to the ſpace of the power, as the power to the weight.—Hence, the greater the power, the faſter is the weight moved; and vice verſa.

7. The ſpaces, paſſed over by the weight and the power, are in a ratio compounded of the revolutions of the ſloweſt Wheel, to the revolutions of the ſwifteſt; and of the periphery of the axis of that, to the periphery of this.— Hence, ſince the ſpace of the weight and the power are reciprocally as the ſuſtaining power to the weight; the power that ſuſtains a weight, will be to the weight, in a ratio compounded of the revolutions of the ſloweſt Wheel, to thoſe of the ſwifteſt, and of the periphery of the axis of that, to the periphery of this.

8. " The periphery of the axis of the ſloweſt Wheel, with the periphery of the ſwifteſt Wheel, given; as alſo, the ratio of the revolutions of the one, to thoſe of the other: to find the ſpace which the power is to paſs over, while the weight goes any given length."

Multiply the periphery of the axis of the ſloweſt Wheel, into the antecedent term of the ratio, and the periphery of the ſwifteſt Wheel, into the conſequent term; and to theſe two products, and the given ſpace of the weight, find a fourth proportional: this will be the ſpace of the power.— Suppoſe, for inſtance, the ratio of the revolutions of the ſloweſt Wheel, to thoſe of the ſwifteſt, to be as 2 to 7; and the ſpace of the weight 30 feet: and let the periphery of the axis of the ſloweſt Wheel be to that of the ſwifteſt, as 3 to 8. The ſpace of the power will be found 280.

9. " The ratio of the peripheries of the ſwifteſt Wheel, and of the axis of the ſloweſt; together with the ratio of their revolutions, and the weight, being given: to find the power able to ſuſtain it."

Multiply both the antecedents and the conſequents of the given ratio's into each other: and to the product of the antecedents, the product of the conſequents, and the given weight, find a fourth proportional: that will be the power required. — Suppoſe, for inſtance, the ratio of the peripheries 8 : 3. That of the revolutions 7 : 2; and the weight 2000: the power will be found 214$\frac{2}{7}$.— After the ſame manner may the weight be found; the power and the ratio of the peripheries, &c. being given.

10. " The revolutions the ſwifteſt Wheel is to perform, while the ſloweſt makes one revolution, being given; together with the ſpace the weight is to be raiſed, and the periphery of the ſloweſt Wheel; to find the time that will be ſpent in raiſing it."

Say, as the periphery of the axis of the ſloweſt Wheel is to the ſpace of the weight given; ſo is the given number of revolutions of the ſwifteſt Wheel, to a fourth proportional; which will be the number of revolutions, performed while the weight reaches the given heighth.— Then, by experiment, determine the number of revolutions the ſwifteſt Wheel performs in an hour; and, by this, divide the fourth proportional found before.— The quotient will be the time ſpent in raiſing the weight.

Centrifugal WHEEL, a name given by Dr. Deſaguliers to a machine for extracting the foul air out of hoſpitals, ſhips, &c. *Plate* XLII. *fig.* 10. repreſents a caſe D E C B, containing a Wheel of ſeven feet in diameter, and one thick; being a cylindrical box, divided into twelve cavities by partitions directed from the circumference towards the center, but wanting nine inches of reaching the center, being open towards the center, and alſo towards the circumference, and only cloſed at the circumference by the caſe, in which the Wheel turns by means of an handle fixed to its axis A, which axis turns in two iron forks, or half concave cylinders of bell-metal, ſuch as A, fixed to the upright timber or ſtandard A E.

From the middle of the caſe on the other ſide behind A, there comes out a trunk or ſquare pipe, which we call the ſucking-pipe; which is continued quite to the upper part of the ſick perſon's room, whether it be near or far from the place where the machine ſtands, in an upper or lower ſtory, above or below the machine. There is a circular hole in one of the circular planes, of the machine of eighteen inches diameter round the axis, juſt where the pipe is inſerted into the caſe, whereby the pipe communicates with all the cavities; and, as the Wheel is turned ſwiftly round, the air which comes from the ſick room is taken in at the center of the Wheel, and driven to the circumference, ſo as to go out with great ſwiftneſs at the blowing-pipe B, fixed to the ſaid circumference.

As the foul air is drawn away from the ſick rooms, the air in the neighbouring apartments will gradually come into the room through the ſmalleſt paſſages: but there is a contrivance to apply the pipes which go to the ſick room to the blowing-pipe B, while the ſucking-pipe receives its air only from the room where the machine ſtands. By this means freſh air may be driven into the ſick room, after the foul has been drawn out.

This machine would be of great uſe in all hoſpitals, and in priſons: it would alſo ſerve very well to convey warm or cold air into any diſtant room; nay, to perfume it inſenſibly, upon occaſion.

Fig. 11. Repreſents the inſide of the flat of the Wheel which is fartheſt from the handle, and next to the ſucking-pipe.

1, 2, 3, 4. Repreſents the cavity or hole which receives the air round the axis, having about it a circular plate of iron, to hold all firm; which plate is made faſt to the wood, and to the iron croſs that has the axis in it.

g g g. Denotes, by a pricked circle, a narrow ring of thick blanketting, which, by preſſing againſt the outſide caſe, whilſt it is fixed to the outſide of the flat of the Wheel, makes the paſſage into the Wheel tight.

H H H, is another circle of blanketting, likewiſe fixed to the outſide of the Wheel, and rubbing againſt the caſe, that the air, violently driven againſt the inner circumference of the caſe, may have no way out, but at the blowing-pipe.

There is on the outſide of the other flat of the Wheel, where the handle is fixed, a ring of blanketting, like H H H, oppoſite to it; but none oppoſite to *g g g*, becauſe the wood there is not open, but comes home cloſe to the axis.

Fig. 12. Gives a vertical ſection of the Wheel and caſe a little forward of the axis, drawn by a ſcale twice as large as that of the other two figures.

A *a*, the axis ſeparated by the irons A *a*, cylindrically hollowed except the upper part, where a pin keeps in the axis.

B D, the caſe with the ſucking-pipe S *a*.

E A, the prop for one end of the axis.

1, 2. The opening into the wheel.

g g. The eminence of the wood, to which is fixed the ſmall ring of blanketting.

The four black marks, one of which is near H, repreſent the ſections of the two other rings of blanketting. *Deſaguliers's Courſe of Philoſophy.*

WHEE'ZING, a name given by our farriers to a diſtemperature in horſes, in which they draw their breath with difficulty and noiſe.

The generality of people make this and purſineſs in horſes the ſame diſtemper; but the more judicious always diſtinguiſh it, as wholly different from that. Purſineſs proceeds always from a ſtuffing or oppreſſion of the lungs; but this Wheezing is only owing to the narrowneſs of the paſſages between the bones and griſtles of the noſe.

The horſes that are moſt of all afflicted with this diſtemper, do not want wind; for, notwithſtanding they wheeze exceſſively when they are exerciſed, yet all the time their flanks are not moved, but keep in the ſame condition that they were while the creature ſtood ſtill. The dealers call theſe ſort of horſes blowers, and, though there is no real harm in the thing, it is a diſagreeable quality, and few people will chuſe them that have much ſervice for them.

There are ſome horſes that have a natural defect in their breathing, which makes it at all times attended with ſome difficulty, but not with the Wheezing before-mentioned; theſe are called thick-winded horſes.

People who are careful in the buying horſes, will purchaſe neither of theſe kinds; but then is this caution to be obſerved in regard to this defect, that it often ſeems to be in horſes where it really is not. When a horſe has been kept a long time in the ſtable without exerciſe, he will, at the firſt riding, be out of breath, and fetch it in a difficult and painful manner, though he be neither a blower or thick-winded; but all this will go off with a little exerciſe.

There are ſome temporary wheezers and blowers among horſes: theſe, at times, rattle, and make a great noiſe through their noſes in taking breath; but the complaint goes off and returns. This is only occaſioned by a great quantity of phlegm, for their flanks do not redouble with it at the worſt of times, nor have they any cough with it; ſo that there is no danger of their being purſy.

WHI'PLADE, in huſbandry, a term uſed by the farmers in ſome places, for a particular ſort of cart, whoſe hinder part is made up of boards, after the manner of a dung-cart, having alſo a head of boards, and ſhambles over the thills; this head being made ſo as either to be taken out or left in. The cart may be indifferently uſed to carry dung or other things; dung when the head is in, and corn, &c. when it is taken out.

WHIRL-*pool*. Theſe, in rivers, are very common, from various accidents, and are uſually very trivial, and of little conſequence. In the ſea they are more rare, but more dangerous. Sibbald has related the effects of a very remarkable marine Whirl-pool among the Orcades, which would prove very dangerous to ſtrangers, though it is of no conſequence to the people who are uſed to it. This is not fixed to any particular place, but appears in various parts of the limits of the ſea among thoſe iſlands. Wherever it appears, it is very furious, and boats, &c. would be inevitably drawn in and periſh with it; but the people who navigate them are prepared for it, and always carry an empty veſſel, a log of wood, or large bundle of ſtraw, or ſome ſuch thing in the boat with them; as ſoon as they perceive the Whirl-pool, they toſs this within its vortex, keeping themſelves out; this ſubſtance, whatever it be, is immediately received into the center, and carried under water; as ſoon as this is done, the ſurface of the place where the Whirl-pool was becomes ſmooth, and they row over it with ſafety; and in about an hour they ſee the vortex begin again in ſome other place, uſually at about a mile diſtance from the firſt.

WHI'STLE-*fiſh*, a name given by the people of Cornwall to a ſpecies of gadus with only two fins on the back, otherwiſe called muſtela fluviatilis.

WHITE *Land*, in agriculture, a tough clayey ſoil, naturally of a ſomewhat whitiſh hue when dry, eſpecially when it has lain ſome time untilled, but becoming blackiſh after rain; this appears of a light greyiſh colour, when turned up by the plough, and ſlides off from the plough-ſhare with eaſe, and with a ſmooth gloſſy ſurface.

It has often a yellowiſh hue with the grey, and is often veined with large parcels of a blue marly earth. *Moreton's Northamptonſhire.*

WHITE *Throat*, in zoology, the name of a ſmall bird, very common in our gardens and hedges, and ſeeming to have been deſcribed under the name of ſpipola by Aldrovandus and ſome others, though moſt approaching to the ficedula claſs.

WHITE *upon* WHITE, in the porcelain manufactory, a name given by the Engliſh merchants to a particular China-ware, which is formed of three different white ſubſtances, the body being of one, the flowers of another, and the varniſh which covers theſe of a third.

The principal art, in the making this ſort of China, is the finding the proper degree of dryneſs in the veſſels for receiving the pencilling or upper coats. It is a fine art. And the principal colour is made of an earth called hoache, which is much of the nature of our ſteatites.

WHI'TING, in zoology, the Engliſh name of a common fiſh of the aſellus kind, commonly diſtinguiſhed by the writers in ichthyography, by the name of aſellus mollis, though by ſome called aſellus albus and merlangus.

The Whiting is diſtinguiſhed from the other ſpecies of the cod kind by theſe characters: it is of a ſmall ſize, ſeldom much exceeding a foot in length, and is thin and ſlender in proportion to its length, particularly about the tail. Its ſcales are very ſmall, and its colour much more pale and whitiſh, than in any other fiſh of the cod kind, whence it has its Engliſh name. The belly is white, and the belly-fins behind the tail are ſpotted with ſmall black dots. It has no beard. Its eyes are large, and its upper jaw longer than its under; ſo that its teeth, which are large and crooked, fall over, and are uncovered when the mouth is ſhut; and the inner part of this jaw is armed alſo with very ſmall teeth. Its belly, or rather its breaſt-fins, are nearer the head than in any other ſpecies. It is common in the Engliſh ſeas and elſewhere. *Willughby's Hiſt. Piſc.*

WI'CKER-*tree*, a name given by the Engliſh to a tree common in China, and deſcribed by Kircher and others. It is, as it were, a rope twiſted by nature, about an inch thick, and creeps along the earth often for above a hundred paces together, much embarraſſing the way, but ſerving for cables of ſhips, ſeats, hurdles, beds, mats, and various other neceſſary uſes. It endures no vermin, and is much valued for being cool and refreſhing in the hot ſeaſons. *Kircher's China Illuſt.*

WI'CRANGLE, in zoology, an Engliſh name for the mattageſs, or greater butcher-bird, the lanius cinereus major of authors. *Ray's Ornithol.*

WICRA'NTUM, in natural hiſtory, a name given by the people of the Eaſt-Indies to certain foſſil bodies, of the nature of the pyrites, of the ſize of peaſe, and formed into variouſly angular figures.

WI'LDERNESS, in gardening. There is nothing ſo great an ornament to a large garden as a Wilderneſs, when properly contrived and judiciouſly planted.

The Wilderneſs ſhould always be proportioned to the ſize of the garden, and ſhould never be ſituated too near the houſe; becauſe the trees perſpire ſo large a quantity of watery vapours, as make the air very unwholeſome. They ſhould never be ſo placed as to block up a good proſpect; but, where the view naturally ends with the verge of the garden or little more, nothing terminates it ſo well as a fine plantation of trees. The ſize of the trees ſhould be conſidered, and tall growing ones ſhould be planted in larger places; ſmaller, in leſs extenſive; ever-greens alſo ſhould be kept by themſelves, and placed moſt in ſight, not mingled confuſedly among the trees which caſt their leaves.

The walks ſhould be large, and not numerous; the large walk is beſt made ſerpentine, and this ſhould not be entered upon the grand walks of the garden, but by ſome private walk. *Miller's Gard. Dict.*

WILDS, a term uſed by our farmers to expreſs that part of a plough by which the whole is drawn forwards.

The Wilds are of iron, and are of the form of a gallows, whence they are by ſome called the gallows of the plough, but improperly, the gallows of the plough being properly that part formed by the crow-ſtaves, and the tranſverſe piece into which they are mortiſed at the top.

The Wilds conſiſt of two legs, and a tranſverſe top-piece: one of the legs and the top-piece are all of one piece of iron, and the other leg, which is looſe, has a hole in the top, into which the end of the tranſverſe piece is received; both theſe legs paſs through the box of the plough, which is that tranſverſe timber through which the ſpindles of the wheels run: theſe legs are pinned in behind the box with iron pins; the holes through the box at which theſe legs paſs, are not made at right angles, but ſlanting upwards, ſo that the fore-part of the Wilds is higher than the hinder part; were it not for this, the upper part of the crow-ſtaves would lean quite back when the plough is drawn.

The uſe of the notches in the Wilds is to give the plough a broader or narrower furrow; if the links are moved to the notches on the right-hand, it brings the wheels towards the left, which gives a greater furrow; and, on the contrary, a ſmaller furrow is made when the links are moved to the notches on the left. The legs of the Wilds ſhould be nineteen inches, and their diſtance eight inches and a half; they muſt be made ſtrong, and the links muſt be placed in different notches, that the front of the plough may be kept ſteady, and the wheels not be drawn one before the other. Theſe links are of iron alſo, and are ſix inches and a half long, and to theſe are faſtened the chains of the harneſs, by which the whole plough is drawn along. *Tull's Huſbandry.*

WILLOW, *ſalix*, in botany, a genus of plants, whoſe characters are:

The leaves are entire; the flower, which is male, and grows on a ſeparate plant, is amentaceous, ſpiked, and conſiſts of a multitude of ſtamina. The ovary, which is found only on the female plant, is furniſhed with a long tube, adorned with four horns, is of a conoidal figure and conſtituted in ſuch a manner as to become a ſpiked fruit, containing a multitude of capſules reſembling horns, and gaping by maturity into two parts. Theſe capſules are full of many downy ſeeds.

There are a great number of ſpecies to be found in England, eſpecially of the ſallows, as I have been informed by a very judicious baſket-maker, there are at leaſt thirty ſorts, which they diſtinguiſh by name, commonly in uſe in their trade; and, beſides theſe, there are a great number of mountain Willows, which grow upon dry grounds, and are cultivated as underwood, in many parts of England.

All the ſorts of Willows may be eaſily propagated by planting cuttings or ſets in the ſpring, which readily take root, and are of quick growth. Thoſe ſorts which grow to be large trees, and are cultivated for their timber, are generally planted from ſets, which are about ſeven or eight feet long: theſe are ſharpened their larger end, and thruſt into the ground by the ſides of ditches and banks, where the ground is moiſt; in which places they make a conſiderable progreſs, and are a great improvement to ſuch eſtates; becauſe their tops will be fit to lop every fourth or fifth year. The larger wood, if ſound, is commonly ſold for making wooden heels, and pegs for ſhoes; as alſo to the turners, for many kinds of light wares.

The ſallows are commonly planted in cuttings made from ſtrong ſhoots of the former year, and are about three feet long; theſe are commonly thruſt down two feet deep into the ground, and are one foot above it. The ſoil ſhould always be dug or plowed before they are planted, and the cuttings placed about three feet row from row, and eighteen inches aſunder in the rows; obſerving always to place the rows the ſloping way of the ground, eſpecially if the tides overflow the place; becauſe, if the rows are placed the contrary ways, all the filth and weeds will be detained by the plants, which will choak them up.

The beſt ſeaſon for planting theſe cuttings is in February; for, if they are planted ſooner, they are apt to peel, if it proves hard froſt, which greatly injures them.

Theſe plants are always cut every year; and, if the ſoil be good, they will produce a great crop, ſo that the yearly produce of one acre has been often ſold for fifteen pounds; but ten pounds is a common price, which is much better than corn-land; ſo that it is great pity theſe plants are not more cultivated, eſpecially upon moiſt boggy ſoils, upon which few other things will thrive.

WIND (*Dict.*)— The huſbandman often ſuffers extremely by high Winds, in many different reſpects. Plantations of trees, at a ſmall diſtance from the barns and houſes, are the beſt ſafeguard againſt their ſuffering by Winds; but they muſt not be planted ſo near, as that their fall, if it ſhould happen, would endanger them. Yews grow very ſlowly, otherwiſe they are the beſt of all trees for this defenſive plantation. Trees ſuffer by Winds, being either broken or blown down by them; but this may be in a great meaſure prevented by cutting off great part of the heads and branches of them in places where they ſtand moſt expoſed.

Hops are the moſt ſubject to be injured by Winds of any crop; but this may be in a great meaſure prevented by a high pale, or very thick thorn hedge; this will both keep off the ſpring Wind, which nips the young buds, and be great ſafeguard againſt other Winds that would tear the plants from their poles. The poles ſhould always be very firm in the ground; and the beſt ſecurity to be added to this is a row of tall trees all round the ground.

Winds, attended with rain, do vaſt injury to the corn, by laying it flat to the ground. The beſt method of preventing this, is to keep up good incloſures; and, if the accident happens, the corn ſhould be cut immediately, for it never grows at all afterwards. It ſhould be left on the ground, in this caſe, ſome time after the cutting, to harden the grain in the ear. *Mortimer's Huſbandry.*

Wind *flower*, in botany, the Engliſh name of the anemone. See the article ANEMONE.

WIND-*gall*, a name given by our farriers to a diſtemperature of horſes. In this caſe, there are bladders full of a corrupt jelly, which, when let out, is thick, and of the colour of the yolk of an egg.

They vary in ſize, but are more uſually ſmall than large. Their place is about the fetlock joint, and they grow indifferently on all four legs, and are often ſo painful, eſpecially in the ſummer-ſeaſon, when the weather is hot, and the ground dry and hard, that they make the creature frequently ſtumble, or fall abſolutely down.

The general method of cure is to open the ſwelling about the length of a bean, and to preſs out the jelly: when this is done, they apply a mixture of the oil of bays and the white of an egg, covering it with tow.

Another method is, after the jelly is all ſqueeſed out, to wrap round the part a woollen cloath, and then applying a taylor's hot iron, this is to be rubbed over till all the moiſture is carried away; it is then to be daubed all over with pitch, maſtich, and reſin, boiled together, laying tow in plenty over all.

The Wind-galls that are ſituated near the ſinews, are much the moſt painful of all, and ſooneſt make the horſe lame.

The general cauſe of Wind-galls is ſuppoſed to be extreme work, or exerciſe in very hot weather; but it is to be obſerved, that thoſe horſes, which have long joints, will be Wind-galled, if they work never ſo little.

The worſt Wind-galls are thoſe of the hinder legs; all the above-mentioned will frequently miſs of ſucceſs in theſe, and nothing but fire will cure them.

Wind-*hatch*, in mining, a term uſed to expreſs the place at which the ore is taken out of the mines.

The word hatch is the general term uſed by the miners to expreſs an opening from the ſurface into the mine, or in the attempting to find a mine.

Thus the word eſſay-hatches ſignifies the openings made in ſearch of the trains of ſhoad-ſtones; and the tin-hatch in Cornwall is the name of the opening by which they deſcend into a tin-mine.

The word Wind-hatch ſeems to be a corruption of winder-hatch; for at theſe places, they have a winder conveying two buckets, the one conſtantly up, the other conſtantly down; the man below fills the bucket that deſcends; and, when that which aſcends full is emptied at the mouth of the hatch, the perſon who has the care of that part of the work, delivers it empty to go down again. *Phil. Tranſ.* N°. 69.

Wind-*ſails*, in a ſhip, are made of the common ſail-cloth, and are uſually between twenty-five and thirty feet long according to the ſize of the ſhip, and are of the form of a cone ending obtuſely: when they are made uſe of, they are hoiſed by ropes to about two-thirds or more of their height, with their baſis diſtended circularly by hoops, and their apex hanging downwards, in the hatch-ways of the ſhip; above each of theſe, one of the common ſails is ſo diſpoſed, that the greateſt part of the air, ruſhing againſt it, is directed into the Wind-ſail, and conveyed, as through a funnel, into the upper parts of the body of the ſhip. *Phil. Tranſ.* N°. 463.

Wind-*ſhock*, a name given by our farmers to a diſtemperature to which fruit-trees, and ſometimes timber-trees, are ſubject. It is a ſort of bruiſe and ſhiver throughout the whole ſubſtance of the tree; but, the bark not being often affected by it, it is not ſeen on the outſide, while the inſide is twiſted round and greatly injured.

It is by ſome ſuppoſed to be occaſioned by high Winds; but others attribute it to lightning. Thoſe trees are moſt uſually affected by it, whoſe boughs grow more out on one ſide than on the other.

The beſt way of preventing this, in valuable trees, is to take care, in the plantation, that they are ſheltered well, and to cut them frequently in a regular manner, while young.

The Winds not only twiſt trees in this manner, but they often throw them wholly down: in this caſe, the common method is to cut up the tree for firing, or other uſes; but, if it be a tree that is worth preſerving, and if it be not broken, but only torn up by the roots, it may be proper to raiſe it again by the following method: let a hole be dug deep enough to receive its roots in the place where they before were; let the ſtraggling roots be cut off, and ſome of the branches, and part of the head of the tree; then let it be raiſed; and when the torn-up roots are replaced in the earth, in their natural ſituation, let them be well covered, and the hole filled up with rammed earth; the tree will, in this caſe, grow as well, and perhaps better, than before. If nature be left to herſelf, and the trees be not very large, the pulling off the roots will raiſe it. *Mortimer's Huſbandry.*

Venetian WINDOW, a very elegant Window, invented by the Venetians. *Plate* IV. *fig.* 1. in the Dictionary, repreſents a Window of this kind.

WINE (*Dict.*)—The method of converting white Wine into red, ſo much practiſed by the modern Wine-coopers, is this: put four ounces of turnſole rags into an earthen veſſel, and pour upon them a pint of boiling water; cover the veſſel cloſe, and leave it to cool; ſtrain off the liquor, which will be of a fine deep red inclining to purple. A ſmall proportion of this colours a large quantity of Wine. This tincture might be either made in brandy, or mixed with it, or elſe made into a ſyrup with ſugar for keeping. A common way with the Wine-coopers is to infuſe the rags cold in Wine for a night or more, and then wring them out with their hands; but the inconveniency of this method is, that it gives the Wine a diſagreeable taſte, or what is commonly called the taſte of the rag; whence the Wines, thus coloured, uſually paſs among judges, for preſſed Wines, which have all this taſte from the canvas rags in which the lees are preſſed.

The way of extracting the tincture, as here directed, is not only attended with this inconveniency; but it loads the Wine with water; and, if made into a ſyrup, or mixed with brandy, it would load the Wine with things not wanted, ſince the colour alone is required. Hence the colouring of Wines has always its inconveniencies. In thoſe countries which do not afford the tinging grape, which affords a blood-red juice, wherewith the Wines of France are often ſtained; in defect of this the juice of elder-berries is uſed, and ſometimes logwood is uſed at Oporto.

The colour, afforded by the method here propoſed, gives wine the tinge of the Bourdeaux red, not the port; whence the foreign coopers are often diſtreſſed for want of a proper colouring for red Wines in bad years. This might perhaps be ſupplied by an extract made by boiling ſtick-lac in water. The ſkins of tinging grapes might alſo be uſed, and the matter of the tournſole procured in a ſolid form, not imbibed in rags. *Shaw's Lectures.*

Any conſiderable heat, or even a degree of ſimmering, or tepidity, will, by its inteſtine and ſubtile agitation, that barely diſturbs the fine ſaline and ſpirituous parts, which are very ſuſceptible of heat, thereby disjoin them from the reſt, and occaſion an alteration in the taſte, tranſparency and durability of the Wine, as much as if the ſpirit had been drawn off by diſtillation, and afterwards poured in again, in which caſe the whole ceaſes to be Wine, though it is poſſible to bring it to Wine again by bringing on a new fermentation.

It is a common accident, and a diſeaſe in Wines, to be kept too hot, and is not eaſy to cure when it has been of any long continuance, otherwiſe it may be cured by introducing a ſmall artificial fermentation, that new ranges the parts of the Wine, or rather recovers their former texture: but the actual expoſing of Wine to the fire, or ſun, preſently diſpoſes it to turn eager; and the making it boiling hot is one of the quickeſt ways of expediting the proceſs of making of vinegar.

On the other hand, Wine kept in a cool vault, and well ſecured from the external air, will preſerve its texture entire in all the conſtituent parts, and ſufficiently ſtrong for many years; as appears not only from old Wines, but other foreign fermented liquors, particularly thoſe of China, prepared from a decoction of rice, which being well cloſed down in the veſſel, and buried deep under ground, will continue for a long ſeries of years, rich, generous, and good, as the hiſtories of that country univerſally agree in aſſuring us.

The ſame is to be underſtood of vinegar which has once thrown off the ſuperabundant earthy parts, and many of the oily ones which preſided in it while it was Wine; whence the ſaline ones now get the aſcendant, and as it were ſubdue and preſide over the ſpirituous ones. In this ſtate it will continue perfect a long time; good and ſtrong vinegar, well ſtopped down, and placed in a cool place, preſerving itſelf unaltered for a long ſeries of years: but, if it be left open, ſo that its fine vapour exhales, or its ſubtile part be drawn from it, and again poured back; in either caſe it loſes its uniform conſiſtence, and particularly its durability, and immediately hurries into vapidity and corruption.

If either by fraud or accident a larger portion of water is mixed with Wine than is proper for its conſiſtence, and no way neceſſary or eſſential, this ſuperfluous water does not only deprave the taſte, and ſpoil the excellence of the Wine, but alſo renders it leſs durable; for humidity in general, and much more a ſuperfluous aqueous humidity, is the primary and reſtleſs inſtrument of all the changes that are brought on by fermentation. It may doubtleſs therefore be of uſe, and it is ſometimes abſolutely neceſſary, to take away this ſuperfluous water from the other part which ſtrictly and properly conſtitutes the Wine. This has been agreed upon on all hands as a thing proper; but the manner of doing it has not been well agreed on; ſome have propoſed the effecting it by means of heat and evaporation, others by percolation, and others by various other methods, all found unſucceſsful when brought to the trial; but the way, propoſed by Dr. Shaw from Stahl, is the moſt certain and commodious; this is done by a concentration of the Wine, not by means of heat, but of cold. *Stahl's Schediaſm. de Concentratione Vini.*

Condenſing of WINES, a phraſe uſed by Stahl, and ſome other writers, to expreſs what is more uſually called the concentrating them, that is, the freeing them from what ſuperfluous humidity they contain, and by that means rendering them more rich and noble, and freeing them from their taſteleſs part, reducing them to a ſmaller bulk, and by that means making them fitter for tranſportation, and finally rendering them more durable in their perfect ſtate, and much leſs ſubject to the various accidents that make them decay.

Various methods have been attempted for the effecting of this, and great objections found in the way of all of them, except the lateſt, brought into uſe by Stahl, and ſince recommended greatly to the world by Dr. Shaw in his Chemical Eſſays.

If any kind of Wine, but particularly ſuch as have never been adulterated, be in a ſufficient quantity, as that of a gallon or more, expoſed to a ſufficient degree of cold in froſty weather, or be put into any place where ice continues all the year, as in our ice-houſes, and there ſuffered to freeze, the ſuperfluous water that was originally contained in the Wine, will be frozen into ice, and will leave the proper and truly eſſential part of the Wine unfrozen, unleſs the degree of cold ſhould be very intenſe, or the Wine but weak and poor. This is the principle on which Stahl founds his whole ſyſtem of condenſing Wines by cold.

When the froſt is moderate, the experiment has no difficulty, becauſe not above a third or fourth part of the ſuperfluous water will be frozen in a whole night; but, if the cold be very intenſe, the beſt way is, at the end of a few hours, when a tolerable quantity of ice is formed, to pour out the remaining fluid liquor, and ſet it in another veſſel to freeze again by itſelf: this is proper, for two reaſons; firſt, becauſe, the quantity of ice growing large, more of the concentrated Wine will be apt to lodge in it than ſhould, and it will require a longer time to drain and clear away from the ice. The making the experiment will ſufficiently explain this to any body; for, without breaking the ice, the unfrozen part will, barely by inclining the veſſel, find its own way out, and drain clear from the watery part, which is now converted into ice; ſo that, if the draining be perfect, the ice of the moſt perfectly red Bourdeaux claret will become nearly as clear and pale as water, and will reſolve by heat into an almoſt entirely colourleſs phlegm. This is no ſmall curioſity attending this experiment, and at the ſame time affords a criterion of its exact performance.

If the veſſel, that thus by degrees receives the ſeveral parcels of the condenſed Wine be ſuffered to ſtand in the cold freezing place where the operation is performed, the quantity lying thin in the pouring out, or otherwiſe, will be very apt to freeze anew; and, if it be ſet in a warm place, ſome of this aqueous port thaws again, and ſo weakens the reſt. The condenſed Wine therefore ſhould be emptied in ſome place of a moderate degree as to cold or heat, where neither the ice may diſſolve, nor the various ſubſtance mixed among it be congealed.

But the beſt expedient of all is to perform the operation with a large quantity of Wine, or that of ſeveral gallons, where the utmoſt exactneſs, or the danger of a trifling waſte, needs not be regarded.

By this method, when properly performed, there firſt freezes one third part of the whole liquor, and this is properly the more purely aqueous part of it, inſomuch that, when all the vinous fluid is poured off, to be again expoſed to a concentration, the ice remaining behind, from this firſt freezing, being ſet to thaw in a warm place, diſſolves into a pure and taſteleſs water.

If the Wine, now once concentrated, ſhould, by a long continuance in the freezing cold, be again congealed to the utmoſt (unleſs the cold were very ſevere indeed) and then again be drained from its ice, there, ſoon after this, falls to the bottom of the veſſel a pure white powder or tartar, and even the icy part afterwards depoſits a little of the ſame ſubſtance after thawing; and, after the ſtanding two or three days, there is always more and more of this tartar precipitated, and that conſtantly the more, in proportion as the Wine was the more auſtere, or leſs adulterated with ſugar-candy, or the like, for theſe things contain no tartar.

The ice of the ſecond operation on a quantity of wine differs in nothing from that of the firſt, provided only that the Wine was poured clear off from it, before the ice is ſet to melt, by which means it diſſolves into a clear phlegm. This ſhews the excellency of the operation, as it loſes not its efficacy upon repetition, but brings away mere water as well at laſt as at firſt, without robbing the Wine of any of its genuine or truly valuable parts. The remaining liquor, which has eſcaped being frozen in theſe two operations, is a real concentrated Wine, as appears by its colour, conſiſtence, taſte, and ſmell ; for it now has all theſe properties in a much larger degree, than while it contained ſo much ſuperfluous moiſture of a merely aqueous kind. It therefore becomes a nobler and richer Wine, than could any way be procured without ſuch a contrivance. For, as, by this means, two thirds of the quantity are taken away in the better ſorts of Wine, and three fourths in the weaker, what remains muſt needs poſſeſs three or four times the ſtrength and virtues of the ſame quantity of the crude Wine.

The benefit and advantage of this method of congelation, if reduced to practice in the large way, in the Wine countries, muſt be evident to every body. Concentrated Wines in this manner might be ſent into foreign countries inſtead of Wine and water, which is what is uſually now ſent, the Wines they export being loaded, and in danger of being ſpoiled by three or four times their own quantity of unneceſſary, ſuperfluous, and prejudicial water.

The buſineſs is, how to perform the operation, for, Wine-countries being in general hot countries, the buſineſs of freezing will not be ſo eaſily carried on there as in the cold ones : but this is an objection eaſily ſolved by obſerving, that, in moſt of the Wine countries that we are acquainted with, there are hills and mountains, the tops of which are covered with ſnow all the year round ; and all who are acquainted with natural philoſophy, very well know, that, where there is ſnow to be had, there will be no difficulty about freezing.

The difficulty reſts therefore not in the matter of freezing, but in the reducing the Wines, when thus concentrated, to their due and natural ſtate again ; for, though the addition of water alone does this in a tolerable manner, yet better means may certainly be found on farther trials. The way of uſing poor Wines, and ſuch as in themſelves are of little uſe or value, is always a good one, and is ſufficiently advantageous ; becauſe what there is in the price of theſe above water, is made up to the proprietor in the quantity of the final produce ; water could only give the ſame quantity of the Wine that there was originally, and before the condenſation ; but theſe Wines will bear to be mixed in ſo much larger a quantity, that the produce will warrant the gaining by the practice.

This method is not practicable to advantage in the Wine countries alone. Dr. Shaw aſſures us, that he has himſelf experimented it here, and with the uſe of proper freezing mixtures has reduced wines in England to a much ſmaller quantity, in proportion to the whole, than in the ſtrongeſt of Stahl's experiments. It is evident that, by how much the quantity is ſmaller, by ſo much it is richer and ſtronger, provided that the operation has been properly performed. The doctor aſſures us, the noble eſſence or rob, thus prepared, is capable of working almoſt miracles, by turning water into Wine, and the like ; but that, in order to its ſucceeding well, there requires great care in the operator, when the congelation is repeated the laſt times. *Shaw's Chemical Eſſays. Stahl's Concentrat. Vin.*

Diſeaſes of WINES. All Wines, malt liquors, and vinegars, which are all well made, and perfect in their kind, will grow fine of themſelves, barely by ſtanding ; ſo that, if they do not thus grow fine in a reaſonable time, it is a ſign that they labour under ſome diſeaſe ; that is, they are too aqueous, too acid, too alkaline, or they tend to putrefaction, or the like. In all theſe caſes, which may properly enough be called the diſeaſes of Wines, ſuitable remedies are required before the Wines will grow fine. The moſt general remedy, hitherto known for all the diſeaſes of Wines, is a prudent uſe of tartariſed ſpirit of Wine, which not only enriches, but diſpoſes all ordinary Wines to grow fine. *Shaw's Lectures.*

Low WINES, in the diſtillery, the term for the ſpirituous liquor diſtilled immediately from the fermented matter, and continued running ſo long, that the laſt of it was not at all inflammable. This liquor is afterwards rectified to a proof ſpirit of the ſtrength of brandy, and thence to a rectified ſpirit called alchol, or ſpirit of Wine. *Shaw's Lectures.*

Pricked WINES. An eaſy method of recovering pricked Wines may be learned from the following experiment : take a bottle of red Port that is pricked, add to it half an ounce of tartariſed ſpirit of Wine, ſhake the liquor well together, and ſet it by for a few days, and it will be found very remarkably altered for the better.

This experiment depends upon the uſeful doctrine of acids and alkalies. All perfect Wines have naturally ſome acidity, and, when this acidity prevails too much, the Wine is ſaid to be pricked which is truly a ſtate of the Wine, tending to vinegar: but the introduction of a fine alkaline ſalt, ſuch as that of tartar, imbibed by ſpirit of Wine, has a direct power of taking off the acidity, and the ſpirit or Wine alſo contributes to this, as a great preſervative in general of Wines. If this operation be dexterouſly performed, pricked Wines may be abſolutely recovered by it, and remain ſaleable for ſome time : and the ſame method may be uſed to malt liquors juſt turned ſour. *Shaw's Lectures.*

WINE-*fly*, in natural hiſtory, the name of a ſmall black fly, found in empty Wine-caſks, and about Wine-lees, and called by the Latins bibio.

It is produced of a ſmall red worm, very common in the ſediment of Wine.

WINGS *of butterflies.* The beautiful Wings of this genus of inſects are diſtinguiſhed from thoſe of the fly-kind, by their not being thin and tranſparent, like them, but thicker and opaque. This opacity in them is owing only to the duſt which comes off of them, and ſticks to the fingers in handling them ; and it is alſo to this duſt that they owe all their beautiful variety of colours. — Authors, in general, call this duſt feathers ; but Mr. Reaumur more juſtly calls them ſcales.

WINGS *of gnats.* — Theſe are of a very curious ſtructure, and well worthy the uſe of the microſcope, to ſee them diſtinctly. The wings of a gnat, like thoſe of moſt other inſects, are of a cartilaginous ſubſtance ; friable, and tranſparent as a piece of talc, and the circumference, and inner ſubſtance of the Wing, are ſtrengthened by ſlender, but firm ribs, which are divaricated into ſeveral ramification. Theſe appear to us to be mere ſtraight fibres ; but they are probably hollow, and perform the office of veſſels, for carrying the fluids or air neceſſary to the ſupport of the Wing, as well as to ſtrengthen it. In the wings of butterflies there are ſimilar ribs, but all hid by the ſcales. In the Wings of gnats, they are almoſt, but not abſolutely, naked ; for the microſcope ſhews that theſe nerves or ribs, with their ſeveral ramifications, reſemble ſo many ſtalks of plants, covered with ſmall oblong leaves. The latter are ſcales, but their number is very ſmall, compared with that of the butterfly claſs ; but they make a ſlighter and more elegant ornament. *Reaumur's Hiſt. Inſ.*

WIRE (*Dict.*) — Iron-Wire is made from ſmall bars of iron, which are called Oſleom iron, which are firſt drawn out to a greater length, and to about the thickneſs of one's little finger, at a furnace, with a hammer gently moved by water. Theſe thinner pieces are bored round, and put into a furnace to aneal for twelve hours. A pretty ſtrong fire is uſed in this operation.

After this, they are laid under water for three or four months, the longer the better ; then they are delivered to the workmen called rippers, who draw them into Wire through two or three holes. After this they aneal them again for ſix hours, and water them a ſecond time for about a week, and they are then again delivered to the rippers, who draw them into Wire of the thickneſs of a large packthread. They are then anealed a third time, and then watered for a week longer, and delivered to the ſmall Wire-drawers, called over-houſe men.

In the mill where this work is performed, there are ſeveral barrels hooped with iron, which have two hooks on their upper ſides, on each whereof hang two links, which ſtand acroſs, and are faſtened to the two ends of the tongs, which catch hold of the Wire, and draw it through the hole. The axis on which the barrel moves does not run through the center, but is placed on one ſide, which is that on which the kooks are placed ; and underneath there is faſtened to the barrel a ſpoke of wood, which they call a ſwingle, which is drawn back a good way by the cogs in the axis of the wheel, and draws back the barrel, which falls to again by its own weight. The tongs hanging on the hooks of the barrel are by the workmen faſtened to the end of the Wire, and by the force of the wheel the hooks being pulled back, draw the Wire through the holes.

The plate in which the holes are is iron on the outſide, and ſteel on the inſide ; and the Wire is anointed with train oil, to make it run the eaſier. *Ray's Engliſh Words.*

WOAD, *iſatis*, in botany. See the article ISATIS.

WOLF, *lupus*, in zoology. See the article LUPUS.

WOOD (*Dict.*) — The ſtructure and organiſation of Wood is a ſubject on which many have employed their thoughts ; but perhaps none with greater ſucceſs than the celebrated Monſieur Buffon, of the Royal Academy of Sciences at Paris.

This gentleman obſerves that the organiſation of Wood is yet unknown in all its parts ; and, that though the world is greatly indebted to the obſervations of Grew, Malpighi, and Hales, yet, when he entered on the ſubject, he found there was much more unknown than known, and determined to obſerve, from its firſt ſtate, the growth of trees, and the formation of their woody part.

The ſeed of a tree, ſuppoſe an acorn, if put into the earth in the ſpring ſeaſon, produces, after a few weeks, a tender ſhoot, of an herbaceous ſtructure, which enlarges, extends itſelf, and hardens by degrees, and, in the firſt year's growth, has in it a ſlender filament of a woody ſubſtance. At the extremity of this young tree there is a little button formed, which opens the next year into leaves, and from which there is propagated a ſecond ſhoot, in all reſpects like that of the firſt year, except that is more vigorous, grows faſter, and hardens much more conſiderably. This is alſo terminated by a button like that of the precedent year, and in this is contained the ſhoot of the third year; and in this manner is the growth of the tree carried on, till it has acquired its whole height.

Each of theſe buttons is a ſort of ſeed, which contains the ſhoot of the ſucceeding year, juſt as the ſeed itſelf did that of the firſt: and the growth of a tree in height is carried on therefore by a ſeries of annual productions, exactly like one another; and the full-grown tree is, though perhaps a hundred feet high, compoſed only of a number of ſhort trees, joined end to end, the longeſt of which is not above two feet in length. Theſe little trees of the ſeveral years never at all alter their height or length, or even their thickneſs; they remain even in a tree of a hundred years old, of their original length and diameter, and ſuffer no change, but in becoming harder. This then is the manner in which trees grow in height; how they grow in thickneſs is next to be inquired into.

The button which makes the ſummit of the tree of the firſt year, draws its nouriſhment through the very ſubſtance of that little tree; but the principal tubes or veſſels which ſerve to convey the ſap, are placed between the bark and the woody filament.

The action of this ſap, in moving, dilates and enlarges theſe veſſels, while the button, in raiſing itſelf up in growth, elongates them; the ſap alſo, in continually paſſing them, leaves behind it certain fixed parts, which augment the ſolidity. Thus the ſecond year's little tree contains in its middle a woody filament in form of an elongated cone, which is the production of the Wood of a former year, and a woody bed for it, which is alſo of a conic ſhape, and which ſurrounds the firſt filament, and reaches beyond it in length; and this is the production of the ſecond year. The third bed forms itſelf altogether like the ſecond, and all the ſucceeding ones are formed by the ſame law, and in the ſame order, and envelope one another in a continued ſucceſſion or ſeries, ſo that a large tree is compoſed of a number of woody cones, which enfold, cover, and envelope one another, as the tree increaſes in thickneſs.

When the tree comes to be cut down, one eaſily counts, in a tranſverſe ſection of the trunk, the number of theſe cones, the ſections of which make ſo many concentric circles; and the age of the tree is known by the number of theſe circles, for they are diſtinctly ſeparate from one another; in a vigorous and well grown-oak, theſe lines are each of a ſixth of an inch or more in thickneſs, and the ſubſtance of theſe lines or circles is very hard and firm, but the ſubſtance of the Wood, which lies between, and unites theſe to each other, is much leſs ſo. This intermediate matter is always the weak part of the Wood, and its ſtructure and organiſation is perfectly different from that of the woody cones, and depends entirely on the manner in which thoſe cones are united to one another. This is explained in the following manner:

The veſſels, which are longitudinally diſpoſed in the Wood, and convey the nouriſhment to the button, not only are extended and hardened by the action of the ſap in motion, and by the firm particles it depoſits; but they are ever attempting alſo an extenſion of another kind; they are ramified all along as they go, and break into numberleſs extremely minute filaments, which iſſue from them like ſo many branches; theſe, on the one part, are deſtined to the production of the bark of the tree; and, on the other, are connected to the Wood of the preceding year, and from between the two woody beds a ſort of ſpungy reticular work, which, when cut tranſverſely, even to a great thickneſs, ſhews numberleſs little cavities and holes, reſembling a ſort of lace-work. The woody beds are therefore united to one another by a ſort of net-work; this net-work, however, does not occupy nearly the ſpace of the woody circles which it ſeparated, and is uſually indeed but about a ſixth part of their thickneſs. This thickneſs is much the ſame in all the trees of the ſame ſpecies, whereas the woody beds vary in them very conſiderably in thickneſs; in the oak they are found from a ſixth to a four and twentieth part of an inch in thickneſs.

By this eaſy expoſition of the texture of Wood, it is eaſy to diſcover that the longitudinal coherence of the particles of it muſt needs be vaſtly greater than the tranſverſe: one ſees alſo that, in little pieces of Wood, as in a bar of an inch thickneſs, if there are fourteen or fifteen of theſe woody beds, there will alſo be thirteen or fourteen of theſe intermediate ſpaces; and conſequently it will be much weaker than if there were but five or ſix of theſe woody beds in it, and conſequently but four or five of theſe intermediate ſpaces.

It may alſo be obſerved, that in thoſe little bars of Wood there are two or three of the woody beds wounded, which is often the caſe; the ſtrength of the bar muſt be thence greatly impaired: but the greateſt fault theſe ſmall pieces of Wood are ſubject to, is the different diſpoſition of theſe beds in the different parts of the ſame tree; and this difference is ſo great, that the force or ſtrength of a large beam of any Wood cannot be computed by proportion, from that of a ſmall piece of the ſame Wood; which, were it poſſible, would make calculations of this kind extremely eaſy. The ingenious author of this paper has from hence calculated the force and ſtrength of timber uſed in building. *Memoirs Acad. Par.* 1740.

The people who work much in Wood, and that about ſmall works, find a very ſurpriſing difference in it, according to the different ſeaſons at which the tree was cut down, and that not regularly the ſame in regard to all ſpecies, but different in regard to each. The button-mould-makers find that the Wood of the pear-tree, cut in ſummer, works tougheſt; holly, on the contrary, works tougheſt when cut in winter; box is melloweſt when it has been cut in ſummer, but hardeſt when cut about Eaſter; hawthorn works mellow when cut about October, and the ſervice is always tough, if cut in ſummer.

Wood-*cock*, a bird of paſſage, that comes into England about the middle of October, and goes away again in March.

During their ſtay with us, they ramble about from place to place, never remaining above eight or ten days together in the ſame Wood or meadow. They ſeldom or never fly in the day-time, unleſs diſturbed by men, or by ſome beaſt. In whatever places they are put up, they always fly to the thickeſt Wood that lies near, and there hide themſelves under the ſturdieſt and thickeſt trees, where they remain all day ſearching for earth-worms, and other food, under the fallen leaves.

When night comes, they go out of the Woods, and generally reſort to watery places, where they may waſh their bills, fouled with the taking their prey, and thruſting into the earth; here they remain all the night, and, if there is tolerable ſhelter, they ſtay alſo the day under it; but, when there wants this, they fly away to the Woods in the morning. In their flight, they chuſe the ſhadieſt places, and will coaſt it away to a great diſtance in ſearch of the higheſt Woods to retire to, that they may be the better ſecured, and there more defended from the annoyance of the Wind. While they travel under ſhelter, they always fly low; but when they come to any glade to croſs, they mount to a conſiderable height; but, as ſoon as they have paſſed this, they ſink again.

They hate flying high, and they are afraid to fly among trees, becauſe, like the hare, they ſee but very badly ſtraight before them; and it is owing to this imperfection in their ſight, that they are ſo eaſily taken in nets ſpread in their places of reſort.

The draw-net, in countries which are very woody, is extremely profitable in this ſport, it being no uncommon thing to take ten or a dozen Wood-cocks at a time in it.

The method of uſing it to advantage is this: there muſt be choſen a proper place in ſome thick Wood, where theſe birds are found to reſort, and a place muſt be cleared for them, and for the net. Suppoſing the Wood about three hundred paces long, in this caſe, towards the middle there muſt be cut a walk through it eight fathoms wide: near the end of this, two oppoſite trees are to be pitched upon, proper to ſupport the two ſides of the net; the boughs of theſe are to be all cleared away, and the nets faſtened by logs and pullies.

When the net is thus placed, the ſportſman muſt provide ſome covert in which he may ſtand concealed. This is eaſily made by half a dozen boughs of ever-green trees with their leaves; and the ſportſman, when he has ſtuck theſe down in the ground, and interwoven their boughs together, may either ſtand behind it, or ſit down on a bundle of dry fern, or any other ſuch matter. At three or four feet diſtance from this ſtand, towards the net, there is to be a ſtrong ſtake faſtened into the ground, and on this the lines of the net are to be faſtened when it is drawn up. When there comes a Wood-cock, the net is to be let down as ſoon as ever he is taken, to entangle him the more, for, otherwiſe, in the ſtruggling he may chance to make his eſcape. The ſportſman is then to run up, and break a wing, and cruſh his head. The net is then to be refitted again as quick as poſſible, for, when one is caught, there is great reaſon to ſuſpect that many more are coming the ſame way, which will be all loſt, if the ſportſman is ſlow at his work.

If a hare, or any other creature worth the taking, come along the walk, the net is not to be immediately let down upon it, for in that caſe it would certainly ſtart back, or run forwards, and in either caſe would probably make its eſcape: the net is to be drawn up five or ſix feet, that he may paſs quietly under it without ſuſpicion: as ſoon as he is gone by, the ſportſman is to make a great ſhout, and let go the net; the creature will, on this noiſe, ſtart back, and will thus be certainly taken in the net.

There are, in many places, great thoroughfares through ſome open piece of ground, by which Woodcocks paſs in great numbers from one Wood to another. If there be in theſe two trees, naturally planted, ſo as to ſuſtain the nets, they are by all means to be uſed; but, if not, the ſportſman will find it worth his while to be at the expence of planting two trees deep in the earth, at proper diſtances, that they may ſtand all weathers. Nets ſpread between theſe are the moſt fatal of all others to theſe birds, for all that inhabit either one or the other of the Woods come this way at times, without ſuſpicion of any danger or diſturbance.

There is another method of taking theſe birds in high Woods, with thoſe nets called hays, of the nature of the rabbets-hays, only with ſmaller meſhes. The Woodcocks are to be driven into theſe, and there ſhould always be at leaſt two or three of them planted together. When the ſportſman has provided himſelf with nets, he is to take five or ſix perſons into the Wood with him. The proper Woods for this purpoſe are thoſe of ſeven or eight years growth; and the people are to go into ſome part of them, near the middle. The nets or hays are to be placed in the ſame manner as they are for taking of rabbets, but two or three joining together at the end, and hanging over ſlopewiſe that way which the Wood-cocks are intended to be driven.

The nets being thus fixed, let the company go to the end of the Wood, placing themſelves at about ten rods diſtance from one another; they muſt all have ſticks in their hands, and they are to move forwards ſlowly towards the nets, making a noiſe by ſtriking the ſticks againſt the trees and branches, and by hallooing with their voices: in this manner they are to move up to the net; and the Wood-cocks in that part of the Wood will all be terrified before them, but will not take wing, but run along upon the ground, and thus be driven along like a drove of beaſts, ſo that, when the company come up, they will find almoſt all of them in the net. When that part of the Wood is thus drove, the nets are to be turned the other way, and placed ſlopewiſe in the contrary direction, and the company, retiring to the other end of the Wood, are to drive the Wood-cocks that are in that part with the ſame noiſe, till they have ſent them into the nets in the ſame manner.

Thus all the Wood-cocks in the Wood may be taken with very little trouble, and this may be done equally at any time of the day.

Another way of taking this bird is, by means of nooſes or ſprings.

The Wood-cock and the ſnipe ore both eaſily taken alſo with bird-lime, when their places of reſort are known, but they are not ſo eaſily found as many other birds.

The cuſtom of the Wood-cock is uſually to be upon the banks under hedges, and by the ſides of ditches towards the ſun; and they will ſuffer the ſportſman to come nearer them in the day-time after a moon-ſhiny night, than after a dark one. The reaſon of which is, that, having fed well by moon-light, they are only fit for reſt in the day following; but, when the night has been dark, they are ſeeking food all the day long.

The ſnipes naturally lie by the ſides of rivers, when the plaſhes and ponds are frozen, and they always lie with their heads up or down the ſtream, never tranſverſely.

In order to take either of theſe birds by bird-lime, the ſportſman muſt be provided with a large number of ſmall and ſmooth twigs, neatly and evenly covered with good bird-lime. Theſe muſt be placed ſloping, ſome one way, ſome another, and the whole place about where they reſort muſt be covered with them. The ſportſman then muſt conceal himſelf very carefully, that the ſight of him may not frighten away the game.

Wood-*cock ſhell*, a name given by the Engliſh naturaliſts to a particular kind of the purpura. The French call it becaſſe.

Wood-*land*, in agriculture, a term uſed, by the farmers of many counties of England, for a ſort of ſoil, from its conſtant humidity and dark colour, reſembling the ſoil in Woods, which, of whatever nature it originally is, will always be made to appear thus from the continual dropping of trees, and the want of a free air and ſun, together with the fall of leaves, deſtroyed and waſhed to pieces by the wet.

This ſoil in the open countries has a conſiderable quantity of clay in it, and holds the water a long time that once falls upon it: in wet weather it ſticks firmly to the plough-ſhare, and, in dry, is very apt to crack. In uncultivated places it uſually produces ruſhes and ruſh-graſs. A moiſt and dripping year is extremely detrimental to this ſort of land. *Moreton's North.*

Wood-*lark*, in ornithology. This is one of the ſweeteſt of our ſinging-birds, and is indeed very little inferior to the nightingale, when in good health; for we are not to judge by ſuch as are made feeble by improper food, or want of cleanlineſs in their cages.

It is one of the tendereſt birds we have, and yet it breeds the ſooneſt of any that we know of. They principally frequent gravelly grounds, and the ſides of hills, that are expoſed full to the ſun; and, if there be any ſtumps of oaks in theſe places, they always reſort to them.

The females couple with the males in the beginning of February, at which time, and never before, they part with their laſt year's brood; immediately after coupling, they betake themſelves to building their neſt.

They generally build in lay, or grounds, where the graſs is rank, and is grown brown. The principal material they uſe is dry graſs, and they always chuſe ſome place ſheltered by a good tuft for their neſt, to defend themſelves from the cold winds, which are very ſevere at that ſeaſon. They feed their young principally with a ſmall red worm; but it is very difficult to find this kind, to feed a neſt of them under our care, and they will not do well without it; ſo that they ſcarce ever come to any thing this way.

Wood-*mite*, in natural hiſtory, the name of a little animal frequently made the ſubject of microſcopical obſervation, and by ſome called the Wood-louſe; though that leſs properly, as there is another larger animal generally known by that name.

The Wood-mite is in ſhape and colour very like a louſe, and is frequently found running very nimbly, but always by ſtarts and jumps, on old books and rotten Wood. The eyes of this creature are of a fine gold colour, and can be thruſt out or drawn in at pleaſure; and when examined by the microſcope, the periſtaltic motion of the guts is ſeen very diſtinctly and beautifully; and, what is more wonderful, there is obſerved a very diſtinct and regular motion in the brain.

This probably is the ſame animal with the pediculus pulſatorius, deſcribed by Derham, as one of the death-watches. *Baker's Microſcope.*

Wood-*pucerons*, in natural hiſtory, a name given by Mr. Reaumur to a ſmall ſpecies of inſects of the puceron kind, of a greyiſh colour, and diſtinguiſhed by its two hollow horns on the hinder part of its body.

Theſe animals very much reſemble, both in ſhape and ſize, the pucerons of the alder; but, as thoſe live always on the ſurface of the ſtalk, theſe make their way deep into the wood of a tree.

WOOLLEN *Manufactory* (*Dict.*)—In order to ſet this uſeful mechanic invention in a true light, we ſhall add here the moſt uſual terms uſed therein, ranged in the ſame order as the various operations are performed.

The wool is waſhed; either in heaps, in ſtanding water; or in the coyriddle, in running water; or in tubs full of river water.

To prepare the bath or ſuds, is to let the wool ſoak in water, until it has thickened the water in the tub, by diſcharging its greaſineſs and ſalt in it. Thence it is, that inſects ſeek clean wool, and will not touch that which retains its natural moiſture.

Wool in the greaſe, is that which ſtill preſerves its natural greaſineſs. This is better for keeping, becauſe the moth will not get into it.

A waſhing of wool, is a heap of wool, taken out of the tub, and ſet to drain in the air.

To waſh the wool alive, is to waſh it on the ſheep's back before ſhearing.

The ſhears are ſciſſars made of one piece of ſteel, which forms the bow and two blades. The bow is a ſemicircle, from whence the two blades ſtretch forwards. Theſe are preſſed cloſe to each other, and cut the wool under the workman's fingers, and then fly back by the ſpring of the bow.

A tod of Wool is what is cut off the ſkin of the ſheep, beginning at the legs and ending at the head.

A fleece is the tod gathered up into a packet. Out of trade, a fleece ſometimes ſignifies a ſheep ſkin with the Wool on.

The puſhes are Wool finer than the reſt, which ſhoot out by little tufts in different places. They are plucked off the ſheep before ſhearing. In the province of Berry this laſt name is given to the wool taken off the thighs.

The breechings are thoſe which are ſo hard and clotted, that they are of the conſiſtence of felt. They are alſo called clottings, becauſe the beaſt, eſpecially when ſick, dirts and clots them by lying much on one ſide.

Pelled wool is that which comes off from ſcabby ſheep.

Sprazely or crudley wool is the young hungry wool which ſhoots out before the old is ſhorn.

Locks or breechings are long white hairs, as ſtiff as badger's hair.

All theſe ſorts of wool are bad or rejected. Yet it cannot be ſaid that they ought to be thrown away as uſeleſs. They are uſed in very coarſe works, ſuch as ordinary rugs.

Clipping is cutting off the coarſe ends of the wool, before it is waſhed. Thoſe ends are called locks.

The fleece wool is that which hath been ſhorn off the ſheep while alive.

The lambs wool is the wool cut off lambs.

The glovers wool is the wool, which the leather-dreſſer takes off the ſkin, after the ſheep is killed.

The fell wool is the wool ſtripped off ſheep, which died of ſome diſtemper. The uſe of this ſort is prohibited.

In ſorting Segovia wool, it is diſtinguiſhed into firſt, ſecond, and third. The ſame order is obſerved in ſorting Spaniſh wool.

As to other ſorts of wool, the only diſtinction that is made, is into the high wool, which is the longeſt, and is generally reſerved for combing; and the low wool, which is uſually carded. However the long wool, when it is to make cloth, is alſo carded, becauſe it does better ſo than when combed.

Fine wool unſcoured, is only fit for the market, and not for working. In order to work it, in ſome caſes they begin by waſhing and combing it; in others by getting out the greaſe by boiling, in order to waſh and comb it afterwards: and there are other caſes ſtill, in which it is firſt dyed, then carried to the river, and thence to the comber.

The ſcouring boiler, or copper, has a croſs bar in it, to ſupport the wool taken out of the water. There are alſo poles to ſtir the wool, peſtles to pound or beat it, hooks to draw it out, baſkets to hold and carry it to the river, where the cleaning of it is finiſhed.

Common wool, which has been waſhed on the ſheep's back, ought, before working, to be carefully examined, picked off the locks or clipped, and cleaned of all refuſe.

In ſome manufactories wool is wrought white, in others it is dyed before working.

For dying wool the ſame utenſils are requiſite as for ſcouring.

The ingredients are the preparatory and colouring materials.

Setting the copper is to put the neceſſary ingredients into it.

Handling the wool is to open it, by ſtirring it with the poles, in order to make every part of it take the colour equally.

Increaſing the boiling is to enlarge the fire.

Cooling the wool is to ſpread it out in the air.

If the wool has been only grounded or galled; that is, if it has only had its firſt dip, or the firſt tincture of Galls, copperas, or other ingredients, whether preparatory or colouring; then it muſt be brought in from the airing to the copper, to be there revived by a ſecond dip, which brightens the dye, or to be lowered by a new mixture, which either diminiſhes its luſtre, or gives it another teint; or in fine to give it a deeper caſt of the ſame colour.

To beat the wool, whether dyed or white, is to ſpread it on a hurdle, and to open its texture by whipping it with ſwitches, in order to make it fit for combing, or carding, and ſpinning.

For combing wool they uſe

A little furnace, which ſerves to warm the combs.

A vice and hook to fix the combs.

A pair of combs, which are two little boards, almoſt ſquare, ſtuck with teeth of iron wire, ſome a little longer than others. Each comb has its handle.

A hammer, to put in and take out theſe teeth.

A braſs hollow tube, to mend them when out of order.

A file, to point them when blunt.

A windlaſs, to twiſt the wood ſoaked in ſoaped water, before it be put on the comb.

A tub, in which the ſoap is diſſolved.

To comb in water, is to comb the wool that has been ſprinkled with oil, in order to waſh it afterwards.

A certain quantity of wool is given by weight to the workman.

A beating, is a parcel of wool beaten on the hurdle.

A ſliver is a proper quantity of wool put into the teeth of the comb.

To diſcharge it, is to take out the ſliver, after having moved the right comb backwards and forwards on the left, and the left on the right.

The carding is the quantity of wool that ſticks to each comb, and is ſufficiently combed after a certain number of movements of one comb on the other. There are always two cardings, as well as two combs.

A diſtaff is two cardings joined together, which make up a ſufficient quantity for the diſtaff.

The ſhort wool, which cannot be wrought together by combing, is not loſt. It goes to the card.

To brimſtone the wool, is to ſuſpend the ſeveral ſkeins over the brimſtone room.

The brimſtone ſtove is a little ſtove well cloſed and cemented at top, to whiten the wool by the fumes of brimſtone burning in a pan.

When dyed wool is combed, they begin by mixing it according to the taſte and ſkill of the maſter-worker.

The different colours are effaced by the judgment in mixing them, whereby there reſults a new colour.

The comber follows a certain rule in the quantity of each colour he takes for each combing: on which depends the uniformity of the colour required.

Carded wool is broke in a different manner from combed wool. It paſſes through two tools called cards, which are two little quadrangular pieces of board, three or four times as broad as tall, with a handle to each, and thick ſet with ſmall crooked wires. The cards are changed, beginning by the wideſt, and ending with the cloſeſt, in order to break the wool, and mix the colours the better.

Spinning is of two ſorts.

Twiſted thread is ſpun by the ſpindle or little reel, from combed wool, and ſerves for the chain or warp, which is the ground of little ſtuffs. The name of chain, or warp, is alſo given to the threads running lengthwiſe in a piece of cloth, and which make the ground of it.

The ſlack ſpun is made by the great wheel from carded wool, and is called the wool or ſhute. The wool croſſes the threads of the warp, and may be called ſhute with regard to a ſtuff that has a pile.

The thread of the work in cloths is generally called back thrown, becauſe, being made from carded wool, as well as the woof, it is likewiſe ſpun by the great wheel, but with the circumſtance of croſſing the wheel-ſtring: which has a double good effect, viz. to make a thread ſomewhat better twiſted and ſtronger, and to give it a different twiſt from that of the woof; whereby they thicken better in the fulling mill.

Stuffs may be divided into three ſorts, tammy, ſerge, and cloth.

Tammy or ſtuffs of two tammies, are made of thread of warp upon thread of warp, that is, the warp is of twiſted thread, and the woof of the ſame, both made from combed wool.

Serge is made of ſlack ſpun, or carded wool, on a warp of tammy, or combed wool.

Cloth is made of two ſoft threads, that is, both the warp and woof are of thread ſpun from carded wool, and very little twiſted, in order to make a more ſubſtantial and woolly ſtuff.

Theſe three fundamental ſorts are ſubdivided into a vaſt number of others, according to certain qualities added to them, and different ways of working.

To weave, is to work at the loom, or to make ſtuff.

One weaver is ſufficient for making tammy and ſerge; becauſe as theſe little ſtuffs are not wide, the ſame workman can throw his ſhuttle with his right hand between the threads of the warp, and receive it with his left, in order to throw it the contrary way. But cloths and blankets, being very wide, are wrought by two weavers, one of whom throws the ſhuttle, the other receives and throws it back; and they go on thus alternately with as much regularity, as if the work was done by the two hands of the ſame man.

The loom is compoſed of ſeveral parts, whereof the chief are the loom-poſts and croſs-bars.

The three rolls or rollers, viz. the little one, the cane-roll. The warp is at firſt faſtened at one end of the loom on the leaſt of theſe rollers, and at the other end is rolled on the ſecond cylinder, which is thicker, and is called the cane-roll: according as the warp is filled with woof, the ſtuff is to be rolled under the loom on the knee-roll; and at the ſame time the ſame length of the thread of the warp is unrolled off the cane-roll, as that of the ſtuff rolled on the knee-roll.

The batten is a large moveable frame ſuſpended on two pins at the top of the loom, to move freely backwards and forwards, under the workman's hand, who, after every throw of the ſhuttle or thread of the woof, ſtrikes in this thread more or leſs with the batten and reed.

The reed or comb is made of two rods, with a long row of teeth of reeds, or braſs wire. It is placed at the lower part of the batten. Every thread of the warp paſſes ſingly between two teeth of the reed: that ſo the batten may move without breaking the threads, and ſtrike in the woof equally, without leaving any part of it irregular.

The lams are behind the reed. Each lam is compoſed of two virgees or laths, whoſe length ſhould be the width of the ſtuff, and of little ſtrings ſtretched from one virgee to the other, which are called leiſhes. In the middle of each leiſh there is a loop or little ring of thread, horn, or glaſs, to receive one of the threads of the warp. Thoſe threads of the warp, which paſs through the loops of one lam, paſs between the leiſhes or threads of the other lam; and thoſe which paſs through the loops of the ſecond lam, play freely between the threads of the firſt; ſo as to be able to deſcend, while the firſt aſcends: and thus theſe two lams being near their ends faſtened to a common cord paſſed round a pulley at top, and at bottom to another cord which ſupports a treadle, lying under the workman's feet; if he lowers the fore lam with his left foot, the other lam muſt riſe up. The reverſe happens upon a contrary motion. If there are a greater number of lams to vary or figure the ſtuff, certain parcels of threads are thus raiſed and lowered at a time, whereby divers openings are made to receive the throw of the ſhuttle. As often as the foot is changed, and the warp receives a new throw of the woof, the batten cloſes it more or leſs according to the quality of the ſtuff. When the increaſe of the ſtuff hinders the play of the batten, there is as much of the warp rolled off the cane-roll, as of the ſtuff rolled on the lower great cylinder. Concerning the manner of guiding the threads of the warp through the rings of the jack on the warping mill; of managing the ſeparation of the threads of the portee; of uniting ſeveral portees in one chain; and of making one entire warp of them all; of bruſhing or moiſtening it with ſize, to make the threads glide eaſier in working; of mounting it on the loom, by faſtening it in a grove of the little roller; of paſſing the threads in good order through the teeth of the reed, and then dividing the ſame threads, and making ſome of them go through the loops of one lam, and between the leiſhes of the next; and others between the leiſhes of the firſt, and through the loops of the ſecond; of fixing and maintaining the diviſions of the threads, by the inſertions of ſeveral rods which prevent their mixing; of facilitating, in fine, the unwinding and play of the warp and woof by the uſual precautions and proper tools. Theſe operations are eaſily comprehended at firſt ſight. But their number is ſo great, that if the workmen did not uſe great diſpatch, by every one conſtantly plying to his own part; ſheep's wool either would never be converted into cloathing, or would bear too high a price for the common people. Let us not remain unacquainted with what ſhews the greateſt induſtry, after the play of the lams.

The ſhuttle is a piece of hard wood, that runs tapering to a point at both ends, and has a cavity in the middle, called the box or chamber, for receiving the quills.

The quill is a ſmall pipe of reed, on which a proper quantity of the thread of the woof has been wound, and which plays on the ſhuttle pin.

The ſhuttle pin is an iron wire, which runs through the quill, and with it is ſet in the chamber of the ſhuttle. It is put in, ſecured, and taken out, by the different action of a ſpring at the end of the chamber, where the ſhuttle pin is placed.

As the ſhuttle runs through the warp, the thread of the woof, which ſlips through a hole or eye in the ſide of the ſhuttle, and has been faſtened to the lizier, muſt run off the quill, which runs round as the ſhuttle goes on. When this quill is emptied, another is put in its place; and the ends of the thread of the two quills are laid cloſe to one another without knotting; only taking care to manage the throw of the ſhuttle, ſo as to be ſure of keeping both theſe ends of the woof together.

The head of the piece are ſome few inches of the ſtuff, made with a different ſort of woof from the reſt. The names of the workmen and place are wrought in it: and afterwards the lead-ſeals are put to it, which are a teſtimony of its being examined and found to be of good materials, and of the breadth and quality required by the laws for the reſpective ſorts.

The temple is compoſed of two flat notched rulers, ſecured one over another by a ſliding ring, and having pins points at their ends. The workman faſtens the two ends, full of points or ſpikes, to the two liziers, or liſts, which are the outer threads of the width of the ſtuff; and, by bringing the virgers or laths more or leſs forward, he keeps the ſtuff conſtantly of an equal breadth. It he did not take care to temple his ſtuff, the woof would ſhrink unequally, and bring the threads of the warp nearer together in ſome places, and in others farther aſunder. But by removing his temple from time to time, to keep it near the laſt throws of the woof, he ſtrikes the woof in upon a ſquare, and ſo as to make it receive the ſtroke of the batten equally in every part.

The workman continues to throw the ſhuttle, to temple, and to wind off alternately. When he is come to the end of the piece, he takes another ſort of thread for the woof, as he had done at beginning it, and makes a ſtripe of a different colour, for the names and ſeals, as above. Theſe two ends are called the head and the fag-end.

To ſteam a little ſtuff, as is done at Amiens, Rheims, and La Mans, is to render it ſopple, by expoſing it to the ſteam of boiling water in a ſquare kettle or copper, where it is laid, ſtill on its roller, with other pieces. This operation diſpoſes it for dreſſing well.

The fullery is a water-mill for working great mallets on ſtuffs, either to clean them, or thicken them to the conſiſtence of felt.

The ſtocks, or fuller's pots, are hollow veſſels to hold the ſtuffs, which are continually turned under the ſtrokes of the mallets.

The levers, or prominent bars, are the ends of pieces of timber, that run through the axle-tree or arbor of the wheel, and which, as they paſs, catch the heads of the mallets, raiſe them up, and let them fall as they go off.

To earth the ſtuff, is to rub it with fuller's earth.

To beat it in the earth, is to full the ſtuff with the earth on it, letting a water-cock run on it at the ſame time.

To ſcour cloth, is to full it after ſoaping it with black ſoap, which carries off all ſpots.

To clean-ſtuff, is to full it with a great deal of water, to carry off any remains of dirt, and to rince it.

To beat it dry, is to full it without water, till it has acquired the utmoſt thickneſs it is capable of, and beyond which it runs into a pap.

When ſtuffs come from the fulling mill, they are aired, that is, hung out.

The pieces, brought from off the poles or tenters, ought to be made up, that is, properly folded on a table; then gummed at every fold, by ſprinkling the backſide with a ſolution of gum arabic in water.

To ſtretch the ſtuff, is to paſs it from one roller on another, keeping it conſtantly of the ſame breadth, over a braſier, by means of an iron bar, on which it ſlides; whereby the heat penetrates, and breaks its ſtiffneſs. And, by thus paſſing ſeveral times from one roller on another, it is rendered pliant in every part alike.

There are ſome ſtuffs that are unrolled and rolled without fire. But it is always allowed to ſuch as are to be dreſſed very well.

The effects of this ſtretching are, firſt, to ſmooth or take out the bad folds; ſecondly, to gum the whole piece equally by the fire's ſpreading the moiſture every-where, which evaporates, and leaves the gum behind. Thirdly, to ſtretch the whole in an uniform manner: which is of vaſt conſequence in the wear of ſtuffs.

They are folded near a good fire.

They are leafed, by putting a leaf of paſteboard hot, between every two folds.

They are put between two thick boards of box, which take in the whole pile of folds.

They are left ten or twelve hours in a ſtrong preſs: and this is repeated three or four times.

They are viſited for the laſt time, and after drawing out the two ends, called the head and fag-end, the lead-ſeals, tickets, and other marks are put on which denote the quality, breadth, length, dye, and other things preſcribed by the laws: then they are put into the preſs again, and ſtitched, by ſecuring the folds looſely with threads run through the liziers.

There are ſome other practices peculiar to different manufactories; but they all tend to the ſame end.

Cloth is not ſtretched on the rollers; but, after having been fulled, teazled, tentered, or hung on the rack, ſhorn twice, cottoned, and the pile laid ſmooth one way, it is gummed or folded on leaves, put to the preſs, the leaves are changed, and, inſtead of thick coarſe paſteboards, others thinner and ſmoother, called cards, are put between the folds: it returns to the preſs, or elſe to the calender, which gives it its laſt gloſs. *Spectacle de la Nature, Tome VI.*

WORD (*Dict.*)—Simple and primitive Words have no natural connection with the things they ſignify; whence there is no rationale to be given of them: it is by a mere arbitrary inſtitution and agreement of men, that they come to ſignify any thing. Certain words have no natural propriety or aptitude, to expreſs certain thoughts, more than others; were that the caſe, there could have been but one language.

But, in derivative and compound Words, the caſe is ſomewhat different.—In the forming of theſe, we ſee, a regard is had to agreement, relation, and analogy: thus, moſt Words that have the ſame ending, have one common and general way of denoting or ſignifying things; and thoſe compounded with the ſame propoſitions, have a ſimilar manner of expreſſing and ſignifying ſimilar ideas in all the learned languages where they occur.

For the perfection of language, it is not enough, Mr. Locke obſerves, that ſounds can be made ſigns of ideas; unleſs theſe can be made uſe of, ſo as to comprehend ſeveral particular things; for the multiplication of Words would have perplexed their uſe, had every particular thing needed a diſtinct name to be ſignified by.

To remedy this inconvenience, language had a farther improvement in the uſe of general terms, whereby one Word was made to mark a multitude of particular exiſtences; which advantageous uſe of ſounds was obtained only by the difference of the ideas they were made ſigns of: thoſe names becoming general, which are made to ſtand for general ideas; and thoſe remaining particular, where the ideas they are uſed for are particular.

It is obſervable, that the Words which ſtand for actions, and notions quite removed from ſenſe, are borrowed from ſenſible ideas; as, to imagine, apprehend, comprehend, underſtand, adhere, conceive, inſtil, diſguſt, diſturbance, tranquillity, &c. which are all taken from the operations of things ſenſible, and applied to modes of thinking.—Spirit, in its primary ſignification, is no more than breath; angel, a meſſenger. By which we may gueſs what kind of notions they were, and whence derived, which filled the minds of the firſt beginners of languages; and how nature, even in the naming of things, unawares, ſuggeſted to men the originals of all their knowledge: whilſt, to give names that might make known to others any operations they felt in themſelves, or any other ideas that came not under their ſenſes, they were forced to borrow Words from the ordinary and known ideas of ſenſation.

The ends of language, in our diſcourſe with others, are chiefly three: firſt, to make our thoughts or ideas known one to another.—This we fail in, 1°. When we uſe names without clear and diſtinct ideas in our mind. 2°. When we apply received names and ideas, to which the common uſe of that language doth not apply them. 3°. When we apply them unſteadily, making them ſtand now for one, and anon for another idea.

Secondly, to make known our thoughts with as much eaſe and quickneſs as poſſible.—This men fail in, when they have complex ideas, without having diſtinct names for them; which may happen either through the defect of a language, which has none; or the fault of the man, who has not yet learned them.

Thirdly, to convey the knowledge of things.—This cannot be done, but when our ideas agree to the reality of things.—He that has names without ideas, wants meaning in his Words, and ſpeaks only empty ſounds.—He that has complex ideas without names for them, wants diſpatch in his expreſſion.—He that uſes his Words looſely and unſteadily, will either not be minded, or not underſtood.—He that applies names to his ideas, different from the common uſe, wants propriety in his language, and ſpeaks gibberiſh; and he that has ideas of ſubſtances, diſagreeing with the real exiſtence of things, ſo far wants the materials of true knowledge.

Watch-WORD, in an army, or garriſon, is ſome peculiar Word, or ſentence, by which the ſoldiers know and diſtinguiſh one another in the night, &c. and by which ſpies and deſigning perſons are diſcovered.

It is uſed alſo to prevent ſurprizes.—The Word is given out in an army every night by the general, to the lieutenant, or major-general of the day, who gives it to the majors of the brigades, and they to the adjutants; who give it firſt to the field-officers, and afterwards to a ſerjeant of each company, who carry it to the ſubalterns.

In garriſons it is given, after the gate is ſhut, to the town-major, who gives it to the adjutants, and they to the ſerjeants.

WORK-HOUSE, a place where indigent, vagrant, and idle people are ſet to Work, and maintained with cloathing, diet, &c.

Meal WORM. There are two very different inſects found in our meal or flour; the one is ſo ſmall, that it is only to be ſeen by the microſcope: all that the naked eye can diſcover of it is, that ſomething is alive in the place, from the whole ſubſtance of the flour being in motion.

The other meal-Worm is larger, and more frequently offers itſelf to our obſervation; it conſiſts of eleven rings, and has three pair of legs. The mouth of this Worm is made into a kind of forceps, and from this ariſe, on each ſide, a great number of ſmall ſpinulæ; theſe ſerve inſtead of teeth, and the animal feeds by means of them. They are found ſometimes very ſoft and tender, ſometimes hard and firm, and at other ſeaſons they are very briſk and lively; at others they have ſcarce any life in them.

The moſt remarkable thing, in regard to theſe worms, is, that they are always exactly of the colour of the flour which they live among. Ray has obſerved, that the white flour breeds white ones; the coarſer flour breeds larger and greyer ones; and that flour which has the bran among it breeds brown ones, of the ſame colour with itſelf. This is a proviſion of nature for the ſafety of the animal, ſince, were it of a colour different from that of the flour, it muſt be eaſily diſcovered among it, and would be picked out and thrown away. The caterpillar tribe are thus preſerved, by being of the colour of the leaves they feed on; their green uſually ſuiting itſelf exactly to that of the tree or plant. *Deſlandes, Trait Phyſ.*

Worms, in huſbandry.—Theſe creatures are very prejudicial to corn-fields, eating up the roots of the young corn, and thereby deſtroying great quantities of it.

Sea-ſalt is the beſt of all things for deſtroying them.—A decoction of wood-aſhes, or walnut leaves, will anſwer the ſame purpoſe; and any particular plant may be ſecured, both from worms and ſnails, by ſtrewing a mixture of lime and aſhes about its roots. It is a general caution among the farmers to ſow their corn as ſhallow as they can, where the field is very ſubject to Worms. *Mortimer's Huſbandry.*

Worms, in medicine (*Dict.*)—Tin is often recommended as a good remedy againſt Worms, particularly of the flat kind. Dr. Alſton, in the Med. Eſſ. Edinb. Vol. V. Art. 7, directs an ounce and an half of the powder of pewter-metal to be mixed in half a Scotch mutchin, or about half a pint Engliſh meaſure of treacle, for children; but, to grown perſons, he gives two ounces of the powder of pure tin, put through the fineſt hair-ſieve, and mixed with eight ounces of treacle. As to the adminiſtration of this medicine, the original receipt directs half of it to be taken the Friday before the change of the moon; the day after, half of the remainder, and the reſt on Sunday. On the Monday a purge is to be taken. The doctor thinks there is probably nothing in the particularities of the day: but ſays, the medicine ſucceeds well in ſeveral ſpecies of Worms. The Memoirs of the French Academy give a very remarkable account of an obſtinate pain cauſed by a Worm in the noſe, a place where few perſons would have ſuſpected ſuch an animal for the cauſe of it.

WRECK, in metallurgy, a veſſel in which the third waſhing is given to the ore of metals.

In Cornwall, when the tin-ore has been twice waſhed, they take the head tin, or that part of the tin ore that lies uppermoſt out of the bubble, and, throwing it into this veſſel, they pour water on it, and work it about with wooden rakes, till it is cleared from whatever other extraneous matter there may ſtill have remained mixed with it, and is, after this, fit for the melting-houſe, to be run into metal. *Ray's Engliſh Words.*

WRI'TING. To make new writing appear old, moiſten it with oil of tartar per deliquium, more or leſs diluted with water, as you deſire the ink to appear more or leſs decayed. *Boyle's Works.*

We may write without ink or its materials: for this purpoſe, take a fine powder of calcined harts-horn, of clean tobacco-pipes, or rather of mutton bones burnt to a perfect whiteneſs, and rub it upon the paper, and then write with a ſilver bodkin or the like.

The diſcharging of ink out of parchment, paper &c. is commonly done by aqua fortis diluted ſufficiently with water, that it may not deſtroy the paper. The like may be done with oil, or ſpirit of vitriol diluted. The juice of lemons, or ſtrong vinegar, will take ink out of linen more ſafely, as the mineral acids are apt to deſtroy the linen, unleſs great care be uſed in diluting them.

We may write on iron with corroſive ſublimate wetted with common water: for this purpoſe, the parts of metal we would preſerve untouched ſhould be covered with wax, and that taken off in the proper places to make way for the corroding ſubſtance.

The like may be practiſed by means of aqua fortis.

Mr. Boyle mentions a method he had of copying a whole page of writing at once. But we do not find his deſcription of it any where.

The ſame author informs us of a method of imitating writing, on copper-plates. The copy to be engraved is to be wrote with a peculiar kind of ink; and the copper-plate, being moderately warmed, is rubbed over with a white varniſh, and ſuffered to cool; then the paper being gently moiſtened, that it may readily communicate its ink, the writing is applied to the prepared ſurface of the plate, and paſſed through a rolling-preſs; by which means the ink, adhering to the varniſh, leaves the letters very conſpicuous. And hence it is eaſy with a needle to trace the ſtrokes through the varniſh upon the plate, which being afterwards cleaned, the letters are finiſhed with the graver, and the work printed off in a rolling-preſs as common cuts.

Mr. Boyle does not mention what the varniſh nor ink, uſed by the artificer from whom he received this method, was; but he tells us that he himſelf uſed the purer ſort of virgin's wax, for a varniſh; and for his ink he took fine Franckfort black carefully ground, with water, till it obtained the conſiſtence of common ink; but no gum was added, leſt it ſhould hinder the ink from coming off. He alſo obſerves, that written characters may be taken off without the help of a preſs, by laying the moiſtened paper ſmooth upon the varniſhed copper, and rubbing it on hard with a convex piece of glaſs. *Boyle's Works.*

WYCH-*houſe*.—In the places where there are ſalt-ſprings, and ſalt-works are carried on at them, the work-houſe where the ſalt is made, is always called the Wych-houſe; and hence we may naturally conclude, that Wych was an old Britiſh word for ſalt; which is the more probable, in that all the towns in which ſalt is made end in Wych; as Namptwych, Droitwych, Middlewych, &c. *Ray's Engliſh Words.*

X.

XA'NTHIUM, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the floſculous kind, being compoſed of a number of floſcules, each having one ſtamen. The ſeeds are produced on other parts of the plant, and finally become oblong and uſually prickly fruits, divided into two cells, and containing each ſeveral oblong ſeeds.

XERA'NTHEMUM, in botany, the name of a genus of plants, the characters of which are theſe: the flower is radiated; its diſk is compoſed of floſcules ſtanding upon the embryo ſeeds; but the outer circle is compoſed of plane flat petals, which are not affixed to embryo's, but are contained in the ſame cup with the floſcules which make up the diſk. The embryo's finally ripen into ſeeds, which are furniſhed with a foliaceous head.

We have ſeveral ſpecies of this plant cultivated in our gardens, and known in Engliſh by the name of everlaſting flowers; a name common to all the ſpecies of this plant, and of the amaranthoides.

Theſe flowers are of ſo dry and durable a ſtructure, that, if gathered juſt when they are ripe, they will laſt many years in perfection, and appear as freſh as while growing; they are alſo capable of ſeveral tinges, and hence are often ſeen of fine blues and greens, colours not natural to them.

They are all propagated by ſowing their ſeeds in Auguſt, in a warm border, obſerving to water and ſhade them till they are come up, if the weather proves over dry.

When the young plants are two inches high, they ſhould be removed to another warm border under the ſhelter of a wall, and there planted at five inches diſtance from each other. They will here ſtand the winter very well, and in ſpring will be ready to grow up for flowering without any farther tranſplanting; they are only to be kept clear of weeds, and in June they will flower; the flowers ſhould be gathered in July for drying, and ſome of the fineſt ſhould be ſuffered to ſtand for ſeed; for the plants periſh as ſoon as they have perfected their ſeeds, and muſt be renewed by ſowing every year. *Miller's Gard. Dict.*

XI'PHION, in botany, the name of a genus of plants, the characters of which are theſe: the flower is liliaceous, conſiſting only of one petal, and much reſembling the iris flower. The piſtil is in the manner of the iris alſo, ornamented with three petals, and the cup becomes a fruit of the ſhape of that of the iris; but the root wholly differs from that of the iris, being bulbous, and compoſed of a number of coats.

We have ſeveral ſpecies of this beautiful plant cultivated in our gardens, where they are called bulbous iris's; and, beſides theſe, a vaſt number of varieties or new flowers, as the floriſts call them, are frequently raiſed by thoſe who propagate them from ſeeds. The culture of theſe being the ſame with that of ſeveral other plants of the ſame ſorts, which are much valued for their flowers, it may not be amiſs to give it at large.

There ſhould be great care taken to ſave the ſeeds of the fineſt and ſtrongeſt flowers, and in September ſome ſhallow pans or boxes muſt be placed with holes at their bottom to let out the moiſture, and then filled with light and fine earth. On this the ſeeds muſt be ſown pretty thick, and as evenly as may be; half an inch of the ſame earth muſt be ſifted on theſe, and the boxes muſt then be ſet where they may have the morning ſun; and, if the weather proves very dry, they muſt be gently watered at times. They muſt remain in this ſituation till October, and then muſt be removed to a place where they may have the benefit of the ſun as great a part of the day as may be; here they muſt ſtand the winter, keeping the boxes very carefully clear from weeds.

In the ſpring the young plants will appear, and they ſhould then be removed to their firſt ſituation, where they may have only the morning ſun; and, if the weather be dry, they muſt be watered at times. In June their leaves will decay, and they muſt then have half an inch of freſh earth ſifted over them, and be left in their ſituation till October, when they muſt be removed to the ſame place as before for the winter.

In the ſpring the leaves will appear again, and, when they are again periſhed, the earth muſt be taken out of the boxes, and ſifted to ſeparate the roots, which muſt then be planted at three inches diſtance on a bed of the ſame light earth; they muſt be buried three inches deep, and in the ſpring following muſt have about half an inch of freſh earth ſifted over them; the leaves will this year appear and decay as before; and, the following year in June, they will moſt of them flower; when the fineſt flowers ſhould be marked, that their roots may be taken particular care of. The following year the remainder, which did not flower at firſt, will produce their flowers; ſuch of theſe as are finer than the reſt, ſhould be marked in the ſame manner, and the roots of theſe choice kinds be preſerved with particular care. Whatever fine or new flower is thus raiſed from ſeed, may be afterwards propagated by off-ſets from the roots, which, being planted out, will flower the ſecond year, and often produce even finer flowers than the mother-root.

The roots of theſe flowers ſhould be taken out of the earth only every other year; this ſhould be done juſt when the leaves are decayed, and they ſhould not be kept out of the earth above a fortnight.

The earth in which theſe flowers thrive beſt, is a light ſandy loam; and, if it be taken up with the turf and the graſs rotted among it before it is uſed, it will be ſo much the better. They do not delight in a rich dunged ſoil, nor ſhould they be placed where they are too much expoſed to the ſun; for, beſides that the flowers ſoon fade in theſe places, the roots are alſo always found to decay; but in an eaſt border, where they may have the ſun till eleven o'clock, and where the ground is not too moiſt nor over dry, they will ſtand a long time in flower, and thrive extremely well. *Miller's Gard. Dict.*

XY'LON, *the cotton-tree*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the bell-ſhape, very wide at the mouth, and divided into many ſegments. From its bottom there ariſes a pyramidal tube, uſually loaded with ſtamina; and from the bottom of the cup there ariſes a piſtil, which is fixed in the manner of a nail both to the hinder part of the flower, and to the tube. This ripens into a roundiſh fruit, divided into four or more cells, opening at the top, and containing numerous ſeeds wrapped up in a ſtringy white ſubſtance, which is called cotton.

The cotton is a woolly or downy ſubſtance, which incloſes the ſeeds, and which is contained in a brown huſk, or ſeed-veſſel. It is from this plant that moſt of the cotton we uſe is produced, the difference of the ſeveral ſorts of it being owing to the different ſoil and climates it has grown in, and the different culture it has received.

The cotton in the wool, as it is uſually called, is what we have from Cyprus. Damaſcus cotton is called cotton in the yarn; and the Jeruſalem cottons, which are called bazaes, are the fineſt kinds of all.

All the kinds of cotton plants are propagated with us from ſeeds, which muſt be ſown on a hot-bed early in the ſpring; and, when the young plants are come up, they ſhould be tranſplanted each into a ſeparate pot of light earth, which is to be plunged into a moderate hot-bed of tanner's bark, obſerving to water and ſhade them till they have taken root; after this they ſhould be watered at times, and have as much air as the ſeaſon will permit. As they enlarge in ſize, they muſt be ſhifted into larger pots; but they muſt be kept in the ſtove, where the herbaceous kinds will annually flower in autumn; but they will ſeldom bring their pods to any perfection. *Miller's Gard. Dict.*

Y.

YEAST.—Common ale Yeaſt may be kept freſh and fit for uſe ſeveral months, by the following method: put a quantity of it into a cloſe canvas bag, and gently ſqueeze out the moiſture in a ſcrew-preſs, till the remaining matter be as firm and ſtiff as clay. In this ſtate it may be cloſe packed up in a tight caſk, for ſecuring of it from the air; and will keep freſh, ſound, and fit for uſe for a long time.

This is a ſecret that might be of great uſe to the brewers and diſtillers here; who, though they employ very large quantities of Yeaſt, ſeem to know no method of preſerving it, or raiſing nurſeries of it; for want of which they ſuſtain a very conſiderable loſs; whereas the brewers in Flanders make a very great advantage of ſupplying the malt-diſtillers of Holland with Yeaſt, which is rendered laſting and fit for carriage, by this eaſy expedient. *Shaw's Lectures.*

YE'LLOW (*Dict.*)—The Chineſe are famous for their Yellows in dying, which never change with waſhing. They make this dye of the flowers of the acacia, in a manner in which we might uſe ſeveral of our own productions to great advantage. It is thus: they gather the flowers before they are perfectly ripe, and dry them in an earthen veſſel over a gentle heat, till they criſp up in the manner of tea-leaves; they then add to them the ripe ſeeds of the ſame tree in different proportions; and then, boiling them in river-water with alum, they give the Yellow in any degree that they pleaſe.

They have three kinds of Yellow, which they diſtinguiſh by the names of Ngo-hoang, King-hoang, and hoang alone.

The firſt of theſe is the brighteſt Yellow; to dye five or ſix ells of ſilk of this colour, they uſe a pound of the flowers of the acacia, about two ounces of the ſeeds, and four ounces of alum.

The King-hoang is a ſomewhat deeper Yellow: to dye this, they uſe the ſame ingredients in the ſame proportion as in the former caſe; and, when the ſilk is dry from the dipping in this, they give it a ſecond dipping in a ſlight tincture of Brazil-wood; this brings it to the fine ſtrong Yellow we ſee.

The hoang, or pale Yellow, is made of the ſame ingredients as the firſt, only, inſtead of four ounces of alum, they put in but three ounces: river-water is found to be greatly preferable to any other, for the extracting theſe colours; but, even in that, there is great difference, ſome doing the buſineſs much better than others.

The Chineſe are ſo expert in judging on this occaſion, that they can tell by the taſte of water, whether it will or will not do; and, if it taſte faint, they know it is faulty; but they dip the pieces twice into it inſtead of once, and then the colour ſucceeds well.

The flowers of the acacia, when they have been prepared by roaſting in this manner, may be kept all the year round, and employed in dying as occaſion requires, only there is to be longer boiling for the dried flowers than the freſh ones; and it is always found that the freſh flowers give the brighteſt colour. *Obſerv. ſur les Coutumes de l'Aſie.*

YELLOW-*hammer*, in zoology, the name of a very common Engliſh bird, called by authors emberiza lutea; and by ſome hortulanus, by others luteus, and by others chloreus.

It is a little larger than the chaffinch, and is very beautifully variegated with a greeniſh or greyiſh brown, and a fine bright yellow.

There is beſides this another kind, which is much ſmaller and of a browner colour on the back; this is called by ſome authors zivolo. *Ray's Ornithol.*

YEW, *taxus*, in botany, the Engliſh name of a genus of plants, and alſo a term uſed by the ſalt-workers of Limington and other parts of England, to expreſs the firſt riſing of a ſcum upon the brine in boiling.

YU'CCA, or MANIHOT, in botany, the name of the Indian corn.

We have three or four ſpecies of this plant preſerved in the gardens of the curious; and the common kind, when grown ſtrong and hardy, will endure the cold of our climate in the open air, and produce its flowers with us. All the ſpecies may be propagated either from ſeeds ſent from abroad, or from off-ſets off-ſets or heads taken from the old plants in the manner of the aloe. When they are to be raiſed from ſeeds, theſe are to be ſown in a pot of light freſh earth, which being plunged into a moderate hot-bed, the young plants will appear in five or ſix weeks; and, when they are two or three inches high, they are to be removed, each into a ſeparate pot, which is to be plunged again into the ſame hot-bed, where they are to be watered and ſhaded, and to have air given them, as the ſeaſon and the heat of the bed will permit. In July they muſt be hardened by degrees to the open air, into which they muſt be removed ſoon after to harden them againſt winter. They muſt be placed in a defended ſituation, and remain abroad till October, when they are to be removed into the green-houſe, and placed among the hardier ſorts of aloes. They are here to be treated exactly as thoſe plants; and, when they are grown ſufficiently ſtrong, they may be removed into common borders, where they will remain through our winters, and flower very beautifully.

When they are to be raiſed from the off-ſets, theſe muſt be laid in a dry place for a week or ten days, before they are planted, that the wound where they were taken off from the old plant, may heal; elſe, like the other ſucculent plants, they are apt to rot in the earth, and miſcarry. *Miller's Gard. Dict.*

YUCCA-*bread*, or *Caſſada-bread*, made in many parts of the Weſt-Indies, and eaten there; and ſometimes brought over as a curioſity to us. It is made of the root of this plant, known among the botaniſts by the name of manihot. This grows to five or ſix feet high; the ſtalk is woody and full of knots, and has a large pith in it; the leaves are digitated or divided into a number of ſegments, like ſo many fingers; the flowers are compoſed of one leaf, and are as large as our narciſſus, and are ſucceeded by a fruit of the ſize of a hazel nut. The root is very large and thick, and of a dark colour without, but very white within. It grows wild, common enough in ſome places; but it is generally cultivated for uſe, ſetting it in large furrows. Its juice is poiſonous, though the dry powder of the root is perfectly innocent and wholeſome; but there is a kind of it which may be eaten raw, and which is now getting into uſe, inſtead of the other, which is a ſpeedy poiſon, if eaten with its juice.

The manner of making the bread from theſe roots is this: they peel them, raſp them, and putting them into bags ſqueeze out the juice; then they dry the remaining matter over the fire, and, when it is ſufficiently dried, either in the ſun, or by artificial heat, are the Caſſada-bread; which is very nouriſhing, and will keep without moulding, as well as biſcuit.

The uſe of it is apt to contract the throat, if eaten dry, and ſometimes brings on a danger of choaking; the beſt method is to moiſten it in broth, or otherwiſe, before it is eaten, or elſe to have a bottle of water at hand to waſh down every mouthful.

The juice, expreſſed in preparing this root for bread, will kill any animal that drinks it crude; but it may be boiled over the fire till a great part is evaporated, and the remainder, if it be far evaporated, will be ſweet, and ſerve in the place of honey; if leſs evaporated, and ſet by to ferment, it will make a very good and wholeſome vinegar. The juice of the roucou is ſaid to be a counter-poiſon for the juice of Yucca. *Lemery, Dict. des Drog.*

The thicker cakes of Yucca-bread are called caſſavi, or caſſada, and are eaten by the poorer ſort. The thinner are called ſciam, and are eaten by the rich. *Grew's Muſæum.*

Z.

ZA'FFER, or ZAFFRE, in chemiſtry, the name of a blue ſubſtance, of the hardneſs and form of a ſtone; and generally ſuppoſed to be a native foſſil.

It is in reality, however, a preparation of cobalt; the calx of that mineral being mixed with powdered flints, and wetted with water to bring it into this form. *Hill's Hiſt. of Foſſils.*

To prepare this for uſe in the glaſs trade, put it in groſs pieces into earthen pans, and let it ſtand half a day in the furnace; then put it into an iron ladle to be heated red-hot in the furnace; take it out while thus hot, and ſprinkle it with ſtrong vinegar; and, when cold, grind it on a porphyry to an impalpable powder, then throw this into water in glazed earthen-pans, and, when it has been well ſtirred about, let it ſettle, and pour off the water; repeat this waſhing often, and the foulneſs of the Zaffer will be thus wholly ſeparated. Dry the powder and keep it for uſe.

ZA'RNICH, in natural hiſtory, the name of a genus of foſſils, the characters of which are theſe: they are inflammable ſubſtances, not compoſed of plates or flakes, but of a plain, ſimple, and uniform ſtructure, not flexile, nor elaſtic, ſoluble in ore, and burning with a whitiſh flame, and noxious ſmell like garlic.

ZEBLI'CUM *marmor*, in natural hiſtory, a name given by ſeveral authors to a ſoft green marble variegated with black and white; and though the authors who have deſcribed it have not obſerved it, yet it no ways differs from the white ophites of the antients. *Hill's Hiſt. of Foſſ.*

ZIBELLI'NA, *or the muſtela Zibellina*, in zoology, the name of the creature whoſe furr is the ſable, ſo much valued among us.

It is an animal of the weaſel-kind, of the ſize of a cat, and of a duſky yellow colour, with a mixture of deep brown; the anterior part of the head, and the ears, are of a browniſh grey, and the hairs about its eyes, noſe, and mouth, very long. *Ray's Syn. Quad.*

ZIBE'THICUM *Animal*, in zoology, the name of the creature commonly, but very improperly, called the civet-cat; for it does not at all belong to the cat kind; but wholly to that of the dog; the head and noſe are plainly of the figure of the dog's; and the figure, number, and diſpoſition of the teeth, are plainly the ſame as in the wolf, fox, and dog.

Its colour varies very much; its more uſual one, however, is that of a pale grey, variegated with long black ſtreaks, though in the females it is often yellowiſh, and ſometimes whitiſh, and the ſpots black and round, like thoſe of the leopard, or cat of mountain.

The whole ſhape of the creature approaches to that of the wolf or dog; its ſnout is long and ſmall; its ears are ſmall and roundiſh; its hairs are like thoſe of the badger, but very ſoft. Its body is thick and fleſhy, and ſomething reſembles the ſhape of a hog's; its feet are ſmall, and its legs very ſhort. The bags which contain the civet are placed between the anus and pudenda, and are found equally in the males and females; but in the male they are twice as large as the female; they have a large cavity in their internal part, and their orifice is ſmall and cartilaginous. The perfumed liquor which is found in theſe bags, ſeems to be ſecreted from a number of glands, which lie between the two ſkins of which they are compoſed. It is remarkable, that in this creature, as in the badger, its noſe and belly are black, whereas in almoſt all other animals theſe parts are either whitiſh, or much paler than the reſt. Theſe creatures copulate backwards.

ZI'MENT-*water*, or *copper-water*, in natural hiſtory, the name by which ſome have called water found in places where there are copper-mines, and lightly impregnated with particles of that metal.

The moſt famous ſpring of this kind is about a mile diſtant from Newſol, in Hungary, in the great copper-mine called by the Germans herrn grundt.

It is not eaſy to ſay at what time theſe waters were diſcovered, ſince there is no authentic account of it. Kircher, Brown, Toll, and others, mention them as well known in their times; but it is probable that they were not diſcovered in the days of Agricola, ſince he no where makes the leaſt mention of them; and it is not probable that ſo great a curioſity, and that ſo immediately in his own way, would have eſcaped him, if known at that time, eſpecially as he has commemorated the like virtue in the Schmolnich waters, much leſs famous for it, and of much leſs power than thoſe of Newſol. The water in this mine is found at different depths, and is received into baſons, for the purpoſe of ſeparating the copper from it: in ſome of theſe it is much more highly ſated with this metal than in others, and will make the ſuppoſed change of iron into that metal much ſooner. The moſt common pieces of iron, uſed in the experiments, are horſe-ſhoes, nails, and the like; and they are found not very much altered in ſhape, after the operation, except that their ſurfaces are more raiſed. *Phil. Tranſ.* N°. 479.

ZI'ZYPHUS, *the jujube-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of ſeveral petals arranged in a circular form; the piſtil ariſes from the cup, and finally becomes a fruit of the ſhape of an olive, and of a fleſhy ſubſtance, including a ſtone divided into two cells, each of which contains an oblong ſeed.

The ſpecies of jujube, enumerated by Mr. Tournefort, are theſe: the cultivated jujube, with large oblong fruit. And, ſecondly, the wild jujube. *Tourn. Inſt.* See the article JUJUBE *in the Dict.*

ZODI'ACAL *Light*, a brightneſs reſembling that of the milky-way, and which is ſometimes perceived in the heavens, at certain times of the year, after ſun-ſet, or before its riſe. The form of this light reſembles that of a pyramid, lying lengthways in the zodiac, within which its point and axis are always incloſed, its baſe being placed obliquely with reſpect to the horizon. This phænomenon was firſt diſcovered, deſcribed, and named by Mr. Caſſini the elder.

The Zodiacal light is nothing but the ſolar atmoſphere, a rare and ſubtile fluid, either luminous by itſelf, or made ſo by the rays of the ſun ſurrounding its globe; but in a greater quantity, and more extenſively about its equator, than any other.

The Zodiacal light is more or leſs viſible according to circumſtances: but the ſolar atmoſphere is not always viſible by means of this light, though it be always ſeen about the globe of the ſun in total eclipſes.

One of the moſt eſſential circumſtances for the perception of the ſolar atmoſphere by the Zodiacal light, is its having a ſufficient length on the zodiac; for, without this, its brightneſs is entirely hid from us by the twilights.

Mr. de Mairan ſays, it may be proved from many obſervations, that the ſun's atmoſphere ſometimes reaches as far as the earth's orbit, and, there meeting with our atmoſphere, produces the appearance of aurora borealis. See the article AURORA BOREALIS.

The length of Zodiacal light varies ſometimes in reality, and ſometimes in appearance only, from various cauſes.

The oblique poſition of this light, little different from that of the plane of the ecliptic, does not permit us to ſee it diſtinctly, and ſufficiently elevated above the horizon; but ſome time after ſun-ſet, towards the end of winter, and in ſpring, or before ſun-riſing in autumn, and towards the beginning of winter. Several cauſes hinder our ſeeing it, any more than the milky-way; ſuch as moon-light, and ſtrong twilights, among others.

Mr. Caſſini often mentions the great reſemblance of the Zodical light to the tails of comets. Mr. Fatio has made the ſame obſervation; and Mr. Euler has lately endeavoured to prove them owing to ſimilar cauſes.

Mr. Euler obſerves, that, if the ſun has an atmoſphere, the force of the impulſe of light, iſſuing from that globe, muſt drive particles of that atmoſphere before it; but, as gravity is very ſtrong at the ſun, this impulſe would never drive thoſe particles beyond the limits of their atmoſphere, were it not for the centrifugal force ariſing from the ſun's motion round its axis. This being oppoſite to the action of gravity, and diminiſhing its effects, the impulſe of the light may conſiderably dilate the figure of the ſolar atmoſphere, from what it would be if it aroſe from the gravity and centrifugal force of its particles only; and this dilatation will be very conſiderable near the ſun's equator, and very ſmall towards its poles. The action of light thus diminiſhing the action of gravity, Mr. Euler attempts to calculate how far this diminution of gravity may increaſe the extent of the ſun's atmoſphere about its equator. He finds a cubic equation, the roots of which expreſs the ſemi-axis, or greateſt amplitude of this atmoſphere. He adds, that, this equation having three real roots, it is poſſible that the ſolar atmoſphere may become a ring ſurrounding the ſun's globe, as the ring of Saturn ſurrounds the body of that planet.

ZOO'LOGY, (*Dict.*) — This makes one of the three kingdoms, as they are called, of natural hiſtory; the vegetable and the mineral being the two others: in theſe, however, there is this difference made by writers, that, while vegetables and minerals are treated of together, as all of a piece in each, the ſubjects of Zoology are divided, and it is made to compoſe, as it were, ſeveral kingdoms. Whoever is to write on plants and minerals, calls his work a treatiſe of botany, or minerology; and we have no words to expreſs any ſubdiviſion of them into kingdoms; but, in Zoology, we treat, as different ſubjects, the different parts of it; and the hiſtory of birds is ſeparated by ſome from the reſt under the name of ornithology; that of quadrupeds under the name of tetrapodology; and we have, for the reſt, the words entomology, amphibiology, and the like, expreſſing theſe things which are properly but the parts of Zoology, and ſo many diſtinct and ſeparate ſtudies.

This may eaſily be amended, by our conſidering the animal world as we do the vegetable and mineral, and dividing it, as we do the others, into its proper families; it will then be found that theſe are no better diſtinctions than thoſe of the families of theſe things, and that the authors may as well ſet up ſeparate ſtudies under the names of bulbology, umbelliferology, and the like, as thoſe.

A natural diviſion of the ſubjects of Zoology, on this principle, will afford ſix ſeveral families of its ſubjects. 1. The hairy quadrupeds. 2. The birds. 3. The amphibious animals, ſuch as ſerpents, lizards, frogs, and tortoiſes. 4. Fiſhes. 5. The inſects. And, ſixthly, thoſe loweſt order of animated beings the zoophytes. *Artedi Ichthyol.*

ZU'RNAPA, in zoology, the Arabian name of an animal of a very ſingular kind, and ſeeming properly to belong to no known genus of animals, but to be perfectly ſui generis. It is alſo called camelopardalis by Latin authors, and geraffa by eaſtern nations.

ZYGÆ'NA, in zoology, the name of a fiſh of the ſhark kind, called in Engliſh the balance fiſh, or the hammer-headed ſhark.

ZYMO'LOGY, in chemiſtry, a term uſed by ſome writers, to expreſs a treatiſe on fermentation, or the doctrine of fermentation in general.